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IRVINE

Kinematic Synthesis of Lower Limb Supporting Linkages

DISSERTATION

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for the degree of

DOCTOR OF PHILOSOPHY

in Mechanical and Aerospace Engineering

by

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Synthesis of a 10-Bar Linkage to Guide the Gait Cycle of the Human Leg Proc. ASME IDETC/CIE	2015
Fitting Useful Planar Four-Bar and Six-Bar Linkages to Over-Specified Tasks <i>Interdisciplinary Applications of Kinematics, Mechanisms and Machine Science 26</i>	2015
Synthesis of an nR Robot with Four-Bar Constraining Modules Proc. ASME IDETC/CIE	2014

ABSTRACT OF THE DISSERTATION

Kinematic Synthesis of Lower Limb Supporting Linkages

By

Brandon Yukio Tsuge

Doctor of Philosophy in Mechanical and Aerospace Engineering

University of California, Irvine, 2015

Professor J. Michael McCarthy, Chair

This dissertation presents a kinematic synthesis method developed to achieve a mechanical system that guides a natural ankle trajectory for a human walking gait. This methodology was the result of exploring hybrid task position optimization for a Watt I six-bar linkage, optimization of a four-bar linkage for 9 point path synthesis, and finally a homotopy directed optimization for a Stephenson III six-bar path generator. The new homotopy directed optimization technique was applied to 205 data points that defined the human ankle trajectory. The data was interpolated using B-splines, and an objective function, obtained from the six-bar linkage loop equations, evaluated the distance between the desired trajectory and the linkage trajectory. The result was 148 designs for 23 trajectories. A clustering algorithm was used to show that these designs are effectively the same. A complete solid model, together with a cam mechanism to control the foot orientation angle is presented. This resulted in both a new six-bar linkage synthesis methodology, as well as a unique linkage system to support natural movement of the human lower limb. The similarity of the linkage designs was exploited to introduce an adjustment that allows changes of the ankle trajectory over its natural variation.

Chapter 1

Introduction

1.1 Introduction

This chapter describes current research results in treadmill based rehabilitation and over-ground walking support exoskeletons. It also presents current results existing leg mechanisms for walking robots, as well as linkage synthesis techniques.

1.2 Research Goal

The goal of this research is a design methodology for treadmill based rehabilitation systems that uses a single actuator. Exoskeletons are used in rehabilitation applications for stroke and spinal cord injury. These devices attach to the user's lower limbs to provide assistance where multiple therapists would normally be needed. However, the design of exoskeletons is difficult due to the complex and cyclic nature of human walking. In addition, gait patterns and lower limb dimensions are different from one individual to another. These exoskeleton design challenges are dealt with by implementing open serial chains with numerous actuators,

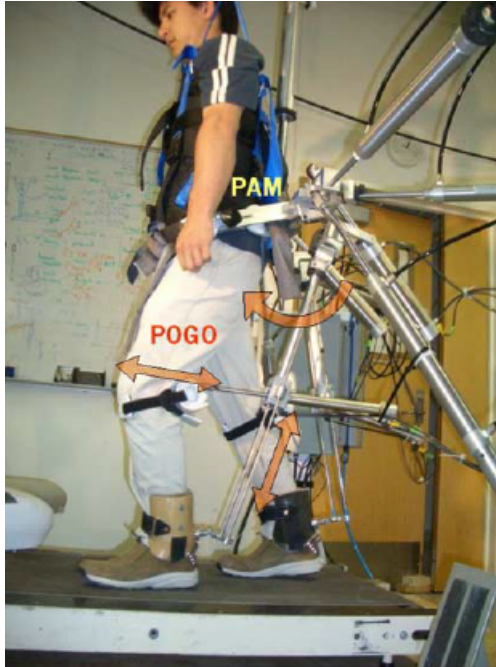
in order to achieve the complex motions. Since these robots cyclic motions the goal was to develop a design methodology that yields a single degree of freedom linkage that follows the trajectory of the human leg during walking.

In the following sections, a review of existing robotic rehabilitation devices is presented. The devices are categorized into multi-degree-of-freedom treadmill exoskeletons, mobile multi-degree-of-freedom exoskeletons, and foot orthotics. A review of multi-degree-of-freedom walking biped and hexapod robots, single-degree of freedom walking linkages, and kinematic synthesis techniques are also presented. By applying design elements from walking robots, linkage synthesis, and robotic rehabilitation technology, a single-degree-of-freedom exoskeleton was designed.

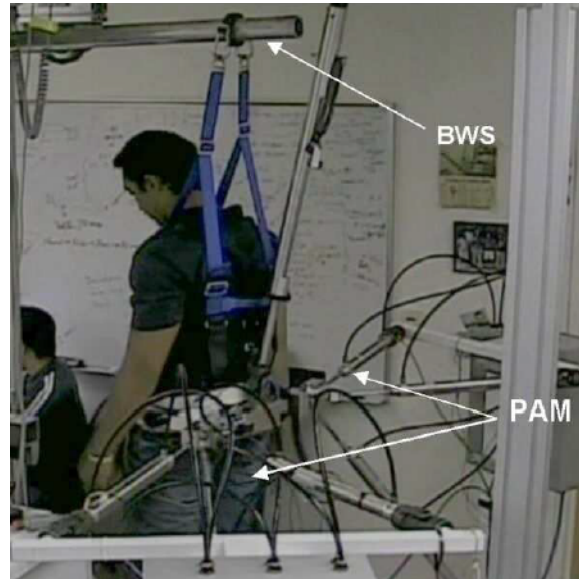
1.3 Literature Review

1.3.1 Multi-Degree-of-Freedom Treadmill Exoskeletons

Multi-degree-of-freedom treadmill exoskeletons consist of a collection of mechanisms and actuators that manipulate the users' legs and pelvis during walking. The Pelvic Assist Manipulator (PAM) and the Pneumatically Operated Gait Orthosis (POGO) utilize linear actuators that are pneumatically powered to move a user's pelvis and legs during treadmill training [5–8]. These robots are shown in Figure 1.1(a) and Figure 1.1(b). The Active Leg Exoskeleton (ALEX), is another powered orthosis that has multi-DOF attachments to the truck, thigh, and foot [9–11]. The device is attached to a parallelogram linkage, which supports the weight of the device, and the hip and knee joint are actuated by linear actuators, as shown in Figure 1.2(a). In addition, the Driven Gait Orthosis (DGO) is another powered exoskeleton that actuates the hip and knee; the trunk attachment is attached to a parallelogram linkage [12], Figure 1.2(b). The Ambulation-assisting Robotic Tool for Human



(a) PAM and POGO [7]



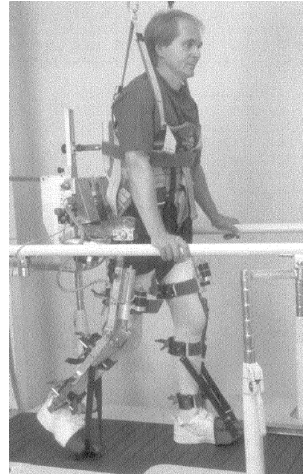
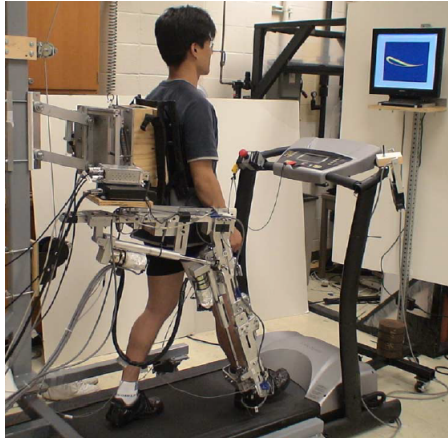
(b) PAM with Body Weight Support [6]

Figure 1.1: Pneumatically Actuated Rehabilitation Exoskeleton

Rehabilitation, ARTHuR, uses linear servo motors on a track attached to a linkage, Figure 1.3. This linkage attaches to the knee or ankle of the user and manipulates the gait [1]. The Lokomat is a device that attaches to the outside of the legs and actuates the knee and the hip with motors, Figure 1.2(c); this device is also supported by a parallel linkage [13–15]. The Lower Extremity Powered Exoskeleton (LOPES), shown in Figure 1.4(a), has spring loaded joints at the hip and knee, and is cable driven [16–19]. Lastly, Hussain et al. [20] developed an exoskeleton, tested only on the left leg, which rotates the hip and the knee with pneumatic actuators, Figure 1.4(b).

1.3.2 Mobile Multi-Degree-of-Freedom Exoskeletons

Exoskeleton devices are also applied to applications that are mobile and do not require a treadmill or fixtures. These devices have an onboard source of power and are meant to enhance the existing abilities of the user. Often times they are used to increase the payload



(a) Active Leg Exoskeleton - ALEX [10] (b) Driven Gait Orthosis - DGO [12]



(c) The Lokomat robot [14]

Figure 1.2: Treadmill rehabilitation exoskeletons that actuate the hip and the knee joint

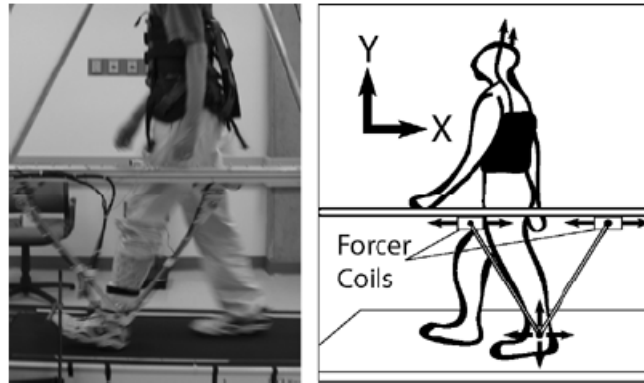
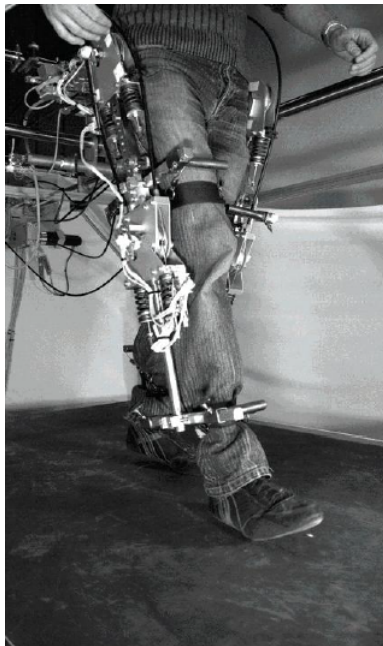
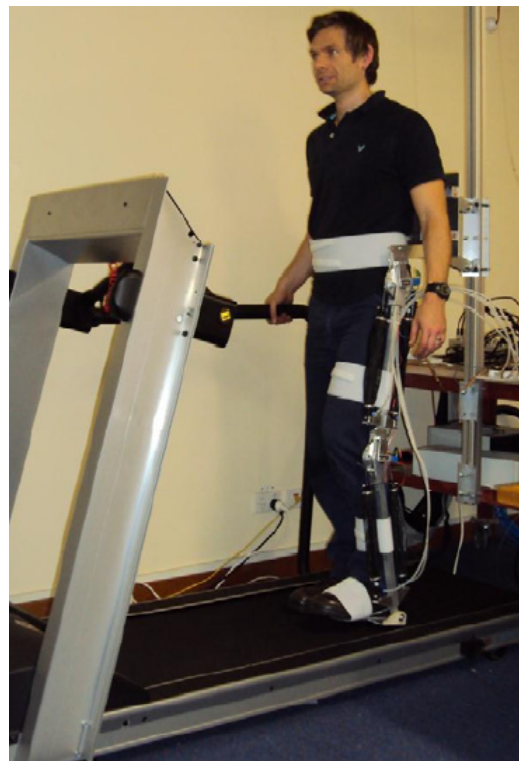


Figure 1.3: Ambulation-assisting Robotic Tool for Human Rehabilitation - ARTHuR [1]



(a) Lower Extremity Powered Exoskeleton - LOPES [21]



(b) Pneumatically actuated exoskeleton [20]

Figure 1.4: Cable driven (a) and pneumatically actuated (b) rehabilitation devices



(a) HULC



(b) FORTIS

Figure 1.5: Mobile Exoskeletons by Lockheed Martin

that a user is able to carry, by reducing metabolic cost. Lockheed Martin has developed the HULC and FORTIS devices [22, 23], Berkeley has designed the Berkeley Lower Extremity Exoskeleton (BLEEX) [24–26], and Cyberdyne has created the HAL device [27], as shown in figures (1.5) and (1.6).

In addition to applications for enhancing existing abilities, mobile multi-DOF exoskeletons can be used for rehabilitation purposes. These devices are similar in mechanical design, in that they have an attached power source and they attach to the outside of the legs and trunk to assist in joint actuation, Figure 1.7. A difference is that they often require the user to use crutches with the device, due to their impaired physical abilities [28–32].

1.3.3 Foot Orthotics

Devices have also been developed that focus on the actuation of the various degrees of freedom of the ankle. These devices focus on providing movement associated with the dorsiflexor and the plantar flexor. Figure 1.8 shows an orthotic device that utilizes pneumatic, artificial muscles that inflate and create contraction. The inflation and deflation causes rotation at



(a) Berkeley Lower Extremity Exoskeleton - BLEEX [25] (b) HAL - Cyberdyne [27]

Figure 1.6: Mobile exoskeletons that enhance existing abilities

the ankle joint [2,33–36]. In addition, Agrawal et al. [3] created a two DOF foot orthotic that is actuated on one axis and provides spring loaded resistance on the other axis, as shown in Figure 1.9. Lastly, Berkelman et al. [4] designed a passive orthotic that uses a four-bar linkage to couple the movement of the knee to the ankle, Figure 1.10.

1.3.4 Multi-Degree-of-Freedom Walking Robots

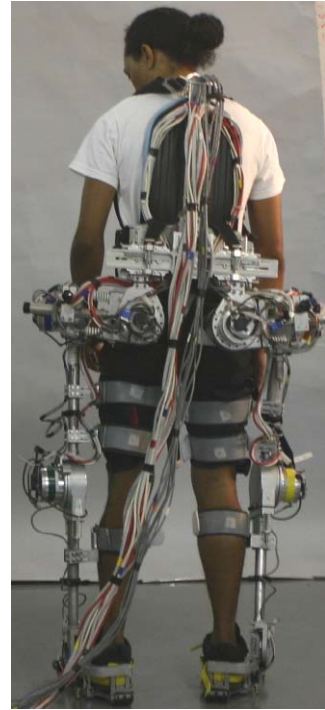
It is also useful to investigate biped and hexapod walking robots, while designing a linkage for rehabilitation purposes. Gini et al. [37] and Yang et al. [38] both developed biped robots that actuate revolute joints at the hip and the knee. Both of the knee joints in these two designs are compliant and provide resistance with springs. Sreenath et al. [39] designed a 58 kilogram robot that consists of motors, bevel gears, and springs to actuate the joints. Grishin et al. [40] created a biped robot that consists of an actuated revolute joint and a



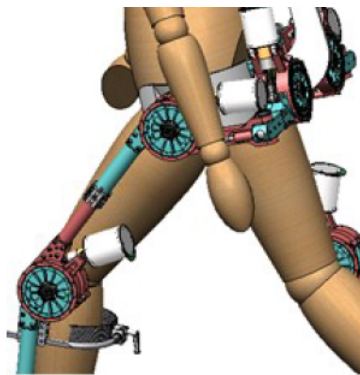
(a) ReWalk - Argo Medical Technologies



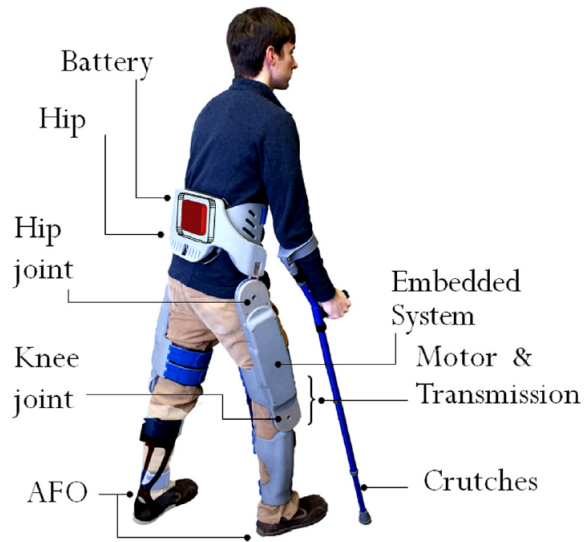
(b) EKSO Bionic Suit



(c) IHMC Mobility Assist Exoskeleton [31]



(d) Mindwalker exoskeleton [30]



(e) Vanderbilt University exoskeleton [32]

Figure 1.7: Mobile exoskeletons for rehabilitation

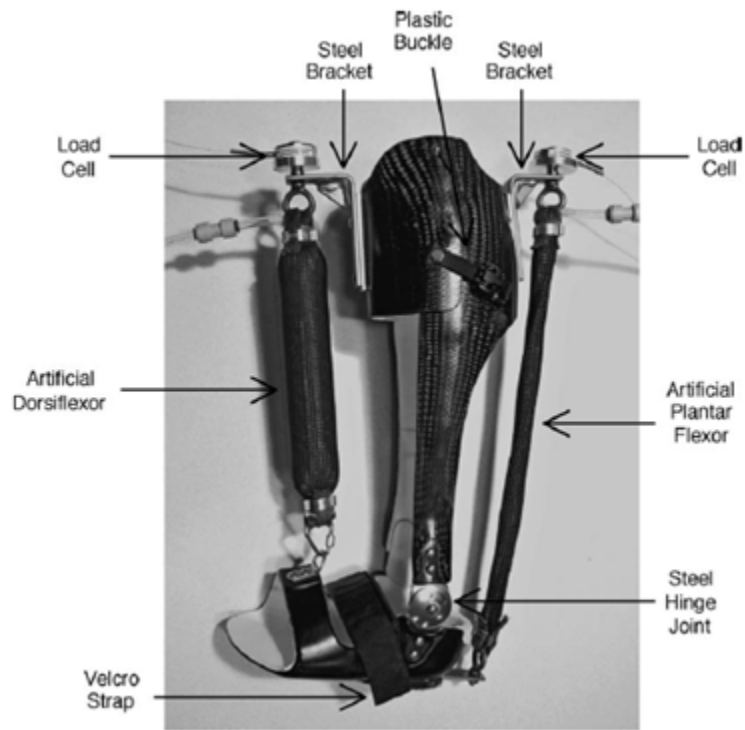


Figure 1.8: Foot orthosis with artificial pneumatic muscles [2]

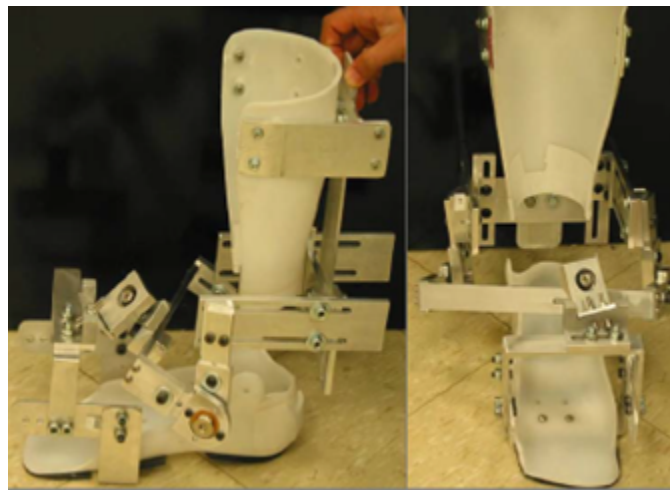


Figure 1.9: Two-DOF foot drop device [3]



Figure 1.10: Orthotic with passive linkage [4]

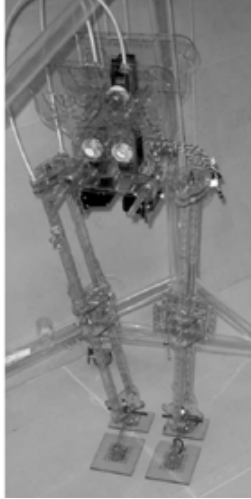
telescopic leg, and Wang et. al [41] developed a multi-DOF walking robot for prosthetic applications; these devices are shown in Figure 1.11.

In addition to biped robots, multi-DOF walking mechanisms are used in hexapod robots. These robots have the advantage by being more stable, due to the additional legs. Each of these robots has legs that are individually actuated, as shown in Figure 1.12. The legs usually consist of revolute joints or mechanisms that are actuated by motors; the legs can also incorporate linear actuators [42–44].

Lastly, Boston Dynamics designed a collection of quadrupeds and bipeds [45]. The LS3, Cheetah, Big Dog, and Little Dog robots are all quadrupeds, and the Atlas and Petman are both biped robots.

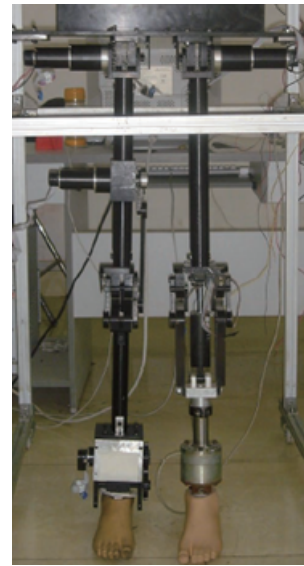
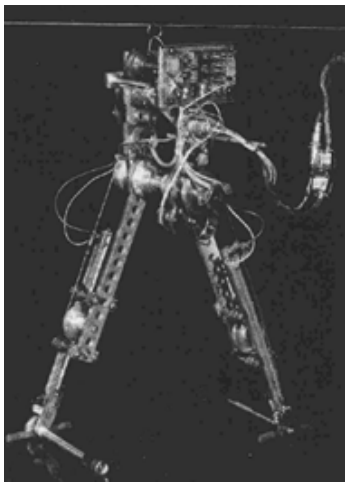
1.3.5 Single-Degree-of-Freedom Walking Mechanisms

Another area of existing research is in walking mechanisms that have a single degree of freedom. The Theo Jansen linkage is a walking linkage that was implemented on a wind powered kinetic sculpture. This linkage has been analyzed and synthesis techniques have been



(a) Biped robot with compliant knees [37]

(b) Biped robot with spring loaded knees [38]

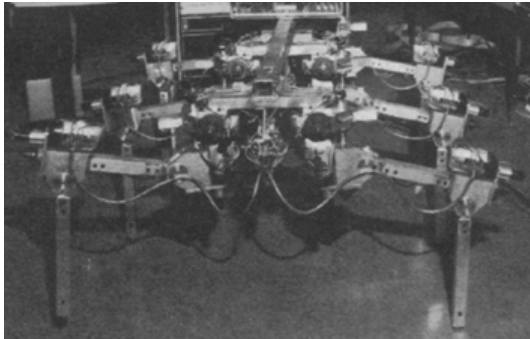


(c) Biped with telescopic legs [40]

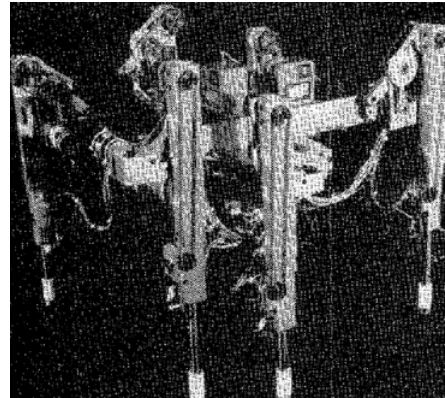
(d) Robot legs with spring loaded drivetrain [39]

(e) Robotic legs for prosthetic applications [41]

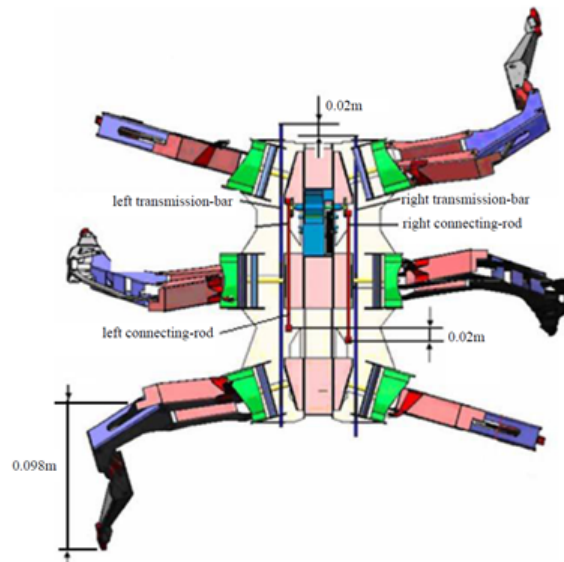
Figure 1.11: Biped Robots



(a) OSU Hexapod [43]

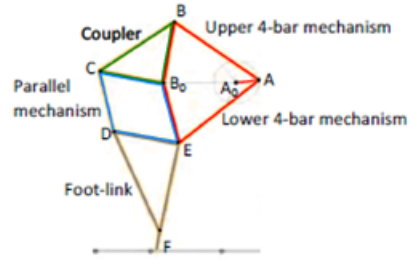


(b) Hexapod robot with straight line mechanisms and linear actuators [42]

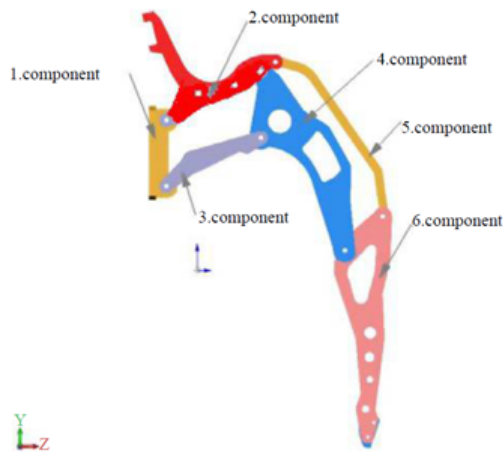


(c) Hexapod robot incorporating the Klann linkage [44]

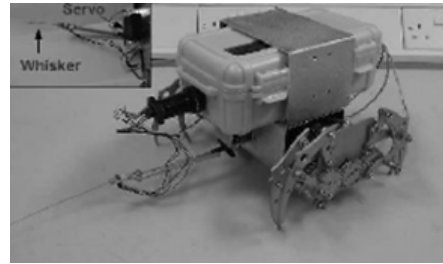
Figure 1.12: Hexapod Robots



(a) Wind powered, kinetic sculpture with the Theo Jansen Linkage [47]



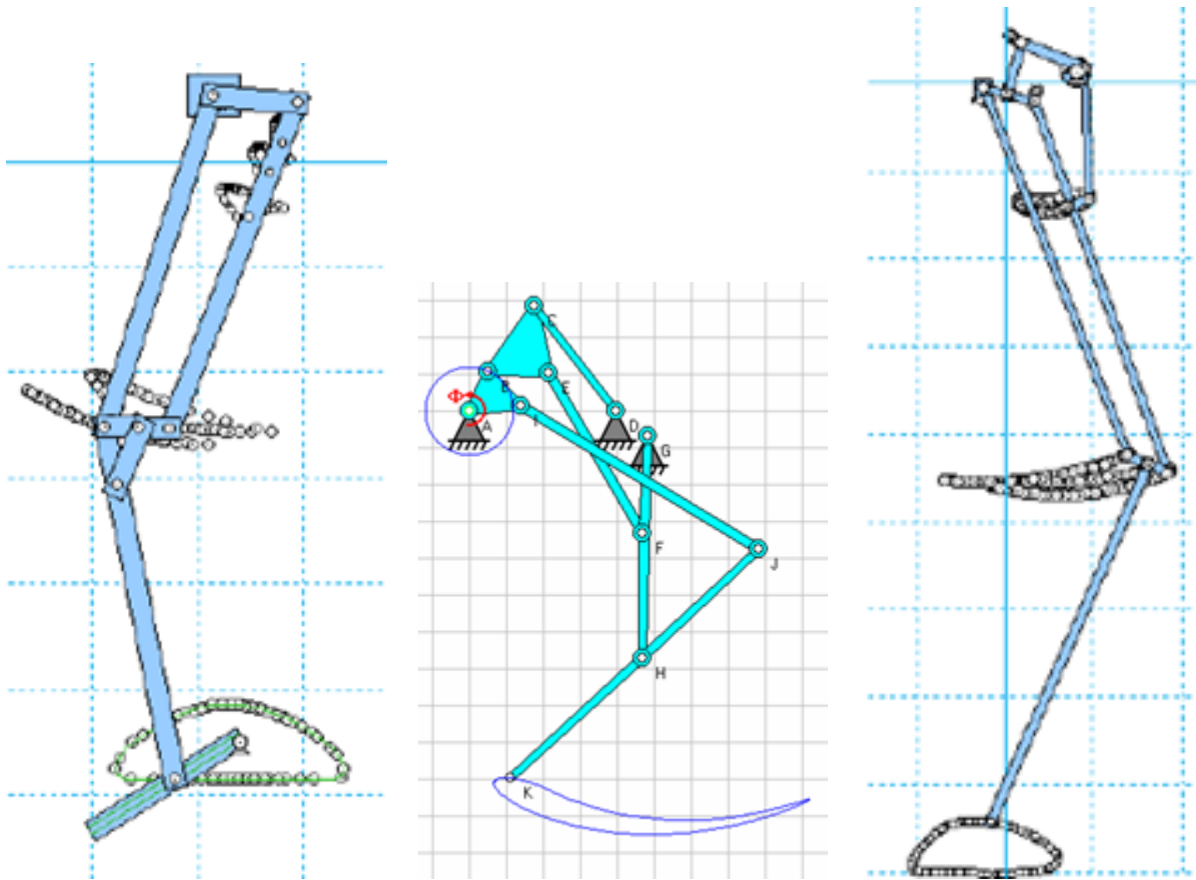
(b) Klann linkage [44]



(c) Klann linkage implemented in a mechanical spider [50]

Figure 1.13: Single-DOF walking mechanisms

developed for this particular linkage topology [46–49]. The Klann linkage is another single-DOF walking mechanism that is patented and is often used on multi-legged robots [44, 50], Figure 1.13. Lastly, synthesis techniques, for the six and eight-bar linkages, have been developed for walking applications, Figure 1.14. These linkages require the location of the foot as an input and not the orientation angle [51–53].



(a) Six-bar walking linkage [52] (b) Eight-bar walking mechanism [53] (c) Alternative eight-bar walking linkage [51]

Figure 1.14: Synthesis of single-DOF walking mechanisms

1.4 Kinematic Synthesis Literature Review

The process of designing linkages as known is kinematic synthesis; Hartenberg and Denavit define it as "the determination of mechanisms that are to fulfill motion specifications" [54]. They also go on to break down kinematic synthesis into function generation, path synthesis, and motion synthesis. Function generation requires that the designer define the input and output angles of the linkage. Path generation requires that the points along of a trajectory be defined as an input, and motion synthesis requires that the position and orientation of an end effector be specified [55].

1.4.1 Four-Bar Synthesis Techniques

The various procedures for designing a four-bar linkage are also broken down into the three groups mentioned above. Wu et. al. used geometric constraints and optimization methods for motion synthesis of a four-bar linkage [56]. Shen et al. [57] also used optimization methods to minimize an error function based on Burmester theory. Roth and Freudenstein developed a procedure for solving the path synthesis problem with numerical methods [58], and Wampler, Morgan, and Sommese formulated the exact solution for the four-bar path synthesis problem for 9 precision points [59]. In addition, Subbian and Flugrad approached solving the polynomial equations of four-bar path synthesis with a continuation method. Cabrera et al. [60] and Holte, Chase, and Erdman [61] use optimization with an evolutionary algorithm and mixed, exact and approximate synthesis respectively. Sun [62] developed optimization of the Freudenstein equation and function generation for the design of four-bar linkages. The particle swarm method was also used by McDougall and Nokleby [63] to design four-bar linkages, and the ant search algorithm used by Xiao and Tao [64] and by Smaili and Diab [65] to design four-bar path generators. Lastly, Kinzel et al. [66] used a combination of function generation and precision points for their design procedure.

1.4.2 Six-Bar Synthesis Techniques

The synthesis techniques for the various topologies of the six-bar linkage are also broken down into the three main groups with optimization, just as they are for the four-bar linkage. For motion synthesis, Soh and McCarthy constrain an open 3R chain with two four-bar linkages to create a Watt I six-bar linkage [67]. Similarly, Plecnik and McCarthy constrained an RPR chain to achieve a single-DOF linkage [68], in addition to using homotopy methods to solve the path synthesis problem for various Stephenson six-bar linkages [69]. Schreiber et al. [70] provide a method to solve for the linkage dimensions of Stephenson six-bar linkages using 5 task positions, and Bawab et al. [71] solve the Watt I six-bar linkage problem for four task positions.

In addition to motion synthesis, six-bar path synthesis was formulated by Kim and Hamid. They formulated and solved for the exact solutions of the various topologies of the six-bar linkage for path synthesis [72]. Path synthesis of six-bar linkages have also relied on optimization techniques. Early research in this area was carried out by Bhatia and Bagci [73]. Nolle [74] and Root and Ragsdell [75] provided a survey of the linkage design methods that utilize optimization methods. Linkage design equations have a large number of local minima, making the solutions heavily dependent on the initial design parameter choices, as Nolle points out.

Modern direct search strategies start with random population of design parameter vectors and then provide a means, systematically, to modify these vectors to find new solutions [76]. This is in order to avoid local minima. Bulatovic and Dordevic [77] applied differential evolution to design a six-bar Stephenson III, path generator for 32 precision points on a curve. The cuckoo search algorithm was also used by Bulatovic et al. [78] for a Stephenson III, six-bar linkage for 26 precision points divided between circular dwells. This cuckoo search algorithm is a strategy that uses a nature-based heuristic to combine design parameters to

find new solutions. Another example included simulated annealing used by Dibakar and Mruthyunjaya [79]. The particle swarm method and the ant search algorithm are also nature-based and an example of their utilization was referenced in the previous section for a four-bar linkage.

Lastly, McLarnan [80], Luo et al. [81], and Dhingra et al. [82] all presented procedures for six-bar synthesis via function generation.

1.5 Research Contribution

In this dissertation, synthesis procedures are explored and documented for the purpose of developing a single degree-of-freedom, planar linkage for a human walking exoskeletons. A collection of synthesis techniques were explored to ultimately reach the final procedure. Hybrid task position synthesis, six-bar trajectory synthesis, coupler motion interpolation, ankle trajectory synthesis, and 10-bar synthesis methods were developed in order to create the final synthesis process. Hybrid task position synthesis combines the formulation of a Watt I, six-bar linkage problem with approximation. Six-bar trajectory synthesis consists of constraining a 2R chain with a four-bar linkage, using path synthesis methods. Coupler motion interpolation utilizes basis splines to select precision points from a large data set, and ankle trajectory synthesis uses the previous two methods to solve for a six-bar linkage for the ankle trajectory of human walking. The 10-bar synthesis goes on to constrain a 3R with two four-bar linkages, with path synthesis methods.

Ultimately, a new global optimization strategy for linkage synthesis that combines the homotopy solution of linkage synthesis equations with gradient based optimization, called homotopy directed optimization, was formulated. This formulation was applied to the synthesis of a six-bar linkage to provide a range of natural ankle trajectories with consistent knee and

hip trajectories. In addition, a cam and parallelogram mechanism was designed for foot orientation. A combined treadmill based gait mechanism that guides natural leg movement with one degree-of-freedom was designed and is called the UCI Gait Mechanism. The synthesis process yielded 148 similar linkages and lead to the definition of an adjustment that provides natural variation of the ankle trajectory.

1.6 Summary

In this chapter, we find that mechanism synthesis theory has not been applied to the design of walking systems for rehabilitation. The ability to provide a single degree-of-freedom system that provides natural walking movement will simplify rehabilitation systems and provide new approaches to therapy.

Chapter 2

Mathematical Introduction

2.1 Introduction

This chapter presents the mathematical theory of six-bar linkage synthesis used to design a one degree-of-freedom mechanism that provides a natural walking movement. In the course of this research, optimization methods are needed in order to refine the design. Those methods are also described.

2.2 Six-Bar Linkage Synthesis Theory

The six-bar linkage consists of six links and seven joints. There two different topologies for this linkage are the Watt and Stephenson linkage. The Watt linkage has two different configurations while the Stephenson linkage as three, as shown in Figure 2.1.

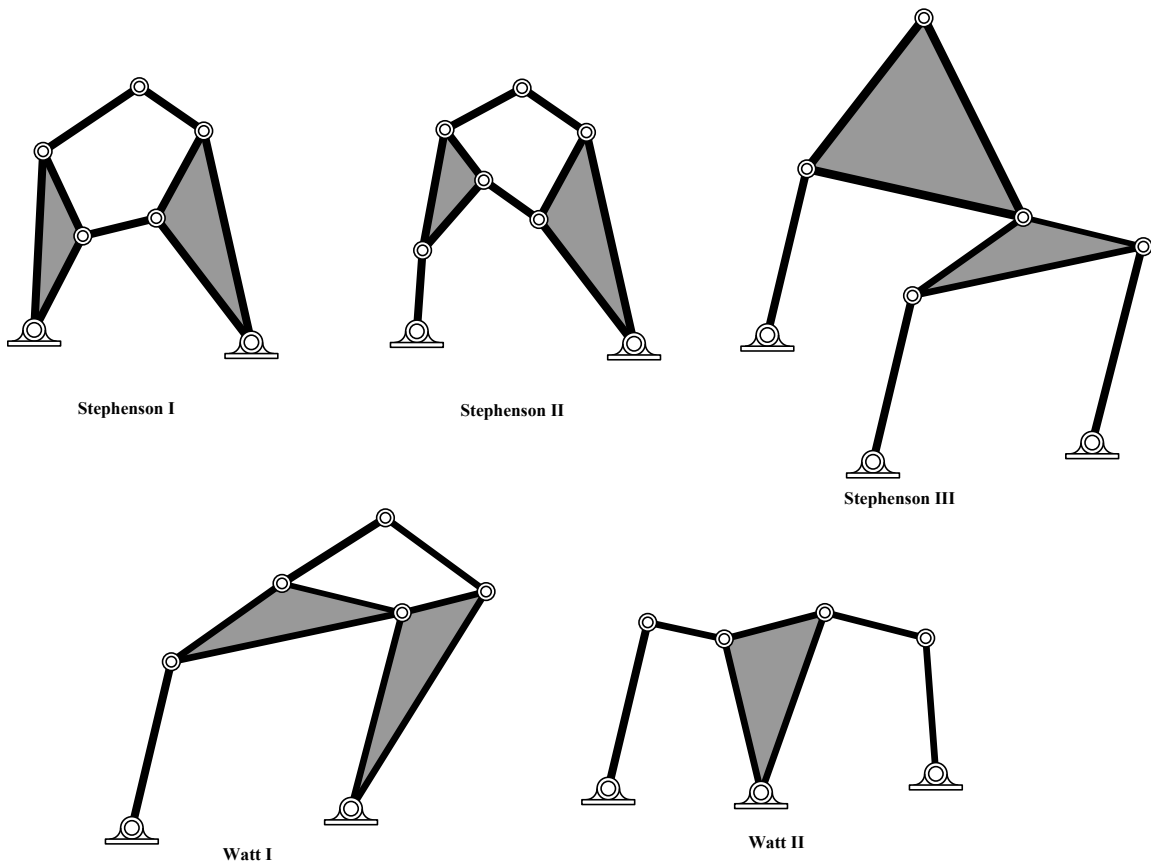


Figure 2.1: The 5 configurations of the six-bar linkage



Figure 2.2: 3R chain matching the dimensions of the human leg

2.2.1 Six-Bar Linkage Synthesis by Constraining a 3R Chain

The first synthesis technique that was developed, in this dissertation, combined the techniques of Soh and McCarthy [67] and Shen et al. [57]. The method begins by specifying a 3R chain; this is done by defining the three link lengths, fixed pivot, and the orientation and coordinates of the last link of the serial chain. Figure 2.2 shows how this 3R chain can be specified to match the dimensions of the human leg. Next, two four-bar linkages are synthesized using motion synthesis. Figure 2.3 illustrates how the two linkages are assembled to form a six-bar linkage. Soh and McCarthy use algebraic techniques to first synthesize the four-bar linkage **OABC**, in the fixed frame. Then the second four-bar, **BDEF**, is designed; however, this linkage has ground pivots that move relative to the global frame. The algebraic method, that achieves an exact solution, only allows for a maximum of five task positions.

In order for the user to define more than five task positions, approximation techniques are required. The techniques used to solve for these two four bar linkages follows that of Shen et al. The joint coordinates, for a single four-bar linkage, are shown in 2.4, where \mathbf{a}_0 and \mathbf{b}_0 are the coordinates of the fixed pivots. The set of coordinate transformations, $[T_j]$, $j = 1, \dots, N$, where specified. These define positions of the coupler link in the ground

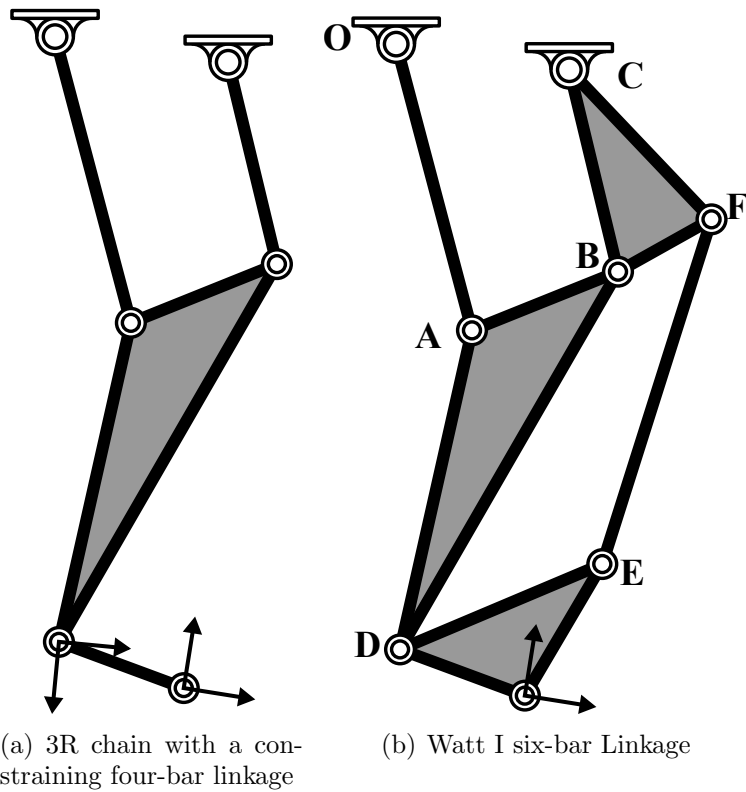


Figure 2.3: Synthesis of single-DOF walking mechanisms

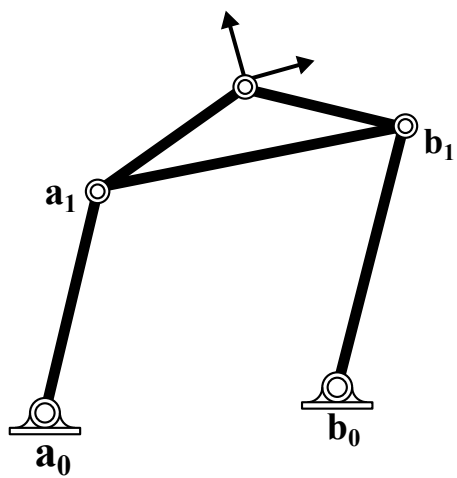


Figure 2.4: Four-Bar Linkage

frame, or task positions,

$$[T_j] = \begin{bmatrix} \cos \theta_j & -\sin \theta_j & x_j \\ \sin \theta_j & \cos \theta_j & y_j \\ 0 & 0 & 1 \end{bmatrix} \quad i = 1, \dots, N, \quad (2.1)$$

where $\mathbf{d}_j = (x_j, y_j)$ define the origin of the moving frame M and θ_j define its orientation.

Task positions as relative displacements, D_{1j} $j = 2, \dots, N$, from the first task position, given by

$$[D_{1j}] = [T_j][T_1]^{-1}, \quad j = 2, \dots, N, \quad (2.2)$$

for convenience.

The constraint equations,

$$\begin{aligned} ([D_{1j}](\mathbf{a}_1 - \mathbf{a}_0) \cdot ([D_{1j}](\mathbf{a}_1 - \mathbf{a}_0) - (\mathbf{a}_1 - \mathbf{a}_0)) \cdot (\mathbf{a}_1 - \mathbf{a}_0) &= 0, \\ ([D_{1j}](\mathbf{b}_1 - \mathbf{b}_0) \cdot ([D_{1j}](\mathbf{b}_1 - \mathbf{b}_0) - (\mathbf{b}_1 - \mathbf{b}_0)) \cdot (\mathbf{b}_1 - \mathbf{b}_0) &= 0, \end{aligned} \quad (2.3)$$

are derived from the requirement that the moving pivots $\mathbf{a}_1 = (a_{1x}, a_{1x}, 1)^T$ and $\mathbf{b}_1 = (b_{1x}, b_{1x}, 1)^T$ lie on a circle relative to the fixed pivots $\mathbf{a}_0 = (a_{0x}, a_{0x}, 1)^T$ and $\mathbf{b}_0 = (b_{0x}, b_{0x}, 1)^T$ in all of the task positions. As many as six, four-bar linkages that reach the five task positions can be found as a result of solving equation 2.3.

The equations, provided by Burmester theory, do not have an exact solution if the number of task positions is greater than five. However, minimizing the crank-error over all of the over-specified number of task positions can yield an approximate solution. Summing equations

(2.2) and (2.3) to define the crank error function,

$$E = \sum_{j=2}^N \left\{ \left[([D_{1j}]\mathbf{a}_1 - \mathbf{a}_0)^T ([D_{1j}]\mathbf{a}_1 - \mathbf{a}_0) - (\mathbf{a}_1 - \mathbf{a}_0)^T (\mathbf{a}_1 - \mathbf{a}_0) \right]^2 + \left[([D_{1j}]\mathbf{b}_1 - \mathbf{b}_0)^T ([D_{1j}]\mathbf{b}_1 - \mathbf{b}_0) - (\mathbf{b}_1 - \mathbf{b}_0)^T (\mathbf{b}_1 - \mathbf{b}_0) \right]^2 \right\}. \quad (2.4)$$

This function is the sum of the squares of the differences in crank lengths in each task position. It measures the variation of the crank length needed to reach more than five task positions. The minimization of equation (2.4) yields the approximate four-bar linkage solution.

2.2.2 Four-Bar Modules for Six-Bar Path Synthesis

Path synthesis allows the user to specify additional precision points, where orientation angle is not considered. For the four-bar linkage, up to 9 points can be specified, and for the six-bar linkage, up to 15 precision points can be defined for an exact solution. In this section, a Stephenson III, six-bar linkage is designed using by defining a 2R serial chain to create a secondary trajectory on the second link. A four-bar linkage is then synthesized to guide the secondary trajectory. The four-bar path synthesis techniques follows that of Wampler et al. [59]. Also, it can be noted that the method presented in this section can be extended to the nR serial chain, by using additional four-bar linkages.

In addition, 11-point path synthesis was utilized for the Stephenson III, six bar linkage, due to the challenge of finding a linkage the passes through the overall ankle trajectory. Homotopy methods were used for this particular formulation.

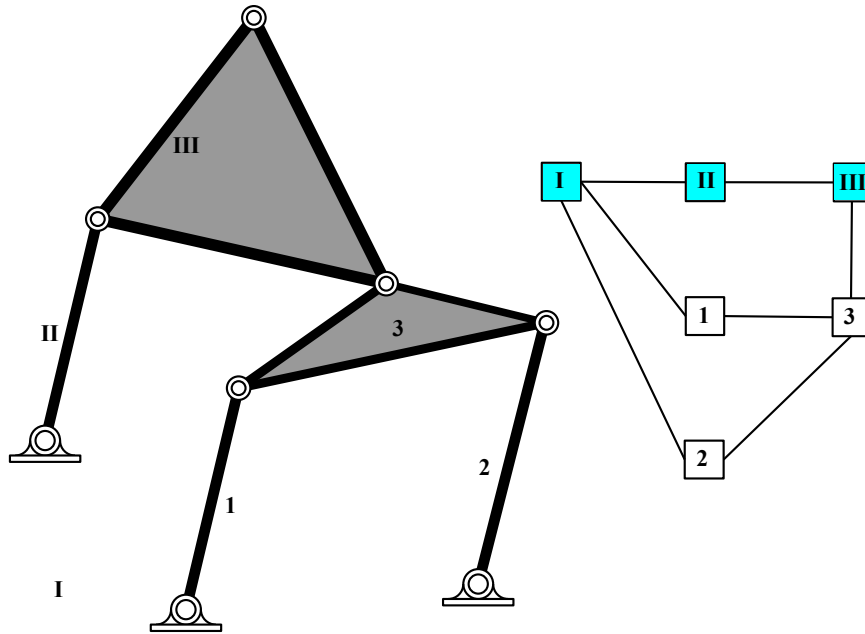


Figure 2.5: Graph of a 2R chain constrained by one four-bar linkage module.

The Constrained nR Chain

A serial nR chain consists of $n + 1$ links including the ground link. These links are connected in sequence by n revolute joints. For convenience, the primary chain is denoted using roman numerals, such that the round link is the number I, the next distal link is II, and so on. A four-bar linkage module that constrains the trajectory of a point in link III, relative to link I of the 3R chain is introduced to form a six-bar linkage. This is shown in Figure 2.5.

In addition, a 3R serial chain can be constrained by introducing one four-bar module to constrain the a trajectory in link III relative to link I, and a second four-bar module to constrain a trajectory in link IV relative to II, resulting in a 10-bar linkage, as shown in Figure 2.6. This procedure can be continued to obtain $4n + 2$ -bar linkages.

Constraining a 2R chain by designing a four-bar linkage that guides a point-path in the end-effector results in a Stephenson III, six-bar linkage.

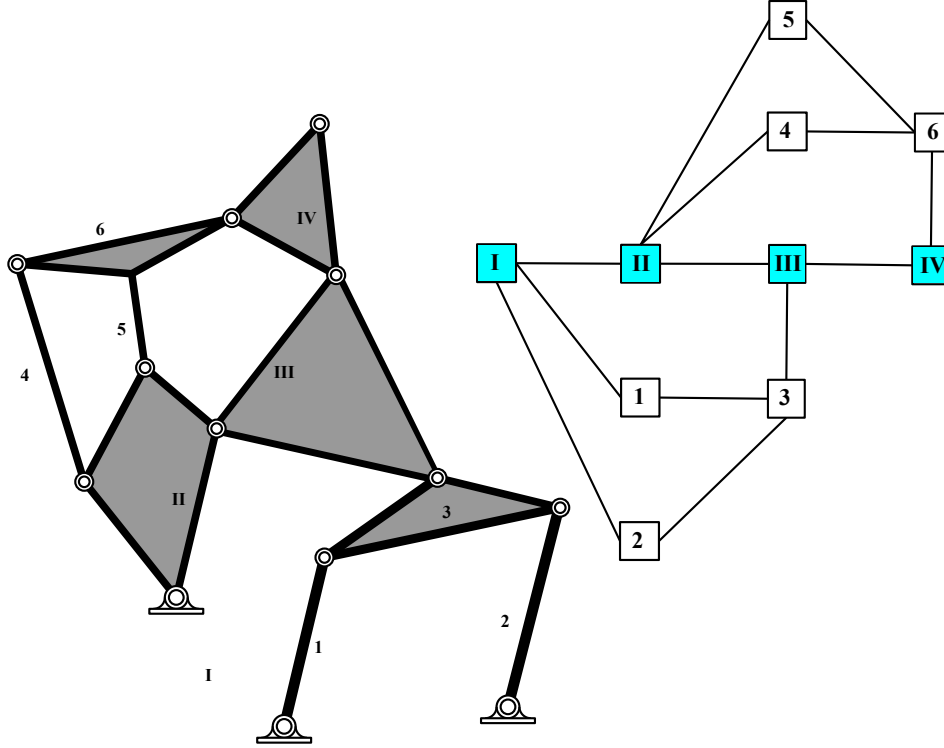


Figure 2.6: Graph of a 3R chain constrained by two four-bar linkage modules.

The Prescribed End-Effector Trajectory

The first step to designing this particular Stephenson six-bar linkage, from Figure 2.5, is to specify the nine precision points, the fixed pivot at point **E**, and the link lengths EF and FQ . Figure 2.7 illustrates these parameters that are to be defined by the user. The location of the moving pivot **F**, the angle that link EF makes with the x-axis θ_1 , and the angle that link FQ makes with the line collinear to link EF , θ_2 , in all nine positions along the trajectory can be determined using inverse kinematics [55]. The angle ψ is the angle between EF and the line segment from point **E** to point **Q**. The equation for θ_2 is defined as

$$\theta_2 = \pm \arccos \left[\frac{Q_x^2 + Q_y^2 - EF^2 - FQ^2}{2(EF)(FQ)} \right] \quad (2.5)$$

where Q_x and Q_y are the x and y components of point \mathbf{Q} respectively. The equation for ψ is

$$\psi = \arctan \left[\frac{FQ \sin(\theta_2)}{EF + FQ \cos(\theta_2)} \right]. \quad (2.6)$$

From this value of ψ , θ_1 can be calculated:

$$\theta_1 = \arctan \left[\frac{FQ}{EF} \right] - \psi. \quad (2.7)$$

The link lengths of FP and QP are chosen by the designer; this dictates the location of the point \mathbf{P} in all nine positions. This creates a secondary trajectory that is used for the path-synthesis of the constraining four-bar linkage. The angle α is determined by the law of cosines as,

$$\alpha = \pm \arccos \left[\frac{-(QP^2 - FQ^2 - FP^2)}{2(FQ)(FP)} \right]. \quad (2.8)$$

Figure 2.8 illustrates how the second trajectory is formed. With all of the joint angles known, the locations of point \mathbf{F} and point \mathbf{P} can be determined. The inverse kinematics for all nine positions will yield the nine positions of point \mathbf{P} .

Four-Bar Path Synthesis For 9 Points

The problem formulation, for the four-bar linkage path synthesis, is similar to that of by Wampler, Morgan, and Sommese [59]. The formulation starts by setting up the four-bar linkage as a collection of complex vectors as shown in Figure 2.9(a). Points \mathbf{A} and \mathbf{B} are the fixed pivots, points \mathbf{C} and \mathbf{D} are the moving pivots, and point \mathbf{P}_0 is the location of the first precision point. The summation of vectors around the left and right loops yield the

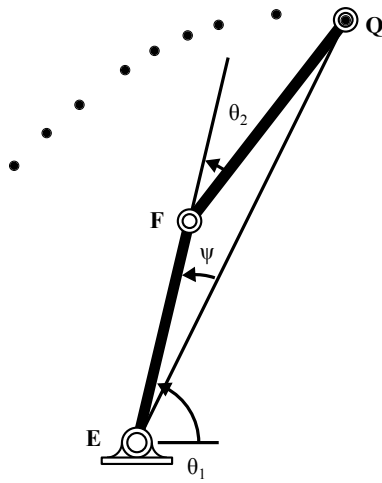


Figure 2.7: RR Serial Chain with 9 Precision Points

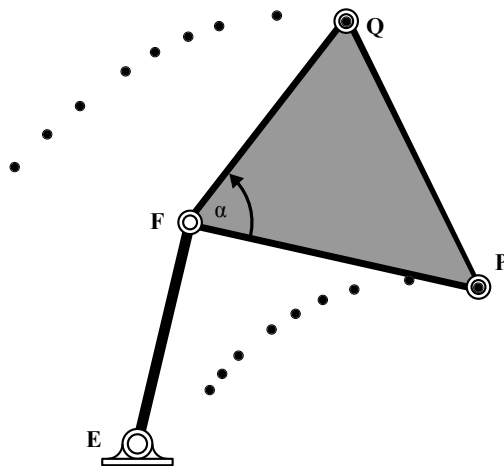


Figure 2.8: RR Serial Chain with Secondary Trajectory

equations,

$$u = x - a, \quad v = y - b, \quad (2.9)$$

where u is of the form $u = u_1 + iu_2$, and similarly for the complex vectors v , x , y , a and b . The values u_1 and u_2 are the x and y coordinates of u respectively. Figure 2.9(b) shows the four-bar linkage after it has been displaced to the new precision point \mathbf{P}_j where $j = 1, \dots, 8$. The vector from the first precision point \mathbf{P}_0 to the next precision point \mathbf{P}_j is denoted as δ_j . Figure 2.9(b) also shows that the angular displacements of link AD , BC , and the coupler are represented by λ_j , μ_j , and θ_j . After each displacement to a new precision point, the loop equations of the linkage are

$$\begin{aligned} ue^{i\lambda_j} &= xe^{i\theta_j} + \delta_j - a, \\ ve^{i\mu_j} &= ye^{i\theta_j} + \delta_j - b, \quad j = 1, \dots, 8. \end{aligned} \quad (2.10)$$

Substitute equation 2.9 into of equation (2.10) to obtain,

$$\begin{aligned} (x - a)e^{i\lambda_j} &= xe^{i\theta_j} + \delta_j - a, \\ (y - b)e^{i\mu_j} &= ye^{i\theta_j} + \delta_j - b, \quad j = 1, \dots, 8, \end{aligned} \quad (2.11)$$

which are the vector loop equations for the four-bar linkage. A new variable γ_j defined as

$$\gamma_j = e^{i\theta_j} - 1, \quad j = 1, \dots, 8 \quad (2.12)$$

is introduced. Multiplying equation 2.11 by their respective complex conjugates results in

$$\begin{aligned}
(\hat{a} - \hat{\delta}_j)x\gamma_j + (a - \delta_j)\hat{x}\hat{\gamma}_j + \delta_j(\hat{a} - \hat{x}) + \hat{\delta}_j(a - x) - \delta_j\hat{\delta}_j &= 0, \\
(\hat{b} - \hat{\delta}_j)y\gamma_j + (b - \delta_j)\hat{y}\hat{\gamma}_j + \delta_j(\hat{b} - \hat{y}) + \hat{\delta}_j(b - y) - \delta_j\hat{\delta}_j &= 0, \\
j &= 1, \dots, 8.
\end{aligned} \tag{2.13}$$

Note that the complex conjugate is denoted by $\hat{\cdot}$. Also, the variables γ_j and $\hat{\gamma}_j$ have the property

$$\gamma_j\hat{\gamma}_j + \gamma_j + \hat{\gamma}_j = 0. \tag{2.14}$$

Continuing to follow Wampler, the variables,

$$n = a\hat{x}, \quad \hat{n} = \hat{a}x, \quad m = b\hat{y}, \quad \hat{m} = \hat{b}y. \tag{2.15}$$

are introduced. The homogeneous coordinates, x^0, y^0 , and γ_j^0 are introduced, so the equations (2.15) become,

$$nx^0 = a\hat{x}, \quad \hat{n}x^0 = \hat{a}x, \quad my^0 = b\hat{y}, \quad \hat{m}y^0 = \hat{b}y. \tag{2.16}$$

Now (2.16) is substituted into (2.13) to obtain,

$$\begin{aligned}
(\hat{n} - \hat{\delta}_jx)\gamma_j + (n - \delta_j\hat{x})\hat{\gamma}_j + (\delta_j(\hat{a} - \hat{x}) + \hat{\delta}_j(a - x) - \delta_j\hat{\delta}_jx^0)\gamma_j^0 &= 0, \\
(\hat{m} - \hat{\delta}_jy)\gamma_j + (m - \delta_j\hat{y})\hat{\gamma}_j + (\delta_j(\hat{b} - \hat{y}) + \hat{\delta}_j(b - y) - \delta_j\hat{\delta}_jy^0)\gamma_j^0 &= 0, \\
\gamma\hat{\gamma}_j + \gamma_j\gamma_j^0 + \hat{\gamma}_j\gamma_j^0 &= 0 \\
j &= 1, \dots, 8.
\end{aligned} \tag{2.17}$$

This is used to design the four-bar linkage. Wampler goes on to show that these equations can be simplified by eliminating γ_j , $\hat{\gamma}_j$, and γ_j^0 using Cramer's rule, as shown below:

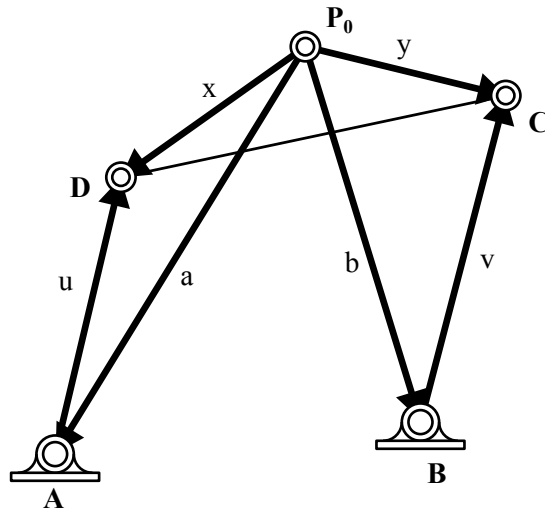
$$\begin{aligned} \gamma_j &= \begin{vmatrix} n - \delta_j \hat{x} & \delta_j(\hat{a} - \hat{x}) + \hat{\delta}_j(a - x) - \delta_j \hat{\delta}_j x^0 \\ m - \delta_j \hat{y} & \delta_j(\hat{b} - \hat{y}) + \hat{\delta}_j(b - y) - \delta_j \hat{\delta}_j y^0 \end{vmatrix}, \\ \hat{\gamma}_j &= \begin{vmatrix} \delta_j(\hat{a} - \hat{x}) + \hat{\delta}_j(a - x) - \delta_j \hat{\delta}_j x^0 & \hat{n} - \hat{\delta}_j x \\ \delta_j(\hat{b} - \hat{y}) + \hat{\delta}_j(b - y) - \delta_j \hat{\delta}_j y^0 & \hat{m} - \hat{\delta}_j y \end{vmatrix}, \\ \gamma_j^0 &= \begin{vmatrix} \hat{n} - \hat{\delta}_j x & n - \delta_j \hat{x} \\ \hat{m} - \hat{\delta}_j y & m - \delta_j \hat{y} \end{vmatrix} \\ j &= 1, \dots, 8. \end{aligned} \tag{2.18}$$

Equation (2.16) and (2.18) are substituted into equation $\gamma \hat{\gamma}_j + \gamma_j \gamma_j^0 + \gamma_j^0 \gamma_j^0 = 0$ resulting in a system of 12 equations with 12 unknown variables. The calculation of these 12 variables are the parameters needed to construct a four bar linkage that guides point \mathbf{P} from Figure 2.5 through the desired nine precision points.

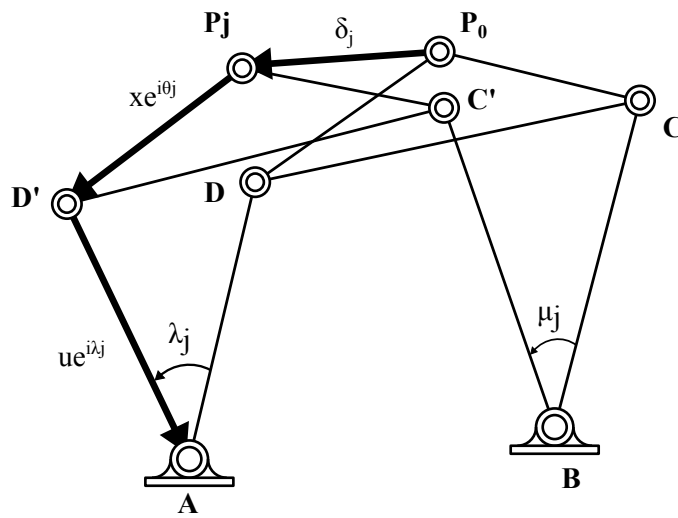
2.2.3 Six-Bar Linkage Path Synthesis

In addition to four-bar path synthesis, six-bar path synthesis was investigated. A Stephenson III six-bar linkage is shown in Figure 2.10, and the seven hinged joints of this linkage are denoted by the complex vectors, A , B , C , D , F , G and H . The point P is the point that will trace the coupler curve. The coordinates of the joints in the reference position are the design parameters that are to be determined by the synthesis process. The angles ψ , ρ , ϕ , μ , and θ are measured from the reference position to the current configuration.

Path synthesis begins with the specification of a set of N points, P_j , $j = 0, \dots, N - 1$, that define the desired coupler curve; in the case of this research it is for the Stephenson III,



(a) Four-Bar Linkages Represented as Vectors



(b) Four-Bar Linkage Displaced to a New Precision Point

Figure 2.9: Formulation for the Four-Bar Path Synthesis Problem

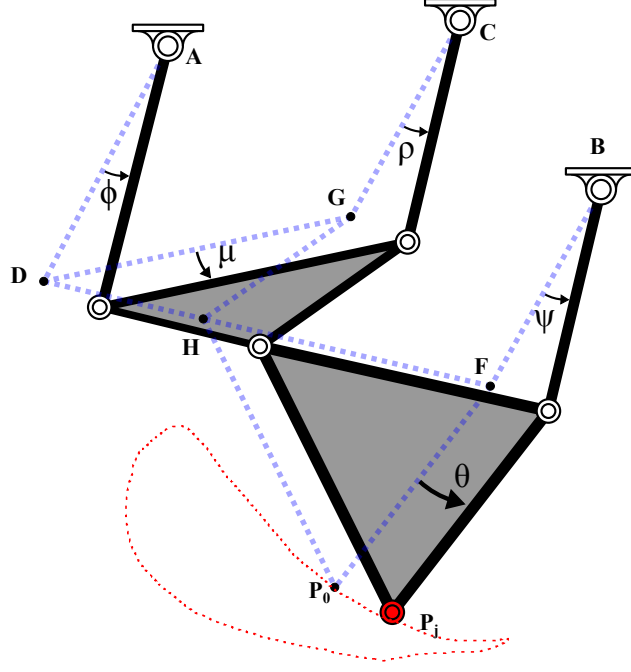


Figure 2.10: Stephenson III six-bar linkage

six-bar linkage. The three loop equations, in the reference position are,

$$\begin{aligned}
 (F - B) + (P_0 - F) &= P_0 - B, \\
 (G - C) + (H - G) + (P_0 - H) &= P_0 - C, \\
 (D - A) + (H - D) + P_0 - H &= P_0 - A.
 \end{aligned} \tag{2.19}$$

The following notation is introduced, for convenience,

$$\begin{aligned}
 Q_j &= e^{i\phi_j} & R_j &= e^{i\rho_j} & S_j &= e^{i\psi_j} \\
 T_j &= e^{i\theta_j} & U_j &= e^{i\mu_j} & j &= 1, \dots, N - 1,
 \end{aligned} \tag{2.20}$$

to represent the rotation of the individual links of the six-bar linkage. These parameters

satisfy the normality conditions,

$$\begin{aligned}
Q_j \bar{Q}_j &= 1, & R_j \bar{R}_j &= 1, & S_j \bar{S}_j &= 1, \\
T_j \bar{T}_j &= 1, & U_j \bar{U}_j &= 1, & & j = 1, \dots, N - 1,
\end{aligned} \tag{2.21}$$

where the bar denotes the complex conjugate.

Thus, the loop equations for the remaining coupler points P_j , $j = 1, \dots, N - 1$, are,

$$\begin{aligned}
Q_j(D - A) + U_j(H - D) + T_j(P_0 - H) &= P_j - A \\
R_j(G - C) + U_j(H - G) + T_j(P_0 - H) &= P_j - C \\
S_j(F - B) + T_j(P_0 - F) &= P_j - B \\
j &= 1, \dots, N - 1.
\end{aligned} \tag{2.22}$$

In addition, the complex conjugate loop equations are,

$$\begin{aligned}
\bar{Q}_j(\bar{D} - \bar{A}) + \bar{U}_j(\bar{H} - \bar{D}) + \bar{T}_j(\bar{P}_0 - \bar{H}) &= \bar{P}_j - \bar{A} \\
\bar{R}_j(\bar{G} - \bar{C}) + \bar{U}_j(\bar{H} - \bar{G}) + \bar{T}_j(\bar{P}_0 - \bar{H}) &= \bar{P}_j - \bar{C} \\
\bar{S}_j(\bar{F} - \bar{B}) + \bar{T}_j(\bar{P}_0 - \bar{F}) &= \bar{P}_j - \bar{B} \\
j &= 1, \dots, N - 1.
\end{aligned} \tag{2.23}$$

Equations 2.22, 2.23, and 2.21 form the path synthesis equations for the Stephenson III, six-bar linkage. For N specified path points, there are seven complex vector joint unknowns, five joint angle unknowns in $N - 1$ task positions, together their complex conjugates, for a total of $14 + 10 * (N - 1)$ unknowns. There are also three complex loop equations and their conjugates, as well as five normality conditions in the $N - 1$ task positions, for a total of $11 * (N - 1)$ equations. Thus, there are as many equations as unknowns for the case $N=15$,

which yields 154 quadratic equations in 154 unknowns.

The challenge posed by the solution of these synthesis equations can be estimated by computing the Bezout root count [88], which is $d = 2^{154}$ or 2.28×10^{46} .

11-Point Path Synthesis

The dimensions and the $n - 1$ positions of the RR chain BFP_j , $j = 1, \dots, N - 1$, are specified, in order to reduce the complexity of the synthesis equations. This reduces the specified number points on the curve to $N = 11$ —recall that R denotes a revolute, or hinged joint. This simplifies equations (2.22), (2.23), and (2.21) into the following two set,

$$\begin{aligned}
\mathcal{S}_1 : \quad & S_j(F - B) + T_j(P_0 - F) = P_j - B, \\
& \bar{S}_j(\bar{F} - \bar{B}) + \bar{T}_j(\bar{P}_0 - \bar{F}) = \bar{P}_j - \bar{B}, \\
& S_j \bar{S}_j = 1, \\
& T_j \bar{T}_j = 1, \quad \quad \quad j = 1, \dots, 10.
\end{aligned} \tag{2.24}$$

and

$$\begin{aligned}
\mathcal{S}_2 : \quad & Q_j(D - A) + U_j(H - D) + T_j(P_0 - H) = P_j - A, \\
& R_j(G - C) + U_j(H - G) + T_j(P_0 - H) = P_j - C, \\
& \bar{Q}_j(\bar{D} - \bar{A}) + \bar{U}_j(\bar{H} - \bar{D}) + \bar{T}_j(\bar{P}_0 - \bar{H}) = \bar{P}_j - \bar{A}, \\
& \bar{R}_j(\bar{G} - \bar{C}) + \bar{U}_j(\bar{H} - \bar{G}) + \bar{T}_j(\bar{P}_0 - \bar{H}) = \bar{P}_j - \bar{C}, \\
& Q_j \bar{Q}_j = 1, \\
& R_j \bar{R}_j = 1, \\
& U_j \bar{U}_j = 1, \quad \quad \quad j = 1, \dots, 10.
\end{aligned} \tag{2.25}$$

The equations in \mathcal{S}_1 can be solved to determine unknowns S, \bar{S}, T, \bar{T} . Computing S and \bar{S} from the first equations, and substituting the result into the normalization conditions $S\bar{S} = 1$, results in,

$$aT_j + b + c\bar{T}_j = 0, \quad j = 1, \dots, 10, \quad (2.26)$$

where

$$\begin{aligned} a &= (\bar{P}_j - \bar{B})(P_0 - F), \\ b &= (F - B)(\bar{F} - \bar{B}) - (P_j - B)(\bar{P}_j - \bar{B}) - (P_0 - F)(\bar{P}_0 - \bar{F}), \\ c &= (P_j - B)(\bar{P}_0 - \bar{F}). \end{aligned} \quad (2.27)$$

Multiply (2.26) by T_j to obtain a quadratic equation, which is solved using the quadratic formula, and the values for S, \bar{S}, \bar{T} are found by back substitution.

Once equations \mathcal{S}_1 are solved, equations \mathcal{S}_2 have the unknowns $A, C, D, G, H, Q_j, R_j, U_j$ and their conjugates. Thus, for the case of $N = 11$, the path synthesis equations reduce to 70 quadratic equations in 70 unknowns. The degree of this system is 2^{70} .

Plecnik and McCarthy [69,89] have studied this system of equations. They show that it has the multi-homogeneous degree, $d = 264, 241, 152$, and they obtain a parameter homotopy for the solution of the 11-point path synthesis equations for a given RR chain.

2.3 Gradient Based Optimization Methods

Older, gradient based optimization methods utilized in this dissertation consist of Newton's method, Steepest Descent, Conjugate Gradient, Fletcher-Reeves, Interior Point, and Quasi-Newton. These methods were collected and presented by Luenberger and Ye [90].

2.3.1 Newton's Method

For a function f that is to be minimized can be approximated by the quadratic function

$$f(\mathbf{x}) \simeq f(\mathbf{x}_k) + \nabla f(\mathbf{x} - \mathbf{x}_k) + \frac{1}{2}(\mathbf{x} - \mathbf{x}_k)^T \mathbf{F}(\mathbf{x}_k)(\mathbf{x} - \mathbf{x}_k). \quad (2.28)$$

Minimization occurs at

$$\mathbf{x}_{k+1} = \mathbf{x}_k - [\mathbf{F}(\mathbf{x}_k)]^{-1} \nabla f(\mathbf{x}_k)^T, \quad (2.29)$$

where $\mathbf{F}(\mathbf{x})$ is the Hessian matrix.

2.3.2 Steepest Descent

The steepest descent method is commonly used algorithm and is often referred to as the gradient method. This iterative algorithm is defined as

$$\mathbf{x}_{k+1} = \mathbf{x}_k - \alpha_k \mathbf{g}_k, \quad (2.30)$$

where $\mathbf{g}_k = \nabla f(\mathbf{x}_k)^T$ and α is a scalar that minimizes $f(\mathbf{x}_k - \alpha \mathbf{g}_k)$.

2.3.3 Conjugate Gradient

The conjugate gradient method is used to solve the quadratic problem

$$\text{minimize } \frac{1}{2} \mathbf{x}^T \mathbf{Q} \mathbf{x} - \mathbf{b}^T \mathbf{x}. \quad (2.31)$$

The algorithm for conjugate gradient is

$$\mathbf{x}_{k+1} = \mathbf{x}_k - \alpha_k \mathbf{g}_k, \quad (2.32)$$

$$\alpha_k = \frac{\mathbf{g}_k^T \mathbf{d}_k}{\mathbf{d}_k^T \mathbf{Q} \mathbf{d}_k}, \quad (2.33)$$

$$\mathbf{d}_{k+1} = -\mathbf{g}_{k+1} + \beta_k \mathbf{d}_k, \quad (2.34)$$

$$\beta_k = \frac{\mathbf{g}_{k+1}^T \mathbf{Q} \mathbf{d}_k}{\mathbf{d}_k^T \mathbf{Q} \mathbf{d}_k}, \quad (2.35)$$

where $\mathbf{g}_k = \mathbf{Q}\mathbf{x}_k - \mathbf{b}$. In addition, the Fletcher-Reeves line search method can be implemented by changing the equation for β_k to

$$\beta_k = \frac{\mathbf{g}_{k+1}^T \mathbf{g}_{k+1}}{\mathbf{g}_k^T \mathbf{g}_k}. \quad (2.36)$$

2.3.4 Interior Point

The interior point method that is implemented in Mathematica and presented by Luenberger consists of setting up the minimization as follows:

$$\begin{aligned} & \text{minimize } f(\mathbf{x}) - \mu \sum_{i=1}^p \log(-g_i(\mathbf{x})) \\ & \text{subject to } \mathbf{A}\mathbf{x} = \mathbf{b}. \end{aligned} \quad (2.37)$$

The value for μ is predefined and equal to $\mu^k > 0$, where $k = 1, \dots, \mu^k > \mu^{k+1}$. The optimality conditions are

$$\begin{aligned} -\mathbf{S}\mathbf{g}(\mathbf{x}) &= \mu \mathbf{1} \\ \mathbf{A}\mathbf{x} &= \mathbf{b} \\ \mathbf{A}^T \mathbf{y} + \nabla f(\mathbf{x})^T + \nabla g(\mathbf{x})^T \mathbf{s} &= \mathbf{0}. \end{aligned} \quad (2.38)$$

The matrix \mathbf{S} is a diagonal matrix with the diagonal elements equal \mathbf{s} . The equation,

$$(\mathbf{x}(\mu) > 0, \mathbf{y}(\mu) > 0, \mathbf{s}(\mu) > 0), \quad (2.39)$$

minimizes equation 2.38. An approximate solution point $(\mathbf{x}, \mathbf{y}, \mathbf{s}) = (\mathbf{x}_k, \mathbf{y}_k, \mathbf{s}_k)$, for $\mu = \mu^k > 0$ can be used to find a new approximate solution to 2.38 for $\mu = \mu^{k+1} < \mu^k$.

2.3.5 Quasi-Newton

Quasi-Newton methods are similar to Newton's method or steepest descent, but is uses an approximation of the Hessian. For the algorithm $\mathbf{x}_{k+1} = \mathbf{x}_k - \alpha_k \mathbf{S}_k \nabla f(\mathbf{x}_k)^T$, the value of \mathbf{S}_k is set to the approximation \mathbf{H}_k .

The algorithm implemented in Mathematica uses the Broyden-Fletcher-Goldfarb-Shanno update:

$$\mathbf{H}_{k+1} = \mathbf{H}_k + \left(\frac{1 + \mathbf{q}_k^T \mathbf{H}_k \mathbf{q}_k}{\mathbf{q}_k^T \mathbf{q}_k} \right) - \frac{\mathbf{p}_k \mathbf{p}_k^T}{\mathbf{p}_k^T \mathbf{q}_k} - \frac{\mathbf{p}_k \mathbf{q}_k^T \mathbf{H}_k + \mathbf{H}_k \mathbf{q}_k \mathbf{q}_k^T}{\mathbf{q}_k^T \mathbf{p}_k}, \quad (2.40)$$

where $\mathbf{p}_k = \mathbf{x}_{k+1} - \mathbf{x}_k$ and $\mathbf{q}_k = \mathbf{g}_{k+1} - \mathbf{g}_k$.

2.4 Global Optimization Methods

Newer methods are influenced on phenomenon occurring in nature. These are differential evolution, genetic algorithm, cuckoo search algorithm, simulated annealing, particle swarm optimization, and ant swarm optimization.

2.4.1 Differential Evolution

Differential is a nature based heuristic method that begins with a randomly selected population of the design variables, within a specified boundary. Per Bulatovic et al. [91], three members of the population are randomly selected and mutated. If the mutated members have lower objective function values, they are added to the population; if not, they are removed.

2.4.2 Genetic Algorithm

The genetic algorithm is another nature influenced method similar to differential evolution. This method starts with a random population as well. Two randomly selected members of the population are chosen as parents. Various parameters, or genes, are selected from the parents and passed onto an offspring, or new solution. If the new offspring has a lower objective function values, then the parents are replaced by the offspring. If this is not the case, the offspring is removed from the population and the parents remain.

2.4.3 Cuckoo Search Algorithm

The cuckoo search method is modeled after the nesting patterns of the cuckoo. It starts with a random set of nests. Each nest with an egg is considered to be a solution. If a cuckoo drops an egg in a random nest, it is evaluated for fitness. If the new egg/nest combination is considered fit, the old egg is removed. If not, a new nest is formed for that egg. Overtime, a fraction of the unfit nest/egg combinations are removed. In the context of optimization, fitness relates to the objective function value [78, 92].

2.4.4 Simulated Annealing

This method uses analogies to metallurgy. Annealing is when a crystalline structure is heated to a high temperature and cooled slowly. The objective function is considered the energy state and the optimizing variables are the configuration. The goal is to reduce the overall energy state. The structure consists of atoms. Atoms are given a random displacement. If the result lowers the energy state, the new atom location is taken as a start point for the next iteration. If the energy state is raised, the new configuration is accepted based on the Boltzmann constant and the current temperature [79].

2.4.5 Particle Swarm Optimization

A swarm of particles is randomly placed in a boundary. A particle and its location represent a solution. The swarm moves about the space based on formulas for velocity and position. Movement of the swarm is influenced by the surrounding particles being attracted to a particular minimum. Each particle is also heavily influenced by the location with the best fitness over the entire design space [63].

2.4.6 Ant Swarm Optimization.

This algorithm models the interaction of a swarm of ants looking for food/solution. Ants will search randomly, while leaving a pheromone behind. Other ants are more likely to follow a trail with a stronger pheromone. As the shortest distance, or minimum, is found, the intensity of the pheromone increases, and the other paths decay [64, 65].

2.5 Homotopy Continuation

Homotopy continuation is a numerical method to solve systems of polynomial equations. The following formulation was presented by Sommese and Wampler [94]. Homotopy continuation can be used to solve polynomial equations of the form

$$p(z) = z^d + a_1 z^{d-1} + \dots + a_d, \quad (2.41)$$

where d is a positive integer and the values for a are constant.

The first step is to put the polynomial in equation 2.41 into a family of problems:

$$H(z, t) = t(z^d - 1) + (1 - t)p(z), \quad (2.42)$$

where $p(z)$ is the polynomial to be solved and $(z^d - 1)$ is an equation with known solutions.

When $t = 1$, $H(z, 1) = (z^d - 1)$, and the roots are known. When $t = 0$, $H(z, 0) = p(z)$, which is the polynomial equation that we are trying to solve. The goal is to track the path of the solution as t goes from 1 to 0.

For example, consider the equation

$$p(z) = z^2 - 5. \quad (2.43)$$

The family of equations would then be

$$H(z, t) = t(z^2 - 1) + (1 - t)(z^2 - 5) = z^2 - (5 - 4t) \quad (2.44)$$

For $t \in [0, 1]$, there will be two solutions for $H(z, t) = 0$. The solutions are $z_1(t) = \sqrt{5 - 4t}$ and $z_2(t) = -\sqrt{5 - 4t}$. As t goes from 1 to 0, the roots go from ± 1 to $\pm\sqrt{5}$.

If the formula for the roots was unknown, the continuation method would consist of tracking the solutions of $H(z, t) = 0$ as t goes from 1 to 0. Tracking can be done with the use of the Davidenko differential equation. The Davidenko equation is derived given that $H(z(t), t) \equiv 0$ for all t . Also, $H_t = \frac{\partial H}{\partial t}$ and $H_z = \frac{\partial H}{\partial z}$.

The Davidenko equation is then derived by differentiating H and setting it equal to 0, as shown below:

$$0 = \frac{dH(z_i(t), t)}{dt} = H_z(z_i(t), t) \frac{dz_i}{dt} + H_t(z_i(t), t). \quad (2.45)$$

Solving 2.45 for $\frac{dz}{dt}$ yields

$$\frac{dz_i(t)}{dt} = \frac{H_t(z_i(t), t)}{H_z(z_i(t), t)} \quad (2.46)$$

When this is applied to the previous, simple example, the equations become

$$H(z, t) = z^2 - (5 - 4t), \quad \frac{\partial H}{\partial z} = 2z, \quad \frac{\partial H}{\partial t} = 4, \quad (2.47)$$

resulting in

$$\frac{dz}{dt} = -\frac{2}{z(t)}. \quad (2.48)$$

This is now an ODE that can be solved, given initial values, that can be found when $t = 1$.

The method can also be extended to two variables, where the Davidenko differential equations become

$$0 = \frac{dH}{dt} = \frac{\partial H}{\partial x_i} \frac{dx_i}{dt} + \frac{\partial H}{\partial y_i} \frac{dy_i}{dt} + \frac{\partial H}{\partial t} \quad (2.49)$$

$$\begin{bmatrix} \frac{\partial H}{\partial x} & \frac{\partial H}{\partial y} \end{bmatrix} \begin{bmatrix} \frac{dx}{dt} \\ \frac{dy}{dt} \end{bmatrix} + \frac{\partial H}{\partial t} = \begin{bmatrix} \frac{\partial H_1}{\partial x} & \frac{\partial H_1}{\partial y} \\ \frac{\partial H_2}{\partial x} & \frac{\partial H_2}{\partial y} \end{bmatrix} \begin{bmatrix} \frac{dx}{dt} \\ \frac{dy}{dt} \end{bmatrix} + \frac{\partial H}{\partial t}. \quad (2.50)$$

$$\begin{bmatrix} \frac{dx}{dt} \\ \frac{dy}{dt} \end{bmatrix} = \begin{bmatrix} \frac{\partial H}{\partial x} & \frac{\partial H}{\partial y} \end{bmatrix}^{-1} \frac{\partial H}{\partial t}. \quad (2.51)$$

Equation 2.51 is an ODE and can be solved to attain the solution to the two variable problem. The same procedure can be extended to n variables and is used for polynomial design equations for linkage synthesis.

2.6 Summary

This chapter presented the six-bar linkage synthesis theory and optimization techniques that are used in the design of a single degree-of-freedom gait mechanism.

Chapter 3

Natural Leg Trajectories

3.1 Introduction

This chapter presents the data for natural leg trajectories that guide the design process for the gait mechanism. Motion capture data was recorded from a healthy volunteer walking on a treadmill. The gait mechanism was design to match the ankle trajectory and the foot orientation data.

3.2 Motion Capture for Ankle Trajectories

A Vicon MX three dimensional motion capture system was used to take the motion capture data at Professor Nina Robson's Human Interactive Robotics Lab at the California State University, Fullerton, Figure 3.1. Motion capture data was collected from markers at the hip, knee, ankle, and toe as the user walked on a treadmill.

The trajectory of the ankle is required for the linkage synthesis methods in the later chapters.

The data collected consisted of 23 trajectories ranging from 199 to 210 points, Figure 3.2.

Since it is intended for the final mechanism to be attached to the hip, the coordinates of the ankle trajectory data points were transformed to a coordinate system in the hip. This yielded the 23 different trajectories shown in Figure 3.3, which are the basis for the design of the gait system. The full list of data is in the appendix in A. Table 3.2 shows the data used for first ankle trajectory and foot orientation. The 22 other trajectories have the same form.

Table 3.1: Joint Coordinates Collected from Motion Capture (mm).

Count	x Ankle	y Ankle	x Toe	y Toe
1	-7.431	-896.047	171.885	-883.947
2	-12.321	-896.014	167.107	-884.926
3	-17.093	-896.008	162.477	-885.852
4	-21.771	-895.973	157.926	-886.638
5	-26.368	-895.858	153.443	-887.325
6	-30.873	-895.662	149.016	-887.902
7	-35.266	-895.417	144.72	-888.393
8	-39.538	-895.123	140.583	-888.854
9	-43.708	-894.777	136.557	-889.32
10	-47.84	-894.403	132.534	-889.641
11	-51.985	-893.989	128.399	-889.672
12	-56.129	-893.507	124.19	-889.55
13	-60.251	-892.957	120.067	-889.571
14	-64.38	-892.371	116.043	-889.763
15	-68.529	-891.802	112.038	-889.937
16	-72.659	-891.267	108.006	-889.953
17	-76.718	-890.712	103.952	-889.819
18	-80.658	-890.122	99.964	-889.651
19	-84.478	-889.571	96.127	-889.554
20	-88.215	-889.108	92.403	-889.472

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Table 3.1 – *Continued from previous page*

Count	x Ankle	y Ankle	x Toe	y Toe
21	-91.9	-888.677	88.701	-889.297
22	-95.538	-888.199	84.998	-889.049
23	-99.151	-887.657	81.322	-888.831
24	-102.777	-887.113	77.64	-888.654
25	-106.47	-886.61	73.896	-888.49
26	-110.294	-886.104	70.045	-888.301
27	-114.261	-885.555	66.033	-888.022
28	-118.349	-884.97	61.87	-887.632
29	-122.555	-884.347	57.629	-887.226
30	-126.863	-883.704	53.348	-886.884
31	-131.249	-883.083	48.984	-886.567
32	-135.716	-882.476	44.484	-886.167
33	-140.252	-881.862	39.875	-885.681
34	-144.839	-881.222	35.245	-885.222
35	-149.483	-880.558	30.625	-884.832
36	-154.188	-879.895	25.934	-884.431
37	-158.944	-879.233	21.144	-884.01
38	-163.717	-878.57	16.313	-883.622
39	-168.499	-877.906	11.458	-883.242
40	-173.306	-877.251	6.578	-882.814
41	-178.141	-876.612	1.691	-882.326
42	-182.988	-875.963	-3.179	-881.819
43	-187.814	-875.292	-8.008	-881.379
44	-192.602	-874.588	-12.788	-881.012
45	-197.346	-873.84	-17.571	-880.613
46	-202.045	-873.044	-22.394	-880.129
47	-206.69	-872.25	-27.196	-879.649
48	-211.29	-871.469	-31.909	-879.27
49	-215.854	-870.691	-36.541	-878.995
50	-220.392	-869.886	-41.148	-878.756

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Table 3.1 – *Continued from previous page*

Count	x Ankle	y Ankle	x Toe	y Toe
51	-224.878	-869.025	-45.762	-878.485
52	-229.318	-868.095	-50.361	-878.217
53	-233.758	-867.136	-54.928	-878.024
54	-238.228	-866.167	-59.513	-877.883
55	-242.713	-865.145	-64.174	-877.735
56	-247.206	-864.051	-68.931	-877.568
57	-251.73	-862.876	-73.757	-877.398
58	-256.267	-861.632	-78.587	-877.258
59	-260.791	-860.344	-83.383	-877.172
60	-265.318	-859.027	-88.176	-877.142
61	-269.854	-857.703	-93.01	-877.163
62	-274.409	-856.358	-97.928	-877.223
63	-279.005	-854.997	-102.937	-877.339
64	-283.649	-853.671	-108.007	-877.542
65	-288.35	-852.347	-113.148	-877.813
66	-293.155	-850.92	-118.432	-878.078
67	-298.111	-849.351	-123.9	-878.269
68	-303.182	-847.662	-129.515	-878.39
69	-308.309	-845.905	-135.228	-878.525
70	-313.491	-844.06	-141.066	-878.661
71	-318.775	-842.077	-147.074	-878.746
72	-324.147	-839.916	-153.247	-878.807
73	-329.572	-837.624	-159.566	-878.891
74	-335.043	-835.294	-166.044	-878.987
75	-340.546	-832.912	-172.657	-879.103
76	-346.063	-830.424	-179.348	-879.293
77	-351.578	-827.811	-186.103	-879.527
78	-357.064	-825.104	-192.922	-879.714
79	-362.506	-822.304	-199.748	-879.811
80	-367.898	-819.355	-206.551	-879.826

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Table 3.1 – *Continued from previous page*

Count	x Ankle	y Ankle	x Toe	y Toe
81	-373.228	-816.187	-213.378	-879.778
82	-378.499	-812.841	-220.288	-879.711
83	-383.708	-809.397	-227.271	-879.65
84	-388.832	-805.843	-234.261	-879.568
85	-393.825	-802.182	-241.198	-879.454
86	-398.653	-798.413	-248.099	-879.301
87	-403.294	-794.511	-254.942	-879.096
88	-407.72	-790.433	-261.647	-878.767
89	-411.844	-786.151	-268.129	-878.333
90	-415.635	-781.648	-274.433	-877.752
91	-419.11	-776.914	-280.64	-876.914
92	-422.25	-771.926	-286.711	-875.838
93	-425.022	-766.693	-292.553	-874.589
94	-427.417	-761.275	-298.135	-873.196
95	-429.426	-755.762	-303.511	-871.698
96	-431.02	-750.22	-308.744	-870.133
97	-432.153	-744.68	-313.822	-868.556
98	-432.791	-739.092	-318.663	-866.972
99	-432.902	-733.399	-323.166	-865.267
100	-432.433	-727.614	-327.228	-863.391
101	-431.343	-721.77	-330.822	-861.401
102	-429.609	-715.879	-334.014	-859.278
103	-427.251	-709.939	-336.827	-857.049
104	-424.31	-704.014	-339.221	-854.701
105	-420.787	-698.183	-341.141	-852.239
106	-416.652	-692.464	-342.523	-849.681
107	-411.928	-686.871	-343.327	-847.07
108	-406.702	-681.44	-343.632	-844.488
109	-401.071	-676.254	-343.557	-841.992
110	-395.099	-671.367	-343.132	-839.613

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Table 3.1 – *Continued from previous page*

Count	x Ankle	y Ankle	x Toe	y Toe
111	-388.853	-666.759	-342.401	-837.373
112	-382.43	-662.451	-341.372	-835.189
113	-375.971	-658.579	-339.739	-832.873
114	-369.654	-655.348	-336.823	-830.512
115	-363.552	-652.925	-332.084	-828.452
116	-357.604	-651.392	-325.286	-826.895
117	-351.674	-650.712	-316.546	-825.88
118	-345.651	-650.788	-306.3	-825.286
119	-339.565	-651.558	-295.051	-824.953
120	-333.535	-653.011	-283.114	-824.842
121	-327.636	-655.17	-270.589	-824.911
122	-321.81	-658.052	-257.521	-825.064
123	-315.87	-661.613	-243.954	-825.339
124	-309.562	-665.783	-229.979	-825.758
125	-302.672	-670.534	-215.74	-826.453
126	-295.1	-675.865	-201.394	-827.704
127	-286.862	-681.752	-187.024	-829.654
128	-278.045	-688.138	-172.538	-832.17
129	-268.701	-694.928	-157.744	-834.998
130	-258.804	-702.058	-142.477	-837.956
131	-248.327	-709.541	-126.629	-840.933
132	-237.311	-717.4	-110.229	-843.838
133	-225.851	-725.642	-93.384	-846.608
134	-214.027	-734.253	-76.275	-849.263
135	-201.83	-743.162	-59.08	-851.943
136	-189.207	-752.202	-41.881	-854.785
137	-176.133	-761.168	-24.699	-857.76
138	-162.646	-769.966	-7.508	-860.643
139	-148.794	-778.627	9.801	-863.152
140	-134.615	-787.196	27.3	-865.138

Continued on next page

Table 3.1 – *Continued from previous page*

Count	x Ankle	y Ankle	x Toe	y Toe
141	-120.115	-795.619	45.023	-866.71
142	-105.28	-803.807	62.85	-868.05
143	-90.128	-811.704	80.551	-869.282
144	-74.75	-819.276	98.04	-870.442
145	-59.231	-826.472	115.344	-871.477
146	-43.587	-833.264	132.554	-872.36
147	-27.841	-839.61	149.728	-873.093
148	-12.065	-845.494	166.747	-873.479
149	3.649	-850.923	183.444	-873.338
150	19.221	-855.942	199.78	-872.762
151	34.56	-860.565	215.716	-871.854
152	49.6	-864.699	231.095	-870.533
153	64.272	-868.242	245.877	-868.826
154	78.495	-871.234	260.074	-866.902
155	92.227	-873.802	273.631	-864.847
156	105.427	-875.999	286.455	-862.813
157	117.961	-877.691	298.534	-860.967
158	129.762	-878.852	309.834	-859.42
159	140.828	-879.539	320.342	-858.23
160	151.157	-879.788	330.158	-857.354
161	160.712	-879.576	339.35	-856.771
162	169.42	-878.904	347.885	-856.421
163	177.207	-877.838	355.611	-855.851
164	184.05	-876.588	362.296	-854.271
165	189.976	-875.453	367.774	-851.298
166	195.029	-874.681	372.061	-847.148
167	199.21	-874.341	375.253	-842.342
168	202.411	-874.298	377.35	-837.616
169	204.472	-874.401	378.286	-833.706
170	205.258	-874.674	378.079	-831.015

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Table 3.1 – *Continued from previous page*

Count	x Ankle	y Ankle	x Toe	y Toe
171	204.693	-875.315	376.758	-829.657
172	202.774	-876.432	374.283	-829.644
173	199.502	-877.85	370.695	-830.817
174	194.929	-879.326	366.111	-832.848
175	189.191	-880.717	360.627	-835.254
176	182.469	-882.034	354.296	-837.583
177	174.926	-883.345	347.208	-839.733
178	166.857	-884.649	339.614	-841.847
179	158.836	-885.839	332.133	-843.833
180	151.514	-886.771	325.41	-845.307
181	145.213	-887.271	319.586	-846.149
182	139.696	-887.137	314.406	-846.825
183	134.377	-886.432	309.497	-848.031
184	128.835	-885.596	304.565	-849.997
185	123.018	-885.042	299.357	-852.238
186	117.062	-884.807	293.748	-854.125
187	111.065	-884.674	287.877	-855.688
188	105.07	-884.517	282.097	-857.501
189	99.087	-884.416	276.487	-859.636
190	93.113	-884.531	270.858	-861.759
191	87.137	-884.915	265.115	-863.74
192	81.156	-885.484	259.334	-865.73
193	75.199	-886.149	253.632	-867.852
194	69.259	-886.87	247.975	-869.976
195	63.29	-887.589	242.274	-871.899
196	57.295	-888.272	236.527	-873.666
197	51.323	-888.925	230.728	-875.323
198	45.333	-889.475	224.858	-876.811
199	39.264	-889.86	218.891	-878.086
200	33.094	-890.083	212.83	-879.196

Continued on next page



Figure 3.1: Attached marker locations

Table 3.1 – *Continued from previous page*

Count	x Ankle	y Ankle	x Toe	y Toe
201	26.854	-890.193	206.692	-880.178
202	20.593	-890.228	200.553	-881.111
203	14.356	-890.206	194.479	-882.055
204	8.172	-890.143	188.478	-882.966
205	2.043	-890.055	182.535	-883.783

3.3 Measured Foot Orientation Trajectory

The motion capture data from the ankle and the toe were used to calculate foot orientation angle relative to ground. This data is in table 3.3 for 205 data points.

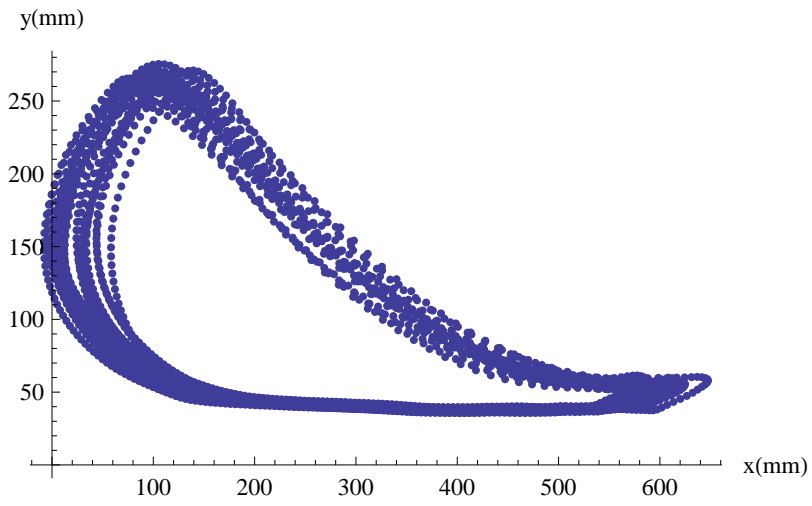


Figure 3.2: Ankle trajectories obtained from the Vincon MX motion capture system.

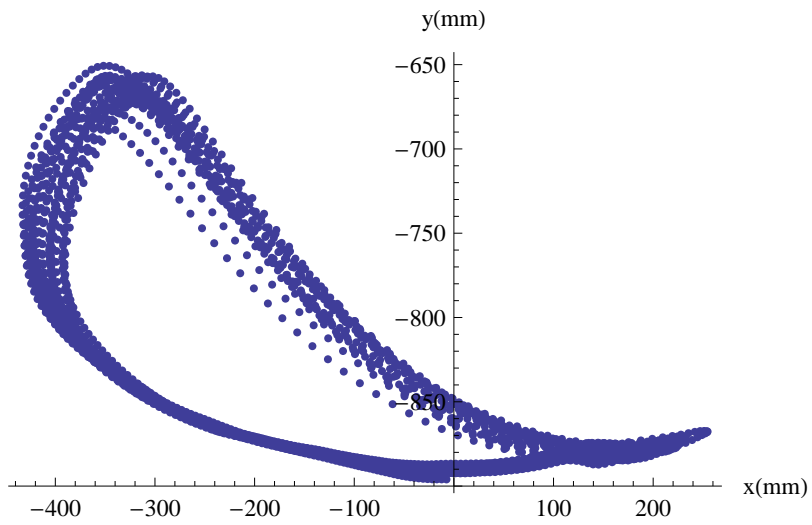


Figure 3.3: Ankle trajectories transformed to a coordinate system in the user's hip.

Table 3.2: Foot Orientation Angles Calculated from Motion Capture (radians).

Count	Foot Angle
1	0.0673748
2	0.0617162
3	0.0564983
4	0.0519036
5	0.0474209
6	0.0431077
7	0.0390071
8	0.0347881
9	0.0302634
10	0.0263935
11	0.0239299
12	0.0219393
13	0.0187791
14	0.0144534
15	0.0103304
16	0.00727023
17	0.00493991
18	0.00260377
19	0.0000957892
20	-0.0020153
21	-0.00343075
22	-0.00470983
23	-0.00650393
24	-0.00854167
25	-0.010419
26	-0.012182
27	-0.0136862
28	-0.014771
29	-0.0159751

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Table 3.2 – *Continued from previous page*

Count	Foot Angle
30	-0.0176436
31	-0.019332
32	-0.0204838
33	-0.0211985
34	-0.0222065
35	-0.0237202
36	-0.0251765
37	-0.0265236
38	-0.0280563
39	-0.0296423
40	-0.0309134
41	-0.031764
42	-0.0325581
43	-0.0338441
44	-0.0357112
45	-0.0376554
46	-0.0394121
47	-0.0412003
48	-0.0434566
49	-0.0462742
50	-0.0494458
51	-0.0527659
52	-0.0565014
53	-0.0608118
54	-0.0654627
55	-0.0703964
56	-0.0756752
57	-0.0814152
58	-0.0877173
59	-0.0945724

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Table 3.2 – *Continued from previous page*

Count	Foot Angle
60	-0.101906
61	-0.109602
62	-0.11768
63	-0.126223
64	-0.135081
65	-0.144342
66	-0.154198
67	-0.164492
68	-0.175123
69	-0.186278
70	-0.198042
71	-0.210403
72	-0.223758
73	-0.238133
74	-0.252999
75	-0.268483
76	-0.285142
77	-0.302914
78	-0.321178
79	-0.339636
80	-0.358585
81	-0.378625
82	-0.399889
83	-0.42209
84	-0.445051
85	-0.46866
86	-0.493015
87	-0.518191
88	-0.54389
89	-0.570319

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Table 3.2 – *Continued from previous page*

Count	Foot Angle
90	-0.597595
91	-0.625454
92	-0.654077
93	-0.683519
94	-0.713545
95	-0.744163
96	-0.775643
97	-0.808289
98	-0.84216
99	-0.876751
100	-0.911587
101	-0.946836
102	-0.982816
103	-1.01966
104	-1.05675
105	-1.09365
106	-1.1302
107	-1.1662
108	-1.2017
109	-1.23678
110	-1.27122
111	-1.30498
112	-1.33744
113	-1.36584
114	-1.38552
115	-1.3934
116	-1.38869
117	-1.37289
118	-1.349
119	-1.3195

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Table 3.2 – *Continued from previous page*

Count	Foot Angle
120	-1.28537
121	-1.24657
122	-1.20334
123	-1.15692
124	-1.10917
125	-1.06218
126	-1.01787
127	-0.977027
128	-0.938572
129	-0.900859
130	-0.862838
131	-0.823684
132	-0.782857
133	-0.740047
134	-0.695666
135	-0.651161
136	-0.608236
137	-0.567787
138	-0.528941
139	-0.489668
140	-0.448638
141	-0.406515
142	-0.364982
143	-0.325356
144	-0.28789
145	-0.252306
146	-0.218418
147	-0.186375
148	-0.155244
149	-0.124031

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Table 3.2 – *Continued from previous page*

Count	Foot Angle
150	-0.0928904
151	-0.0622404
152	-0.0321347
153	-0.00321741
154	0.0238523
155	0.049326
156	0.0727095
157	0.0923561
158	0.107496
159	0.118152
160	0.124674
161	0.126971
162	0.12532
163	0.122626
164	0.124552
165	0.135029
166	0.154292
167	0.179806
168	0.206687
169	0.229985
170	0.247449
171	0.259374
172	0.266319
173	0.268124
174	0.265122
175	0.259224
176	0.253142
177	0.247936
178	0.242865
179	0.237807

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Table 3.2 – *Continued from previous page*

Count	Foot Angle
180	0.234072
181	0.231598
182	0.22677
183	0.21587
184	0.199874
185	0.183929
186	0.17194
187	0.162493
188	0.151437
189	0.138784
190	0.127425
191	0.118419
192	0.110416
193	0.102186
194	0.094247
195	0.0874385
196	0.0813147
197	0.0756697
198	0.0704239
199	0.0654561
200	0.0605016
201	0.0556332
202	0.0506191
203	0.0452221
204	0.0397813
205	0.0347355

3.4 B-Spline Fit to the Data

Parametric equations for splines are constructed from *basis equations*, as shown in equations 3.1 and 3.2, where t is the parameter of the curve, k is the order of the curve, i is the i th control point, and \mathbf{x}_i are elements of the knot vector. The knot vector deals with the weighting of a particular control point, as explained in [93].

$$N_{i,1}(t) = \begin{cases} 1 & \text{if } \mathbf{x}_i \leq t < \mathbf{x}_{i+1} \\ 0 & \text{otherwise.} \end{cases} \quad (3.1)$$

$$N_{i,k}(t) = \frac{(t - \mathbf{x}_i)N_{i,k-1}(t)}{\mathbf{x}_{i+k-1} - \mathbf{x}_i} + \frac{(\mathbf{x}_{i+k} - t)N_{i+1,k-1}(t)}{\mathbf{x}_{i+k} - \mathbf{x}_{i+1}} \quad (3.2)$$

These basis equations are then used to form the parametric equations for the coordinates of the basis spline curve evaluated at t_j , where $\{P_x(t_j), P_y(t_j)\}$ is the j th point along the curve. Equations 3.3 and 3.4 are the parametric equations that yield the coordinates of the spline curve for a given parameter t .

$$P_x(t_j) = \sum_{i=0}^{n-1} P_{x,i} N_{i,k}(t_j) \quad (3.3)$$

$$P_y(t_j) = \sum_{i=0}^{n-1} P_{y,i} N_{i,k}(t_j) \quad (3.4)$$

Once a spline equation for a particular data set is found, values for t can be selected, and

the result with by x and y coordinates of a point that lies on the spline curve.

The 205 data points for the ankle trajectory were fit using this method and are listed in table 3.4 and plotted in Figure 3.4.

Table 3.3: Ankle coordinates Derived from B-Spline Fit (in mm).

Count	x Ankle	y Ankle
1	-12.3013	-896.019
2	-28.5017	-895.762
3	-43.4905	-894.79
4	-57.875	-893.271
5	-72.2304	-891.319
6	-85.8676	-889.402
7	-98.6012	-887.739
8	-111.58	-885.925
9	-125.994	-883.837
10	-141.499	-881.686
11	-157.736	-879.401
12	-174.374	-877.111
13	-191.139	-874.8
14	-207.465	-872.119
15	-223.279	-869.328
16	-238.762	-866.04
17	-254.421	-862.136
18	-270.165	-857.609
19	-286.202	-852.95
20	-303.278	-847.622
21	-321.419	-841.008
22	-340.361	-832.977
23	-359.46	-823.865
24	-378.044	-813.112
25	-395.699	-800.707

Continued on next page

Table 3.3 – *Continued from previous page*

Count	x Ankle	y Ankle
26	-411.249	-786.708
27	-423.17	-770.139
28	-430.681	-751.253
29	-432.729	-731.726
30	-427.766	-711.349
31	-415.486	-691.147
32	-396.802	-672.793
33	-374.806	-658.035
34	-353.679	-650.984
35	-332.749	-653.38
36	-311.995	-664.185
37	-286.041	-682.357
38	-252.92	-706.259
39	-213.557	-734.6
40	-169.259	-765.635
41	-120.308	-795.439
42	-67.6423	-822.553
43	-13.1429	-845.034
44	40.6634	-862.223
45	90.5369	-873.455
46	133.662	-879.072
47	167.855	-878.98
48	191.465	-875.24
49	203.915	-874.392
50	201.845	-876.813
51	184.236	-881.676
52	157.407	-886.006
53	136.079	-886.649
54	116.143	-884.797
55	95.3406	-884.501

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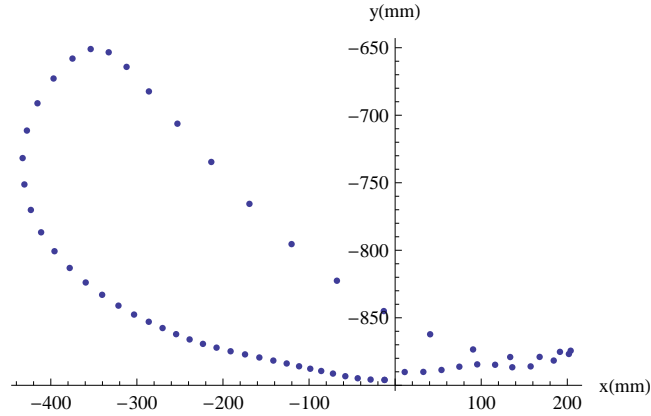


Figure 3.4: 60 data points that are derived from B-Spline Fit

Table 3.3 – *Continued from previous page*

Count	x Ankle	y Ankle
56	74.597	-886.229
57	53.8532	-888.645
58	32.7667	-890.073
59	11.1091	-890.172
60	-12.3013	-896.019

3.5 Natural Knee and Hip Trajectories

The motion capture data was also used to model the leg as an RR chain, Figure 3.5.

3.5.1 Upper and Lower Leg Lengths

The link lengths of the femur and lower leg were determined by calculating the average hip-knee and knee-ankle distance for the first trajectory. The femur was found to be 397.9mm

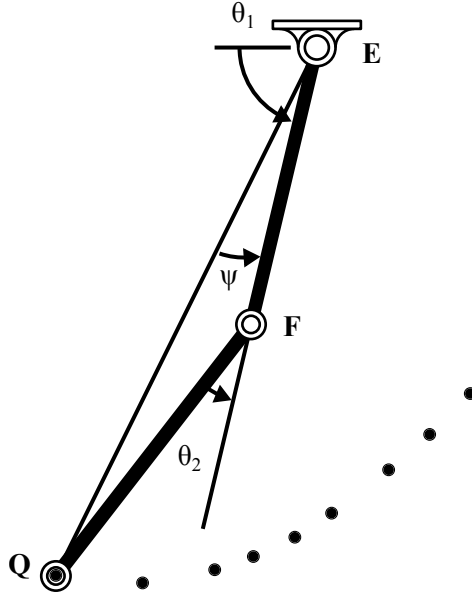


Figure 3.5: The 2R Chain

with a standard deviation of 5.7mm and the lower leg was found to be 502.6mm with a standard deviation of 9.9mm.

3.5.2 Inverse Kinematics

The joint angles are then determined by the inverse kinematics equations,

$$\theta_2 = \pm \cos^{-1} \left[\frac{Q_x^2 + Q_y^2 - (EF)^2 - (FQ)^2}{2(EF)(FQ)} \right] \quad (3.5)$$

$$\psi = \tan^{-1} \left[\frac{(FQ) \sin \theta_2}{(EF) + (FQ) \cos \theta_2} \right] \quad (3.6)$$

$$\theta_1 = \tan^{-1} \left[\frac{FQ}{EF} \right] - \psi. \quad (3.7)$$

Table 3.4: Hip and Knee Joint Angles (in radians).

Count	Hip Angle	Knee Angle
1	-1.4737	-0.198486

Continued on next page

Table 3.4 – *Continued from previous page*

Count	Hip Angle	Knee Angle
2	-1.49322	-0.19592
3	-1.50533	-0.20423
4	-1.5131	-0.219201
5	-1.51927	-0.23707
6	-1.52738	-0.250099
7	-1.53836	-0.256154
8	-1.55035	-0.260951
9	-1.5652	-0.263567
10	-1.58463	-0.260173
11	-1.60758	-0.251941
12	-1.63504	-0.23639
13	-1.66694	-0.213064
14	-1.69809	-0.1903
15	-1.73149	-0.162488
16	-1.76258	-0.138335
17	-1.79114	-0.119336
18	-1.81517	-0.108936
19	-1.84752	-0.0842212
20	-1.88903	-0.0454565
21	-1.91619	-0.0352237
22	-1.91624	-0.0760772
23	-1.9151	-0.120224
24	-1.90302	-0.184454
25	-1.88621	-0.257078
26	-1.86284	-0.339425
27	-1.82536	-0.443346
28	-1.77818	-0.559511
29	-1.7255	-0.676879
30	-1.66198	-0.80192
31	-1.58932	-0.929056

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Table 3.4 – *Continued from previous page*

Count	Hip Angle	Knee Angle
32	-1.51173	-1.04945
33	-1.43706	-1.15217
34	-1.37819	-1.21861
35	-1.33406	-1.2484
36	-1.3035	-1.24614
37	-1.2752	-1.22244
38	-1.2462	-1.18132
39	-1.22106	-1.11976
40	-1.20435	-1.03571
41	-1.19262	-0.938744
42	-1.18732	-0.828825
43	-1.18836	-0.709833
44	-1.19804	-0.581666
45	-1.21617	-0.449523
46	-1.24151	-0.319337
47	-1.25652	-0.224895
48	-1.24252	-0.202219
49	-1.25592	-0.153632
50	-1.29935	-0.0809579
51	-1.3648+0.0262596 i	0.@ -0.0470485 i
52	-1.35416	-0.0731188
53	-1.32017	-0.17614
54	-1.28944	-0.270076
55	-1.28862	-0.312911
56	-1.30992	-0.316669
57	-1.34081	-0.303371
58	-1.36791	-0.297341
59	-1.38857	-0.303877
60	-1.4737	-0.198486

3.6 Summary

In this chapter the first 205 data points for one ankle and toe trajectory are presented. The full data set can be found in the appendix. The foot orientation trajectory is calculated from ankle and toe data. The average thigh and lower leg lengths were found to be 397.9mm and 502.6mm respectively. A B-Spline curve was fit to the joint angle trajectory to smooth the data and reduce the data to 60 point, which was used in the synthesis procedure. The corresponding hip and knee angles were calculated using inverse kinematics of the leg modeled as a planar RR chain.

Chapter 4

Hybrid Task Position Optimization

4.1 Introduction

In this chapter a Watt-I six bar linkage is designed using the techniques discussed in section 2.2.1. This procedure carried out for 7 task positions. In addition, in order to attain additional solutions, a procedure for adjusting the task positions is presented. The solutions are then evaluated.

4.2 Adjusted Task Positions

The components of the task positions can be adjusted within a specified tolerance zone. These adjusted task positions are then used to run the same minimization and sorting algorithm to obtain additional linkage solutions. The previous step can be repeated a set number of times in order to increase the number of linkage solution candidates. The solutions from the original solutions are then combined with the list of solutions from the adjusted task positions phase. Each of the solutions from the original task positions are inserted into the

new sorted list based on the norm of the link lengths. An example of the small variation between the original task positions and the adjusted task positions is shown in Figure 4.1(b); also, an overview of the design algorithm is shown in Figure 4.1(a).

4.3 Evaluating Solutions

Duplicates and defective linkages are removed from the list of solutions resulting from the minimization procedure. The first defect occurs when minimization of E converges to the same crank, due to the starting positions causing convergence to the same local minimum. Next duplicates or solutions that are nearly duplicates of each other are removed. Solutions are considered to be close duplicates if the following condition exists.

$$\|[a_{0k}, a_{1k}, b_{0k}, b_{1k}] - [a_{0k}, a_{1k}, b_{0k}, b_{1k}]\| < e. \quad (4.1)$$

In equation 4.1, e is a constant that determines how close two solutions need to be before they are considered too similar. The value of e is decided by the designer.

4.4 Numerical Results

The hybrid procedure was implemented on a 3R chain with a set of 7 task positions. The lengths of each of the links of the serial chain were set to 1.25. The location of the fixed pivot of the serial chain was also set to (-1.25, -1.25). The non-adjusted task positions are shown in table 4.1(a). For this example minimization was done using the Levenberg-Marquardt, Mathematica function. Starting positions for the minimization problem were chosen by solving the 5 position synthesis problem for every combination of 7 original task positions; Before adjusted task positions, two solutions are listed in table 4.1(b) and illustrated in

Table 4.1: (a) Seven task positions, and (b) Design candidates

(a)

Task	x	y	θ
1	0.53	1.33	16.04
2	-0.07	1.09	18.13
3	-0.33	0.54	26.87
4	-0.13	0.10	40.40
5	0.38	0.07	49.16
6	0.94	0.50	40.55
7	1.10	1.02	23.14

(b)

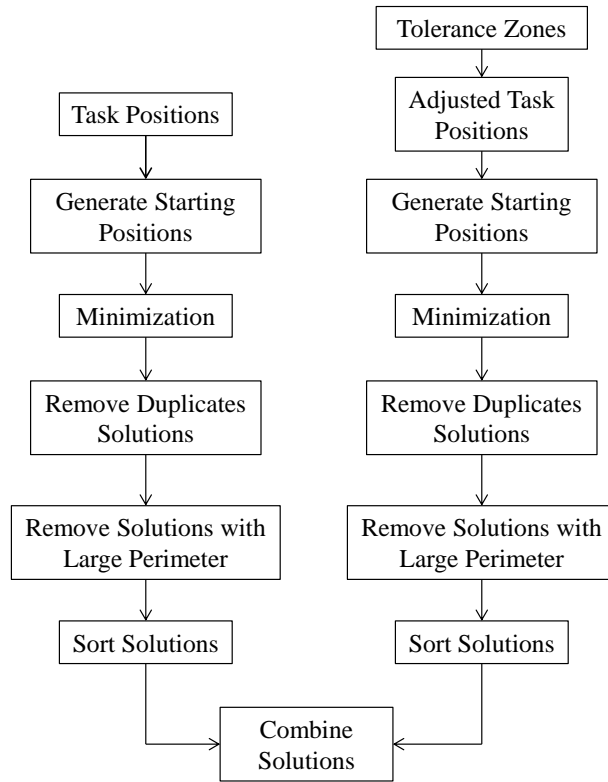
O	A	B	C	D	E	F
(-1.25, -1.25)	(-1.42, -0.011)	(-0.94, 0.83)	(-0.97, 0.07)	(-0.65, 0.98)	(-1.01, 0.80)	(-0.80, 1.10)
(-1.25, -1.25)	(-1.42, -0.011)	(-0.94, 0.83)	(-0.97, 0.07)	(-0.65, 0.98)	(-0.91, 1.13)	(-0.83, 0.97)

Figure 4.2.

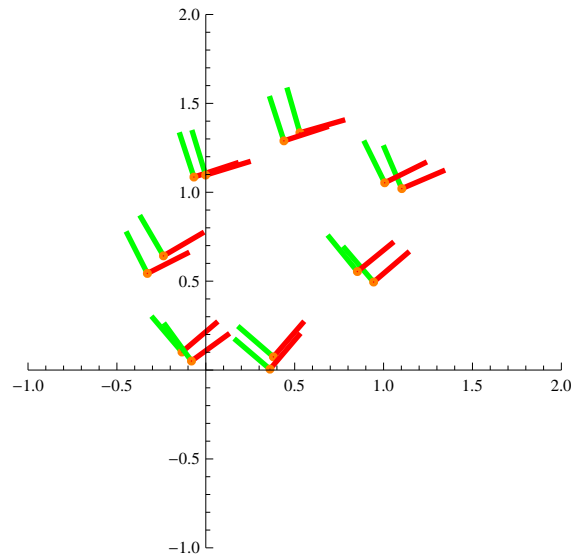
These task positions were then randomized 100 different times in order to get a set of 100 different task positions. In each case, the orientation angles of the tasks had a tolerance of 1° and the x and y coordinates of each task had a tolerance of 0.1. All of the other user defined parameters remained the same. What resulted was 153 linkage solutions; the procedure to 1 minute and 53 seconds to compute on a six core, 3.30Ghz machine. These linkage solutions can be found at the end of section C.2 in the Mathematica code.

4.5 Summary

The use of task positions to model the foot of the gait mechanism did not yield linkages that provided a natural leg movement. In order to better represent the trajectory of the ankle, we separate synthesis of the ankle trajectory from the orientation of the foot.



(a) Design flow chart.



(b) Original and adjusted tasks.

Figure 4.1: The design flow chart and an example of the original tasks and an adjusted set of tasks selected from within the tolerance zones.

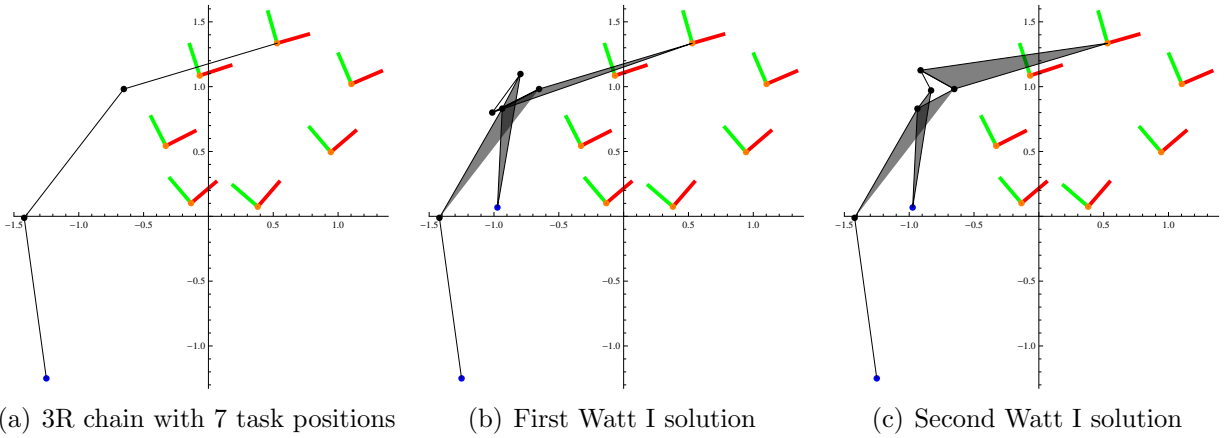


Figure 4.2: Watt I Solutions Adjusted Task Positions

Chapter 5

Four-Bar Modules for Path Synthesis

5.1 Introduction

In order to design an ankle trajectory, we use path synthesis for a four-bar linkages. Combining this with an RR chain, that models the leg, we obtain and Stephenson III, six-bar linkage. The use of a second four-bar linkage to guide the foot results in a 10-bar linkage. This theory of four-bar path synthesis is presented in section 2.2.2.

5.2 Numerical Example for a Sample Trajectory

The path synthesis problem was solved using the homotopy solver, Bertini [88], running on one 64 core node of UC Irvine's HPC, or high performance computing cluster, HPC.

The base pivot for the RR serial chain was located at $(0, 0)$ and the link lengths of 3.00 were selected for EF and FQ . The user defined precision points are given in Table 5.1 and the configurations of the RR chain are shown in Figure 5.1. The secondary pivot was specified

Table 5.1: Nine User Defined Precision Points

Point	x	y
1	3.24308	4.87983
2	3.65837	4.64454
3	4.20336	4.18766
4	4.70158	3.43835
5	4.66366	3.56091
6	4.33759	3.57467
7	3.54971	4.05579
8	3.13476	4.01075
9	2.68975	4.33752

so that the dimensions of FP and FQ were 2.00.

The inverse kinematics of the RR chain defines the secondary trajectory of \mathbf{P} . The coordinates of \mathbf{P} in the task positions are listed in Table 5.2 and shown in Figure 5.1. These new, nine precision points were then implemented into the four-bar synthesis algorithm mentioned previously.

The solution of the synthesis equations required 51 minutes and 21 seconds and resulted in 8652 solutions, 240 of which were real. Linkages solutions were then evaluated to determine if and of the link dimensions had a length that was more than four times the dimensions of the links of the serial chain. Linkages that met this criteria were deleted. Each of these linkages was evaluated to ensure that the input crank could complete a full rotation resulting in 88 linkages. An example of one of these linkages with useful dimensions is shown in Figure 5.2. The Mathematica and Bertini code are shown in C.3 and C.4 respectively. The 88 solutions are listed in the Mathematica Code.

Lastly, the 8652 original solutions can be saved and used as a start file Bertini. This will make it so that only these 8652 paths are tracked when the Bertini is run for other four-bar path synthesis problems formulated in this manner. Using this method with these 8652 paths already found, the computation time reduces to less than 5 minutes with the HPC.

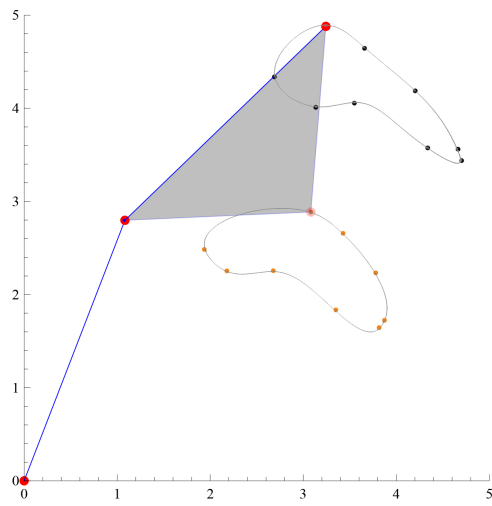


Figure 5.1: Example of an RR Chain with Secondary Trajectory

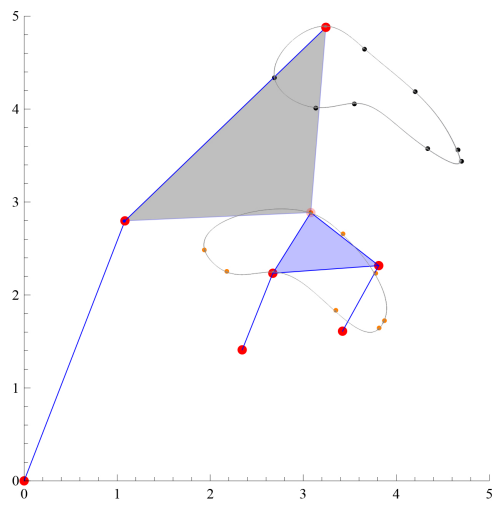


Figure 5.2: One Example of 240 Solutions

Table 5.2: Nine Points of the Second Trajectory

Point	x	y
1	3.08147	2.88637
2	3.42765	2.65789
3	3.77918	2.23316
4	3.81556	1.64531
5	3.87315	1.72377
6	3.35037	1.8353
7	2.67774	2.5588
8	2.17855	2.25415
9	1.93687	2.48464

5.3 Selection of Precision Points

The precision points that are used in the path synthesis procedure are derived from a set of data points discussed in section 3. The lengths of the upper leg, lower leg, and foot can be determined from this data. The first gait cycle was chosen to be the desired path for the synthesis procedure. This path consisted of 205 data points. Since 9 points are required for the four-bar path synthesis, B-spline equations were used. The equation of a B-spline is used to represent the trajectory created by these 205 data points. The data points are used as the control points for the parametric B-spline equation.

The 205 data points of the ankle trajectory can then be used as the control points in the B-spline equation so that the ankle trajectory can be represented by a single parametric equation. Nine evenly distributed values of t , between 0 and 1, were selected and substituted into the B-spline equations, resulting in 9 points that were distributed about the curve. The selected data points have a high density at the bottom of the curve because there was a higher density of data points in this area from the motion capture data. With these 9 points of the ankle, the 9 precision points for the first four-bar linkage problem can be determined, as shown in Figure 5.3.

This same procedure is also used to select the precision points for the second four-bar linkage.

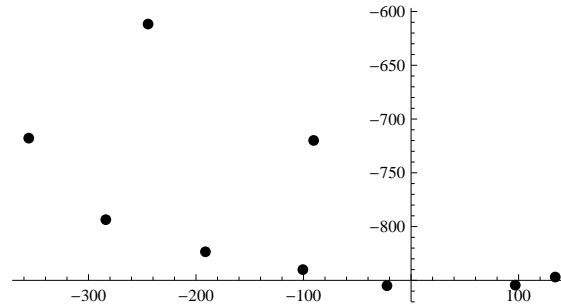
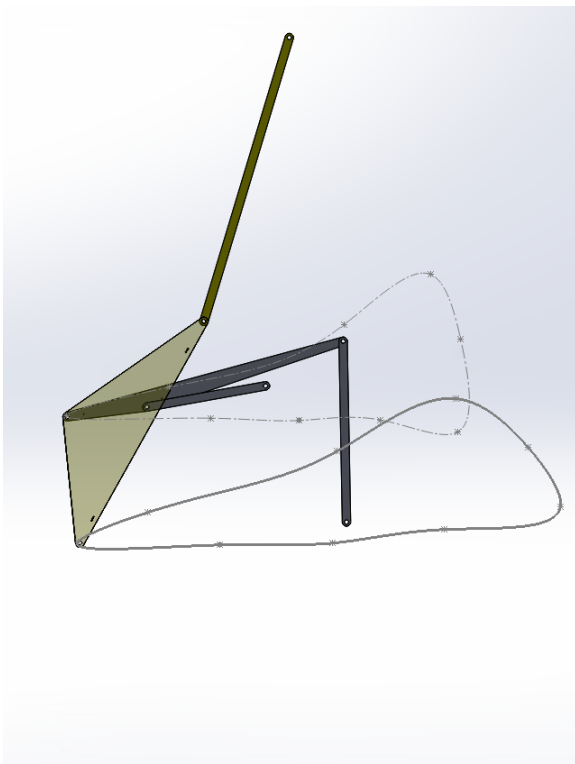


Figure 5.3: 9 Precision Points Derived from the Basis Spline

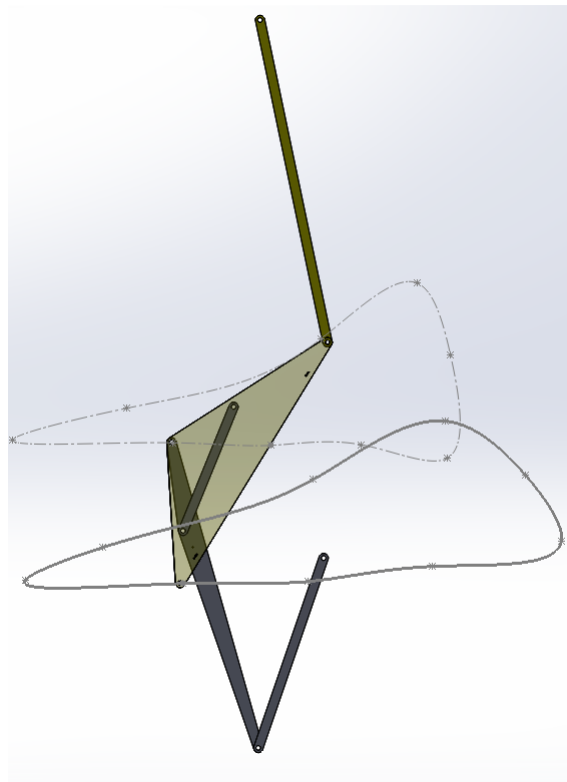
However, these points will be in the same frame as the upper leg, or link II from Figure 5.7, in not in the fix frame.

5.4 Path Synthesis for the Ankle Trajectory

The same path synthesis procedure was applied to 9 precision points that closely follow the gait trajectory, the procedure for path synthesis of the Stephenson six-bar was carried out. The resulting solutions that reached the desired precision points, but didn't have an input link that could make a full rotation were removed. However, linkage flaws existed in many of the solutions. One issue was that there were circuit defects. This occurs when a linkage needs to be disassembled and reassembled in a different configuration in order for the end effector to reach all of the precision points. Figure(5.4) shows one of the solutions in two different circuit configurations. Lastly, when the input crank is rotating, in either of the two assembly configurations, the end effector moves a distance away from the trajectory that is larger than desired. The current strategy to address these two linkage defect issues is to generate large numbers of solutions and verify the linkage performance against user criteria.



(a) Stephenson six-bar assembled in one configuration



(b) Stephenson six-bar assembled in a different configuration

Figure 5.4: A single Stephenson six-bar with a circuit defect

5.4.1 Ten-Bar Linkage Synthesis

The methods from the previous sections were then combined to develop a 10-bar synthesis procedure, specific to the human gait. Gait patterns from this section are from motion capture data.

5.4.2 The Constrained 3R Chain

The first step of the design procedure is to define a 3R serial chain. The defined parameters of the chain correspond with the dimensions of human leg, as shown in Figure 5.5. The fixed pivot, between link I and II, corresponds with the hip joint, and the joints attached to links II, III, and IV correspond with the knee, ankle, and toe respectively. Two additional joint locations are also defined so that links III and IV become triangular links. Inverse kinematics can be used to determine the joint angles and locations, assuming that the ankle joint locations and the foot angle are known.

Figure 5.6 shows how a four-bar linkage is attached to link III of the serial chain to constrain the motion of the ankle. The fixed pivots of this linkage and the fixed pivot of the 3R chain would all be connected to link I. An additional four-bar linkage is coupled to link IV to constrain the angle of the foot, as shown in Figure 5.7. The ground pivots of this linkage are attached to link II, forming a quaternary. Since the ground pivots of this linkage are moving relative to link II, the coordinates of the precision points, for the path synthesis problem, must be in the same frame at link II. A 10-bar linkage results from using path synthesis of two four-bar linkages to constrain the serial chain.

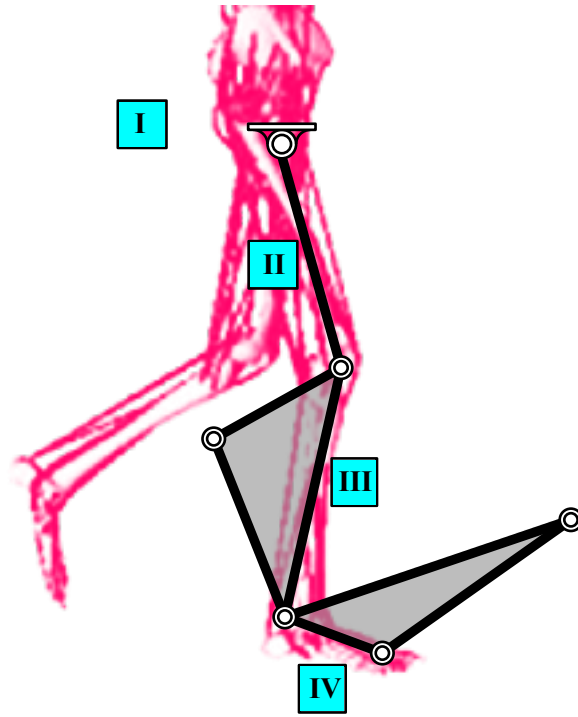


Figure 5.5: 3R Serial Chain

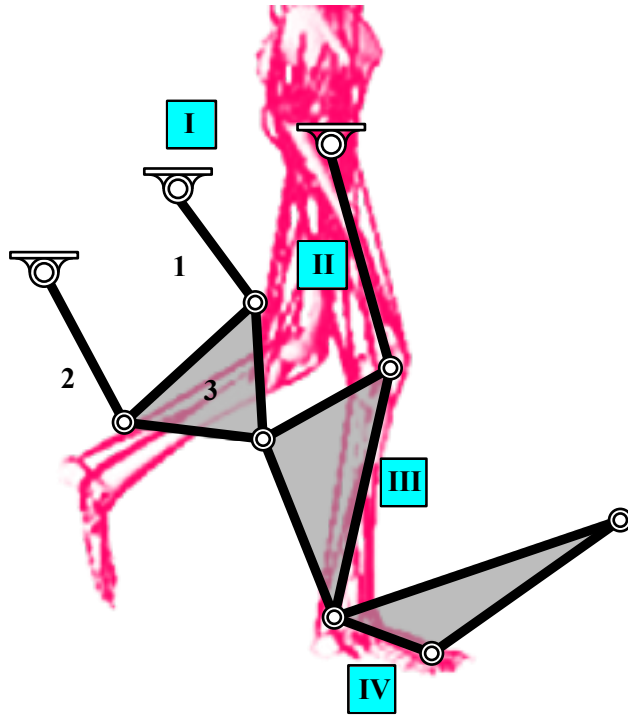


Figure 5.6: 3R Chain with One Four-Bar Module

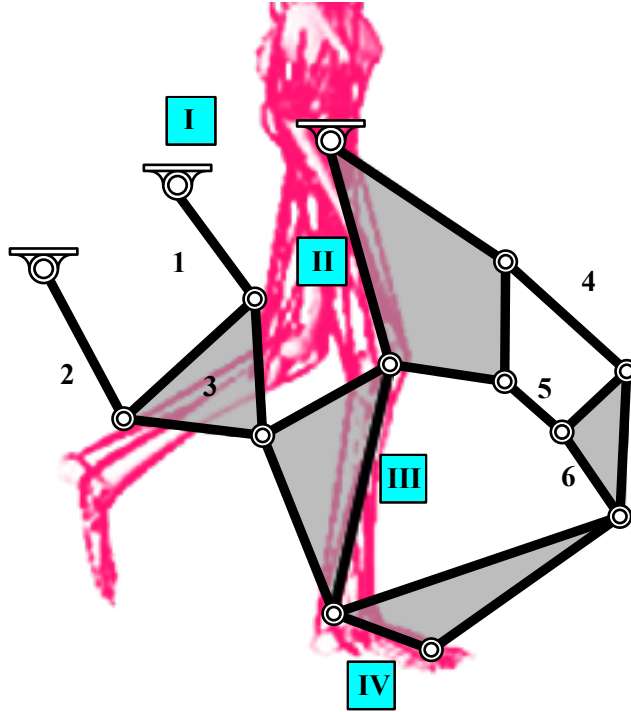


Figure 5.7: 10-Bar Linkage

Just as mentioned previously, the path synthesis method used follows that of Wampler [59]. The resulting formulation of the design equations consists of 12 equations with 12 unknown variables for each four-bar linkage.

5.4.3 Evaluating Solutions

The solutions that result from solving the 9 point path synthesis problem consist of the joint locations, **O**, **A**, **B**, and **C**, shown in Figure 5.8. The values of a, b, g, h, r, α , and θ_0 can be calculated from these joint locations. The equations for the coordinates of the coupler point X are given by

$$\begin{aligned}
 x_0 + a \cos(\theta + \theta_0) + r \cos(\alpha + \theta + \theta_0 + \phi) & \quad (5.1) \\
 y_0 + a \sin(\theta + \theta_0) + r \sin(\alpha + \theta + \theta_0 + \phi), &
 \end{aligned}$$

where, x_0 and y_0 are the coordinates of point \mathbf{O} . The equation for ψ is given below [55]:

$$\psi = \arctan\left(\frac{B}{A}\right) \pm \arccos\left(\frac{C}{\sqrt{A^2 + B^2}}\right), \quad (5.2)$$

where

$$A = 2ab \cos \theta - 2gb, \quad (5.3)$$

$$B = 2ab \sin \theta$$

$$C = g^2 + b^2 + a^2 - h^2 - 2ag \cos \theta.$$

Also, the equation for ϕ is

$$\phi = \arctan\left(\frac{b \sin \psi + a \sin \theta}{g + b \cos \psi - a \cos \theta}\right) - \theta. \quad (5.4)$$

When the known variables are substituted into the equations for the coordinates of \mathbf{X} , the equations become a parametric equation that varies with θ . A parametric plot of this function will produce the coupler curve of the linkage.

The coupler curves for all of the solutions are compared with the desired trajectory. Solutions with a coupler curve that deviate too much from the desired path are eliminated. In addition, linkages that do not satisfy the Grashof condition are also removed; the Grashof condition is when the input link is unable to complete a full rotation.

Lastly, the values of the selected linkage can then be randomized about a relatively small tolerance zone, in order to increase the number of potential linkage solutions. The new set of randomized solutions is also compared with the original set of precision points. The overall process is repeated for the second four-bar linkage in the moving frame.

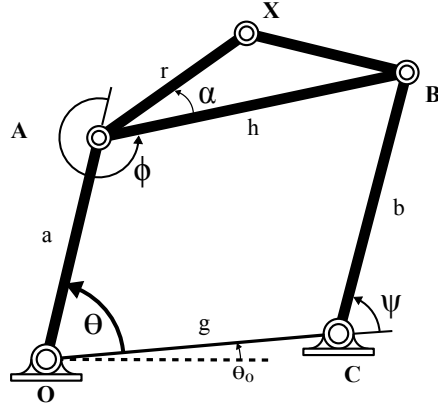


Figure 5.8: The Four-Bar Linkage

Table 5.3: Nine Precision Points for the First Four-Bar Linkage

Point	x	y
1	-22.4077	-854.975
2	-100.615	-840.025
3	-191.23	-823.445
4	-283.884	-793.584
5	-355.541	-717.779
6	-244.59	-611.663
7	-90.6067	-719.892
8	134.077	-846.936
9	96.8837	-854.441

5.4.4 Ten-Bar Numerical Example

The design procedure was applied to the first cycle of the gait cycle data. The desired trajectories were acquired from a motion capture system. Tables 5.3 and 5.4 list the two sets of precision points that are derived from basis splines. For the 3R chain, the hip joint was set at the origin and the lengths of the upper leg, lower leg, and foot were set to 510.908, 526.941, and 184.343 respectively; this data was also derived from the original motion capture data. Figure 5.9 illustrates this, designer defined, chain. Figures (5.3) and (5.10) show plots of the two sets of precision points.

The polynomial solver, Bertini was used to solve the two path synthesis problems [88]. The

Table 5.4: Nine Precision Points for the Second Four-Bar Linkage

Point	x	y
1	-74.7801	-488.537
2	-132.881	-479.35
3	-185.032	-463.913
4	-240.36	-433.901
5	-331.163	-352.701
6	-399.219	-258.914
7	-268.016	-408.732
8	13.3298	-486.262
9	-0.929189	-490.803

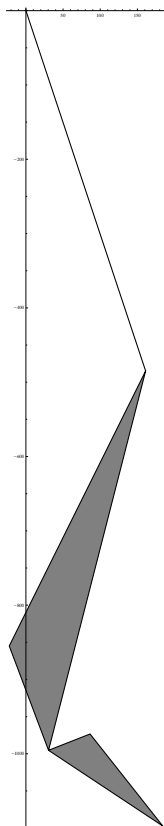


Figure 5.9: 3R Chain with Triangular Links

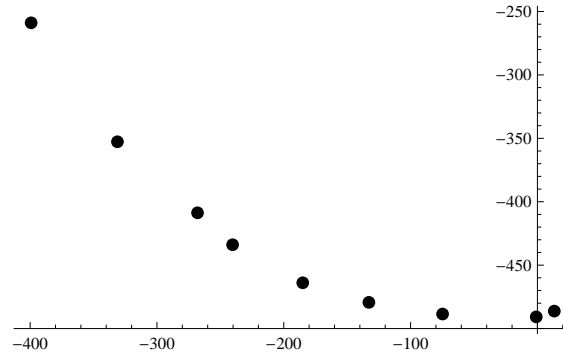


Figure 5.10: Precision Points for the Second Four-Bar Linkage in the Moving Frame

result was 240 solutions for the first four-bar linkage and 228 solutions for the second four-bar linkage. The coupler curve of one of the selected four-bar linkages is shown in Figure 5.11. The linkage parameters were then randomized about a tolerance of 100mm, meaning that there was an allowed variance of the linkage dimensions in either direction of 100mm. Figure 5.12 shows how the randomization about this tolerance resulted in a new linkage that had a more gradual curve.

The linkage that was found for the second four-bar linkage followed an acceptable trajectory and did not require randomization. Figure 5.13 shows the coupler curve of this linkage in the moving frame. The solutions for two selected four-bar linkages are in tables 5.5 and 5.6.

The solutions that had the most desirable coupler curves are shown in Figure 5.14. The first four-bar linkage is plotted in blue while the second linkage is plotted in red. While the resulting linkage had acceptable coupler curves, the overall packaging of the linkage did not. The linkage size would make it difficult to attach to a human leg as an exoskeleton. In addition, while each of the four-bar linkages may meet the Grashof condition individually, the ten-bar linkage may not be. The Mathematica code for this problem is in the appendix in C.5. The Bertini input code is the same as before, with different precision points used.

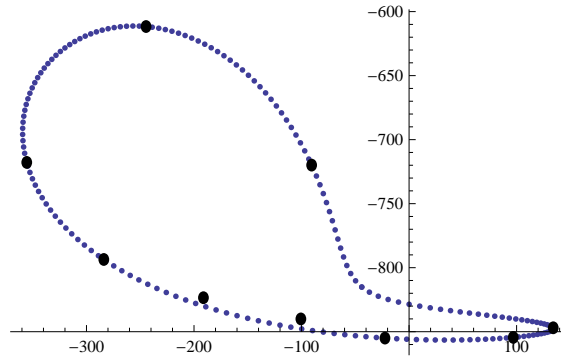


Figure 5.11: Coupler Curve of the First Four-Bar Linkage

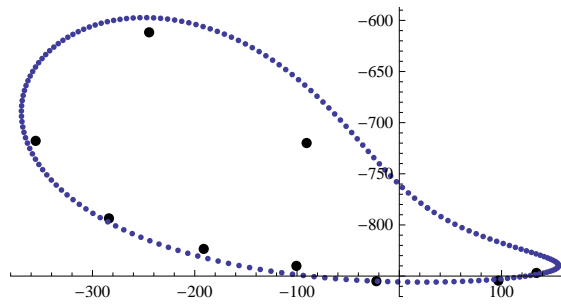


Figure 5.12: Coupler Curve of the Randomized First Four-Bar Linkage

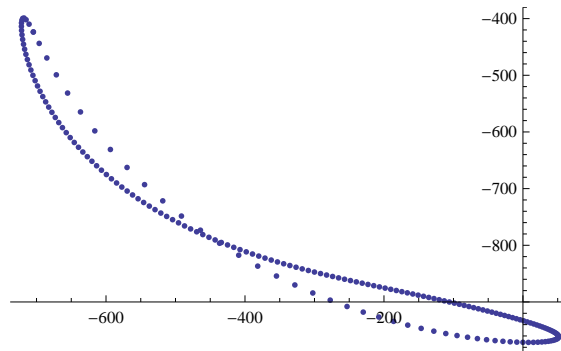


Figure 5.13: Coupler Curve of the Second Four-Bar Linkage

Table 5.5: First Four-Bar Solution

O	(-1657.82, 1430.38)
A	(-1724.49, 1208.35)
B	(1816.42, 2249)
C	(1903.3, 1899.64)

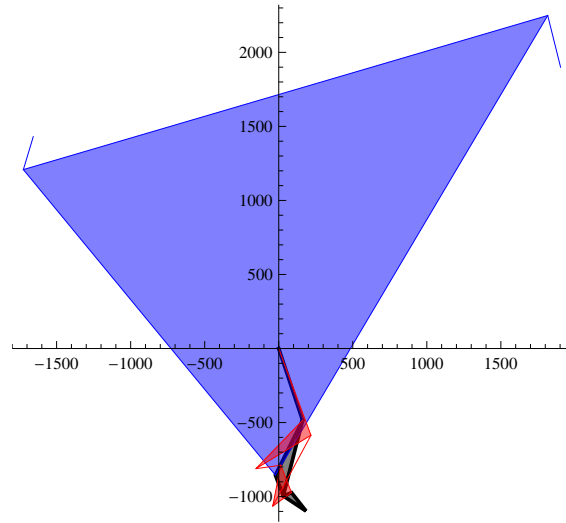


Figure 5.14: Final Ten-Bar Linkage Solution

Table 5.6: Second Four-Bar Solution

O	(-154.111, -811.408)
A	(13.9757,-788.164)
B	(-40.8045, -1064.83)
C	(217.512, -585.897)

5.5 Summary

The synthesis of an ankle trajectory using a planar four-bar linkage does not provide the resolution to achieve a natural ankle trajectory. The second four-bar linkage for the foot orientation looked promising, but was not useful without the first four-bar linkage. Six-bar linkage path synthesis appears to provide better resolution for the ankle trajectory.

Chapter 6

Stephenson III Path Synthesis Module

6.1 Introduction

Since it was determined that using four-bar modules was not an effective means to achieve feasible linkage designs, a procedure for a six-bar path synthesis module was developed. The synthesis procedure utilizes the equations in section 2.2.3. The formulation with a 2R chain and 11 precision points defined was used. By defining 11 precision points instead of 9, there is the opportunity to obtain better resolution of the ankle trajectory.

6.2 Path Synthesis Results for the Six-Bar Module

For this procedure, it is required that a 2R serial chain and 11 precision points are defined. The starting 2R chain is determined from the initial motion capture data. This 2R chain is **BFP**, from Figure 2.10. For this particular problem, fixed pivot **B** was set to be at the

Table 6.1: Table of the 11 Starting Precision Points for the Exact Six-Bar Synthesis Problem

P_x (mm)	P_y (mm)
-12.3013	-896.019
-90.5576	-888.832
-169.812	-877.728
-255.853	-861.74
-349.07	-828.994
-429.677	-754.752
-370.822	-656.01
-232.084	-721.162
35.88979	-860.879
204.9527	-874.624
102.895	-884.484

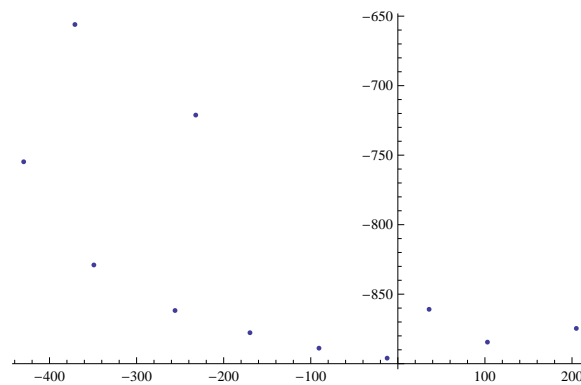


Figure 6.1: Plot of the 11 starting precision points for the exact six-bar synthesis problem origin. The lengths of the proximal and distal links were set to 397.874mm and 502.599mm respectively. These links match the lengths of the upper and lower leg segments of the user. These ultimately will be the leg segments of the exoskeleton that attach to the user. In addition, the 11 precision points that were used were selected by utilizing the basis spline method from the previous chapter. However, the only difference is that 11 evenly distributed values of the parameter t were used. The resulting precision points are shown in table 6.1 and plotted in Figure 6.1. The calculations were carried out on Bertini on a Mac Pro machine. This machine had two 6-core Intel Xeon processors, for a total of 12 cores. The

Table 6.2: Fixed Frame Joint Locations of the Starting Six-Bar Linkage at the first Precision Point

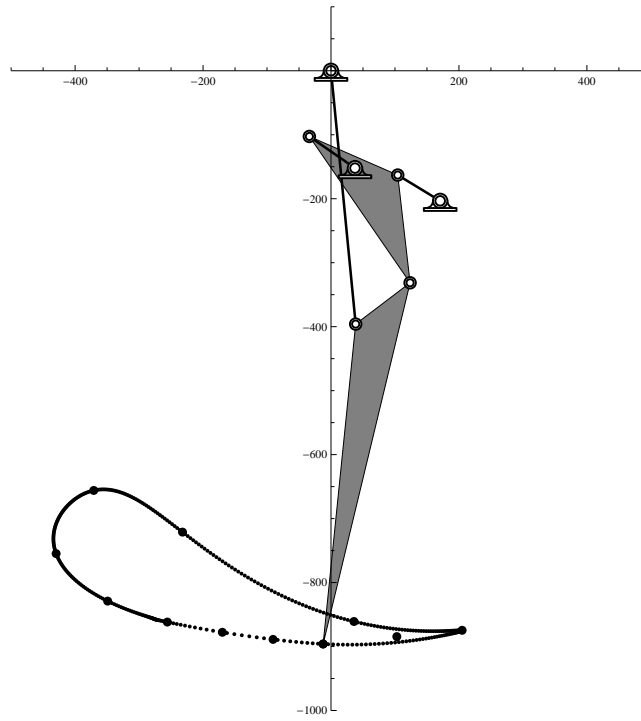
Joint	x-coordinate	y-coordinate
A	170.654	-203.351
B	0	0
C	37.497	-152.75
D	104.318	-163.023
F	38.571	369
G	123.619	-331.443
P₀	-12.301	-896.019

processor speed was 2.93GHz. The calculations were completed in 9.6 hours. The results showed that there were no linkages found that went through all positions. However, there were 13 linkages that went through 10 positions, 35 linkages that went through 9 positions, 183 linkages that went through 8 positions, 771 linkages that went through 7 positions, and 1445 linkages that went through 6 positions. All of these linkages were assembled into a single solution set. After duplicates were removed, there were a total of 2003 solutions. The 2003 linkage solutions were clustered based on similarity. In order measure the similarity between these linkage candidates, a clustering formula was used to measure that distance between linkage joints of a selected design, $L_{\text{ref}} = (\mathbf{A}, \mathbf{B}, \mathbf{C}, \mathbf{D}, \mathbf{F}, \mathbf{G}, \mathbf{H})_{\text{ref}}$ and the remaining designs, given by,

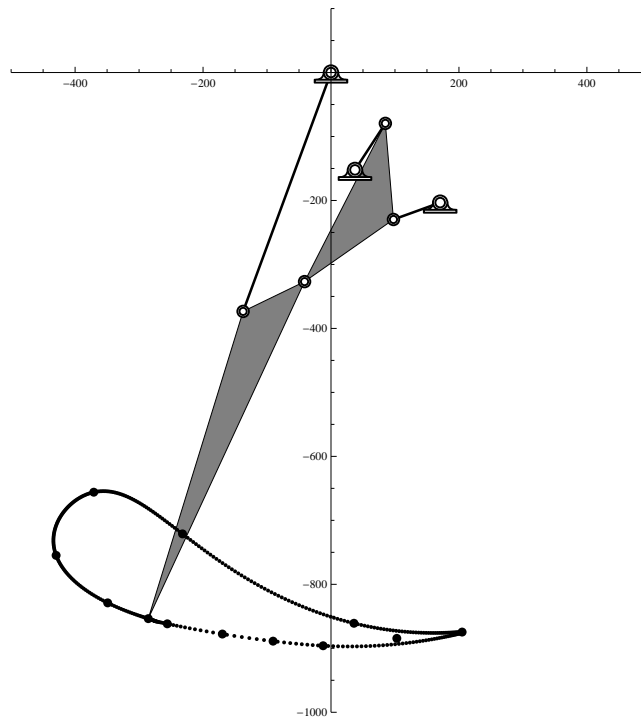
$$V_j = \sqrt{L_{\text{ref}} - L_j}, j = 1, \dots, 11. \quad (6.1)$$

On average, that is a variance of 40mm for each joint parameter. The clustering technique resulted in 1226 different clusters.

A feasible design from this set of linkage candidates is shown in Figure 6.2. This solution only goes through 10 of the points and there is a point in the trajectory where the knee joint hyper-extends. For this reason, additional optimization of the linkage is required.



(a) Six-bar linkage at the precision point



(b) Six-bar linkage with a hyper-extended knee joint

Figure 6.2: Stephenson III linkage Reaching 10 precision points

6.3 Summary

In this chapter we obtain a six-bar linkage that reliably matches the natural ankle trajectory with the hip and knee angles modeled from the motion capture data. The result was 2003 linkage solutions that were in 1226 clusters. A feasible linkage solution yielded an acceptable trajectory that reached 10 precision points. At one point in the trajectory, the knee joint of the 2R chain hyper-extends, which required further design effort.

Chapter 7

Homotopy Directed Optimization

7.1 Introduction

In this chapter we used optimization with initial solutions at each of the homotopy results obtained from the synthesis equations. This is a new global optimization procedure we call homotopy directed optimization, which combines a distribution of initial solutions with gradient based optimization.

7.2 Optimization

Once a set of initial design parameter vectors are determined by the homotopy solution of the 11-point synthesis equations, a gradient optimizer is used to minimize the distance of the resulting linkage to the specified points, P_k , $k = 0, \dots, N_P - 1$, on the desired coupler curve. Recall that the RR chain BFP_k is specified and the system of equations \mathcal{S}_1 can be solved for S_k and T_k , which define the joint angles ψ_k and θ_k .

If the point P_k is on the coupler curve of Stephenson III linkage formed by RR chain $BF P_k$ and the remaining design parameters, $\mathbf{r} = (A, C, D, G, H)$, then they satisfy the loop equations defined by \mathcal{S}_2 , that is

$$\begin{aligned}
Q_k(D - A) &= -U_k(H - D) - T_k(P_0 - H) + (P_k - A), \\
\bar{Q}_k(\bar{D} - \bar{A}) &= -\bar{U}_k(\bar{H} - \bar{D}) - \bar{T}_k(\bar{P}_0 - \bar{H}) + (\bar{P}_k - \bar{A}), \\
R_k(G - C) &= -U_k(H - G) - T_k(P_0 - H) + (P_k - C), \\
\bar{R}_k(\bar{G} - \bar{C}) &= -\bar{U}_k(\bar{H} - \bar{G}) - \bar{T}_k(\bar{P}_0 - \bar{H}) + (\bar{P}_k - \bar{C}), \\
k &= 1, \dots, N_P - 1.
\end{aligned} \tag{7.1}$$

Eliminate Q_k and R_k by multiplying the complex conjugate equations to obtain,

$$\begin{aligned}
|D - A|^2 &= |U_k(H - D) + T_k(P_0 - H) - (P_k - A)|^2, \\
|G - C|^2 &= |U_k(H - G) + T_k(P_0 - H) - (P_k - C)|^2, \\
k &= 1, \dots, N_P - 1.
\end{aligned} \tag{7.2}$$

This is k sets of two linear equations in the two unknowns joint angles U_k and \bar{U}_k .

In order to solve these equations, it is convenient to introduce the parameters,

$$\begin{aligned}
a &= a_x + ia_y = H - D \\
b_k &= b_{xk} + ib_{yk} = T_k(P_0 - H) - P_k + A \\
c &= c_x + ic_y = H - G \\
d_k &= d_{xk} + id_{yk} = T_k(P_0 - H) - P_k + C \\
f &= f_x + if_y = D - A \\
g &= g_x + ig_y = G - C,
\end{aligned} \tag{7.3}$$

which can be determined from the six-bar linkage defined by the RR chain BFP_0 and the design vector $\mathbf{r} = (A, C, D, G, H)$. to obtain k sets of two equations in the two unknowns U_k and \bar{U}_k ,

Substitute the parameters (7.3) into (7.2) to obtain,

$$\begin{aligned} U_k a \bar{b}_k + \bar{U}_k \bar{a} b_k &= f \bar{f} - a \bar{a} - b_k \bar{b}_k, \\ U_k c \bar{d}_k + \bar{U}_k \bar{c} d_k &= g \bar{g} - c \bar{c} - d_k \bar{d}_k, \quad k = 1, \dots, N_P - 1. \end{aligned} \quad (7.4)$$

Each of which can be solved to obtain,

$$U_k = \frac{\begin{vmatrix} f \bar{f} - a \bar{a} - b_k \bar{b}_k & \bar{a} b_k \\ g \bar{g} - c \bar{c} - d_k \bar{d}_k & \bar{c} d_k \end{vmatrix}}{\begin{vmatrix} a \bar{b}_k & \bar{a} b_k \\ c \bar{d}_k & \bar{c} d_k \end{vmatrix}}, \bar{U}_k = \frac{\begin{vmatrix} a \bar{b}_k & f \bar{f} - a \bar{a} - b_k \bar{b}_k \\ c \bar{d}_k & g \bar{g} - c \bar{c} - d_k \bar{d}_k \end{vmatrix}}{\begin{vmatrix} a \bar{b}_k & \bar{a} b_k \\ c \bar{d}_k & \bar{c} d_k \end{vmatrix}},$$

$$k = 1, \dots, N_P - 1. \quad (7.5)$$

The parameters U_k and \bar{U}_k satisfy the normality condition, $U_k \bar{U}_k = 1$, when P_k is on the coupler curve of the linkage defined by the design parameter vector $\mathbf{r} = (A, C, D, G, H)$. We use these this to construct the objective function,

$$F(\mathbf{r}) = \sum_{i=1}^{N_P-1} U_k U_k^{-1} - 1 = \sum_{i=1}^{N_P-1} \sin^2 \mu_k + \cos^2 \mu_k - 1, \quad (7.6)$$

which measures the error between the set of points P_k , $k = 0, \dots, N_P - 1$ and the coupler curve traced by the six-bar linkage formed by the RR chain BFP_0 and the design vector $\mathbf{r} = (A, C, D, G, H)$.

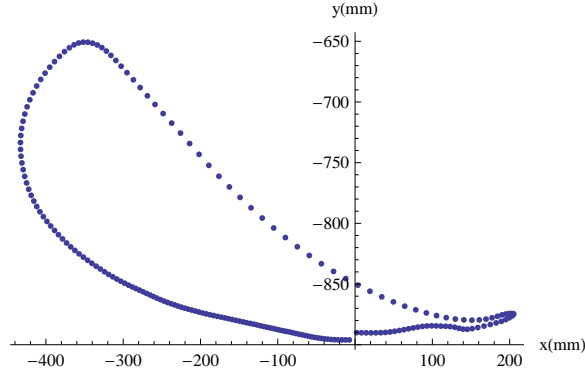


Figure 7.1: Ankle trajectory of a single gait cycle relative to the hip joint

7.3 Selection of Precision Points

The precision points, P_j and P_0 , that are used in the path synthesis algorithm are derived from a set of data points collected from motion capture data of a walking subject in section 3.

The first gait cycle was chosen to be the desired path for the synthesis procedure, as shown in Figure 7.1. This path consisted of 205 data points. Since 205 data points could potentially create a minimization problem that will be too great in complexity, a reduction in the number of precision points is required. This was done by creating a basis spline equation for the 205 data points. This is a parametric equation and the data points are used as the control points.

Note that $\{P_{x,i}, P_{y,i}\}$ are retrieved from motion capture data and $\{P_x(t_j), P_y(t_j)\}$ are points along a continuous spline. The 205 data points of the ankle trajectory can then be used as the control points in the B-spline equation so that the ankle trajectory can be represented by a single parametric equation. Sixty values of t , between 0 and 1, were selected and substituted into the B-spline equations; these values of t were evenly distributed. The results define a number of points that are distributed about the curve.

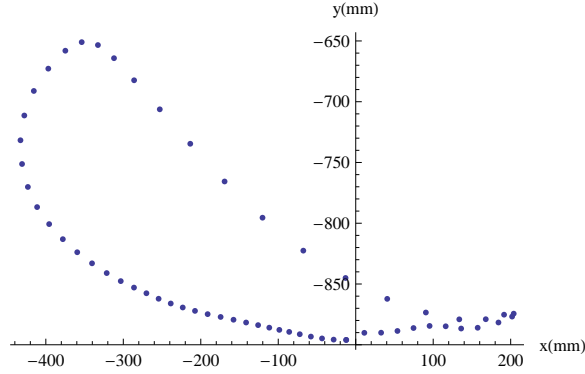


Figure 7.2: Set of 60 precision points derived from a basis spline

From equations 3.1 and 3.2, it can be seen that the spline is a parametric equation in terms of the parameter t ; this parameter varies from 0 to 1. There were 60 values of t that were evenly distributed between 0 and 1. The basis spline equation was then evaluated at each of these values, resulting in a set of 60 precision points displayed in table 7.1. The precision points used for the first gait cycle are in Figure 7.2.

Lastly, the angle θ_j is the relative angle of the most distal link. Since the location of every point P and the lengths of links BF and FP are known from the spline equation and motion capture data respectively, θ_j can be determined by solving for the angle between two vectors. These values are also substituted in equation 7.6. The lengths of the upper leg, \mathbf{BF} , and the lower leg, \mathbf{FP} , are 397.874mm and 502.599mm respectively. The values of θ_j are listed in table 7.1.

7.4 Differential Evolution

The global optimization algorithm, differential evolution, was used in an attempt to solve for 60 precision points. The result was a solution that had link lengths that were too large. Due to this, the linkage was not considered feasible and other optimization techniques were considered.

Table 7.1: Table of Data to be Substituted into the Error Function

j	$P_x(mm)$	$P_y(mm)$	$\theta(^{\circ})$	j	$P_x(mm)$	$P_y(mm)$	$\theta(^{\circ})$
0	-12.3013	-896.019	-	30	-415.486	-691.147	-48.4832
1	-28.5017	-895.762	-0.971	31	-396.802	-672.793	-50.9351
2	-43.4905	-894.79	-2.1413	32	-374.806	-658.035	-52.5427
3	-57.875	-893.271	-3.44411	33	-353.679	-650.984	-52.9764
4	-72.2304	-891.319	-4.82172	34	-332.749	-653.38	-52.155
5	-85.8676	-889.402	-6.03246	35	-311.995	-664.185	-50.2745
6	-98.6012	-887.739	-7.00875	36	-286.041	-682.357	-47.2952
7	-111.58	-885.925	-7.97049	37	-252.92	-706.259	-43.2771
8	-125.994	-883.837	-8.97115	38	-213.557	-734.6	-38.3101
9	-141.499	-881.686	-9.88991	39	-169.259	-765.635	-32.5368
10	-157.736	-879.401	-10.7333	40	-120.308	-795.439	-26.3087
11	-174.374	-877.111	-11.4156	41	-67.6423	-822.553	-19.7073
12	-191.139	-874.8	-11.9071	42	-13.1429	-845.034	-12.9489
13	-207.465	-872.119	-12.3876	43	40.66343	-862.223	-6.16035
14	-223.279	-869.328	-12.7076	44	90.53694	-873.455	0.3723
15	-238.762	-866.04	-13.1053	45	133.6625	-879.072	6.379523
16	-254.421	-862.136	-13.653	46	167.8554	-878.98	10.93037
17	-270.165	-857.609	-14.4337	47	191.4646	-875.24	13.03164
18	-286.202	-852.95	-14.8715	48	203.9151	-874.392	15.04815
19	-303.278	-847.622	-15.0286	49	201.845	-876.813	16.72373
20	-321.419	-841.008	-15.9984	50	184.2357	-881.676	17.61205
21	-340.361	-832.977	-18.3419	51	157.4071	-886.006	14.03234
22	-359.46	-823.865	-20.8059	52	136.0794	-886.649	10.07707
23	-378.044	-813.112	-23.794	53	116.143	-884.797	6.455648
24	-395.699	-800.707	-26.9922	54	95.34059	-884.501	4.048268
25	-411.249	-786.708	-30.3709	55	74.59698	-886.229	2.612696
26	-423.17	-770.139	-34.1777	56	53.85323	-888.645	1.604831
27	-430.681	-751.253	-38.1308	57	32.76674	-890.073	0.397363
28	-432.729	-731.726	-41.837	58	11.10905	-890.172	-1.16092
29	-427.766	-711.349	-45.3618	59	-12.3013	-896.019	0

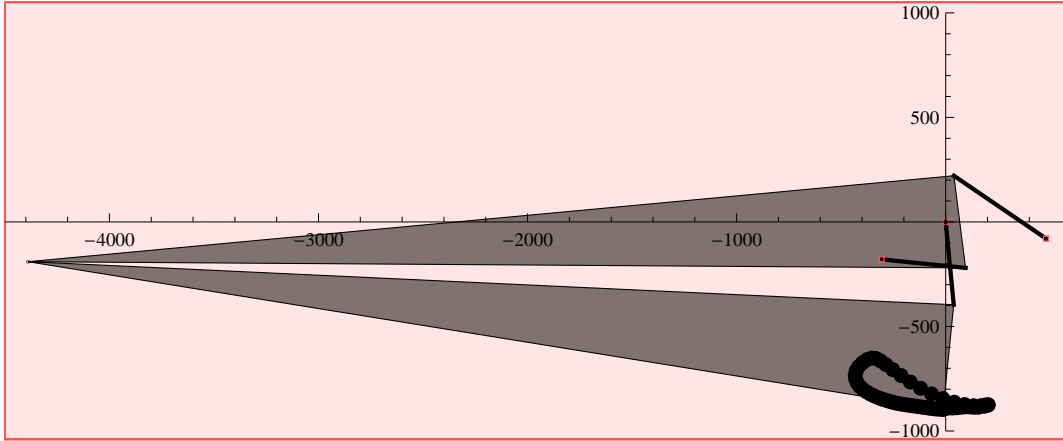


Figure 7.3: Linkage that resulted from the differential evolution algorithm large link lengths.

7.5 Minimization Procedure and Results

Minimization of equation 7.6 for 60 precision points was carried out. The 2003 linkage solutions found from the previous chapter were used as the starting population for the minimization algorithm. Since there were 1226 clusters, there is, at a minimum, 1226 different linkages in the initial population. The minimization problem, for each starting linkage, was completed using *Mathematica*'s built-in optimization algorithms. Six separate methods were used with the starting linkages and objective function. The algorithms options used were "ConjugateGradient" with "FletcherReeves," "Newton," "Gradient," "ConjugateGradient," "InteriorPoint," and "QuasiNewton."

Minimizing the objective function for 2003 different starting linkages with 6 different algorithms resulted in a large solution set that was to be sorted. Solutions with an error value greater than 3 were then deemed to be undesirable linkages. Also, linkage solutions that a link length sum greater than 3000 were removed for the set. Lastly, the solutions that had branch defects were omitted. What remained were 6 linkages that were all in a single cluster; two linkages are considered to be in the same cluster if the norm of their differences was less than one. This solution is shown in Figure 7.2 and the joint positions are in table

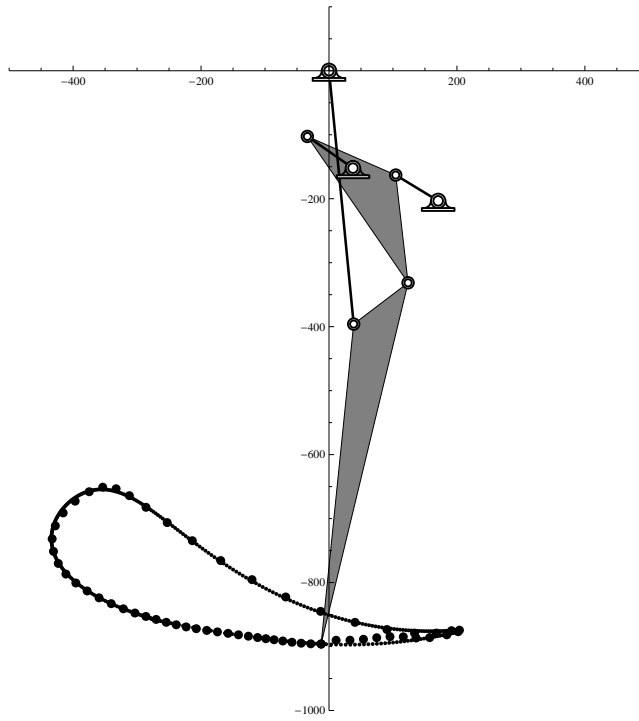
Table 7.2: Linkage solution resulting from the minimization problem.

Error	2.472861
A_x	170.6508
A_y	-203.351
B_x	0
B_y	0
C_x	37.49712
C_y	-152.175
D_x	104.3177
D_y	-163.023
F_x	38.57078
F_y	-396
G_x	-33.817
G_y	-102.676
H_x	123.6186
H_y	-331.443

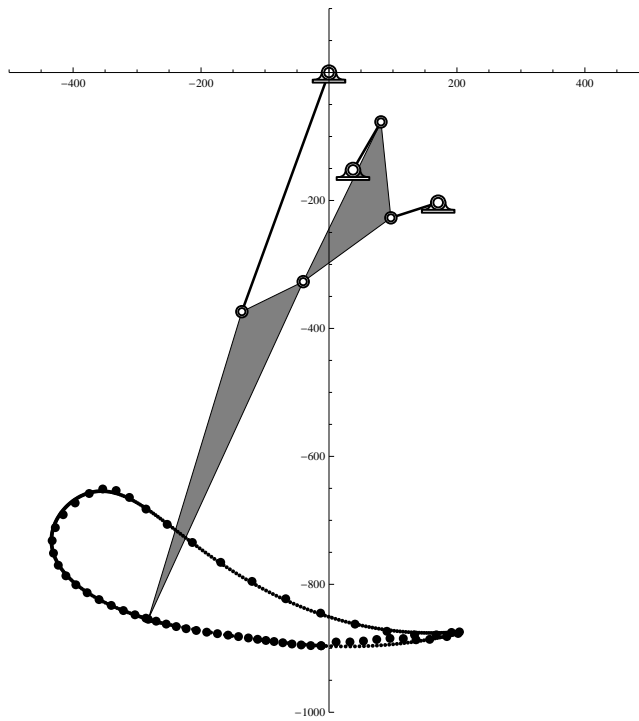
7.2.

The 6 linkages solutions that were all found from the same starting linkage for each of the *Mathematica* functions. This starting linkage is shown in Figure 6.2 and table 6.2.

The starting linkage solution follows the trajectory closely, however, there is a point during the trajectory where the knee hyper-extends, as shown in Figure 6.2(a). The optimized linkage solution also has a coupler point that follows a trajectory that closely matches the desired gait trajectory, as shown in Figure 7.4. However, Figure 7.4(b) shows that there is still a point in which the knee joint slightly hyper extends; this hyperextension has been reduced from the starting linkage. Additional optimization methods are required to get a more desirable linkage solution.



(a) Linkage solution at the first precision point



(b) Linkage with a slightly hyper-extended knee joint

Figure 7.4: Optimized Stephenson III linkage solution

7.6 Design Refinement

The approach to further optimize the walking linkage, and potentially gain additional results, was to randomly adjust the linkage parameters from the original starting linkage about a tolerance zone. These would then become an additional set of starting positions to be utilized in the same approximation procedure; the entire process can be repeated to achieve additional starting points. For this case, the tolerance was set to 10mm and it was repeated 50 times. These randomized starting points are listed in table in appendix B.1. Unlike the original starting linkage, a given adjusted starting linkage didn't necessarily converge to the same solution for the various Mathematica optimization functions. The values of the errors after minimization for each of the Mathematica optimization algorithms is listed in appendix B.2. The number in the far left column of this table corresponds with the number of the far left column of table in B.1. It can then be concluded that for a given starting linkage, the six different optimization functions often do not all converge to the same solution. Therefore, by repeating the minimization process for all of the Mathematica optimization algorithms, there is potential to achieve different linkage solutions.

7.7 Evaluating Solutions

A total of 300 linkage candidates were collected after completing the minimization for the six different optimization methods for all 50 starting adjusted starting linkages. This array could then be reduced by a number of various criteria. First the solutions that had a corresponding error value greater than 3 were eliminated. Then solutions that had its sum of all of its linkages greater than 3000 were also eliminated. Lastly, linkage candidates that had a branching defect were removed.

A total of 12 linkage solutions were selected and are listed in table 7.3; the values for **B** and

Table 7.3: The Linkage Parameters for the 12 Selected Solutions

A	C	D	G	H
163.867,-204.501	34.364, -150.757	102.567, -167.974	-25.404, -91.510	121.762, -333.813
163.894, -206.151	41.093, -154.628	100.387, -163.64	-29.575, -92.358	130.097, -339.749
164.165, -199.499	31.322, 151.301	101.142, -158.771	-32.338, 102.876	131.777, -329.635
167.299, 206.471	37.485, -159.145	105.928, -164.974	-25.165, -112.708	123.356, -323.980
167.793, -203.646	29.438, -149.26	100.678, -169.126	-42.453, -99.616	114.929, -334.485
169.657, -203.65	30.750, -161.169	102.265, -159.392	-43.756, 106.34	124.556, -326.201
169.762, -199.221	40.278, -153.947	106.408, -157.849	-25.515, -113.31	129.371, -338.854
171.019, -205.233	41.427, -160.012	102.81, -158.957	-38.401, -113.051	124.385, -338.153
172.986, -210.229	33.723, -160.14	104.784, -171.743	-41.301, -93.856	123.379, -328.012
173.245, -204.125	44.171, -160.862	100.898, -161.227	-39.407, -103.966	122.841, -339.258

F converged to (0,0) and (38.571, -396.0) for all of the linkage solutions. These linkages are plotted in B.3. The most optimal solution with the desired trajectory and knee trajectory is shown in B.1. All 12 of these linkage solutions were found using the QuasiNewton algorithm and when they are compared to each other, they can be considered to be in the same cluster. Linkages are in the same cluster if they norm of the differences of each of their link coordinates is less than a specified value. The linkages shown in B.2 and B.12 have the greatest variance, with the norm of their differences equal to 54.341.

7.8 Design Refinement

The approach to further optimize the walking linkage, and potentially gain additional results, was to randomly adjust the linkage parameters from the original starting linkage about a tolerance zone. These would then become an additional set of starting positions to be utilized in the same approximation procedure; the entire process can be repeated to achieve additional starting points. For this case, the tolerance was set to 10mm and it was repeated 50 times. These randomized starting linkages are listed in table in appendix B.1. The values of the errors after minimization for each of the Mathematica optimization algorithms is listed in appendix B.2. The number in the far left column of this table corresponds with the number of the far left column of table in B.1. It can then be concluded that for a given

starting linkage, the six different optimization functions often do not all converge to the same solution. Therefore, by repeating the minimization process for all of the Mathematica optimization algorithms, there is potential to achieve different linkage solutions.

7.9 Design for Each Trajectory

The same algorithm was applied to 22 other ankle trajectories that were gathered from the motion capture data. The result, for 22 trajectories was a total of 136 linkage solutions, for a total of 148 linkage solutions for all 23 trajectories. All of the linkages were compared to the linkage solution B.11, by taking the norm of the differences of the joint coordinates, in order to measure variance. The linkage with the highest variance had this value be 100.4mm. Even at this value, the linkage appeared to have a similar overall geometry. This is an indication, that for the ankle trajectory, the homotopy directed optimization algorithm results in generally the same linkage solution.

7.10 Summary

In this chapter we find that gradient optimization is limited by the initial population and that global optimization using differential evolution did not yield useful designs. Therefore we combine our homotopy solutions to the synthesis equations with gradient based optimization to form homotopy directed optimization. Combined with a design refinement process that searches within tolerance zones around the joint coordinates, we obtain 148 linkage solutions that meet the objective function. We find that all 148 linkage have joint coordinates within an average of 40mm.

Chapter 8

UCI Gait Mechanism

8.1 Introduction

In the previous chapter, we obtained a six-bar linkage that provides the desired ankle trajectory. To complete the gait mechanism, we design a cam-driven parallelogram linkage to control the foot orientation. The combined mechanism is called the UCI Gait mechanism.

8.2 Cam Mechanism for Foot Orientation Angle

The next component of the walking exoskeleton device is the linkage used to manipulate the orientation angle of the foot. The mechanism used to move the foot angle utilizes a combination of parallelogram linkages, a slider crank linkage that is driven by a cam. The parallelogram linkage is utilized in order to rotate the foot without affecting the six-bar linkage that is guiding the position of the ankle. The slider crank is used to change the angle of the parallelogram linkage. A diagram of these components is shown in Figure 8.1. A parallelogram linkage and slider crank mechanism attached to the points \mathbf{B} , \mathbf{F} , and \mathbf{P} of

the six bar linkage.

The slider crank is defined by the dimensions l_1 and l_2 and the angles $\alpha_1, \alpha_2, \alpha_3$ and α_4 , as shown in Figure 8.1. Since the angle of the foot, relative to the x -axis ranges from -79.84° to 15.36° , the offset angle α_3 is set to 18° . This is done in order to ensure that the joint connecting the links l_1 and l_2 does not pass through the slider axis, preventing a singularity.

A cam is used to actuate the linkage by moving the slider back and forth. The slider will then achieve the function of changing $s(\alpha_1)$. The values of α_1 are derived from the motion capture data. The loop equations for the slider crank define the angles α_2 and α_4 [55] as,

$$\alpha_2 = \arcsin\left(\frac{\sin(\alpha_3 - \alpha_1)l_1}{l_2}\right), \quad \alpha_4 = 360 - (\alpha_3 - \alpha_1) - \alpha_2. \quad (8.1)$$

The value for $s(\alpha_1)$ is given by the equation

$$s(\alpha_1) = \frac{l_1 \sin \alpha_4}{\sin \alpha_2}. \quad (8.2)$$

The choice of a $r_f = 10mm$ as the roller-follower radius, and displacement function $s(\alpha_1)$ yields the cam profile, [95]. The profile $\mathbf{R}(\alpha_1)$ of the cam was computed using the following equations,

$$\mathbf{R}(\alpha_1) = \begin{Bmatrix} s(\alpha_1) - r_f \cos \phi \\ r_f \sin \phi \end{Bmatrix}, \quad (8.3)$$

where the pressure angle ϕ is given by

$$\phi = \arctan\left[\frac{(ds(\alpha_1)/d\alpha_1)}{s(\alpha_1)}\right]. \quad (8.4)$$

The calculated cam profile is shown in Figure 8.2. The six-bar linkage that controls the

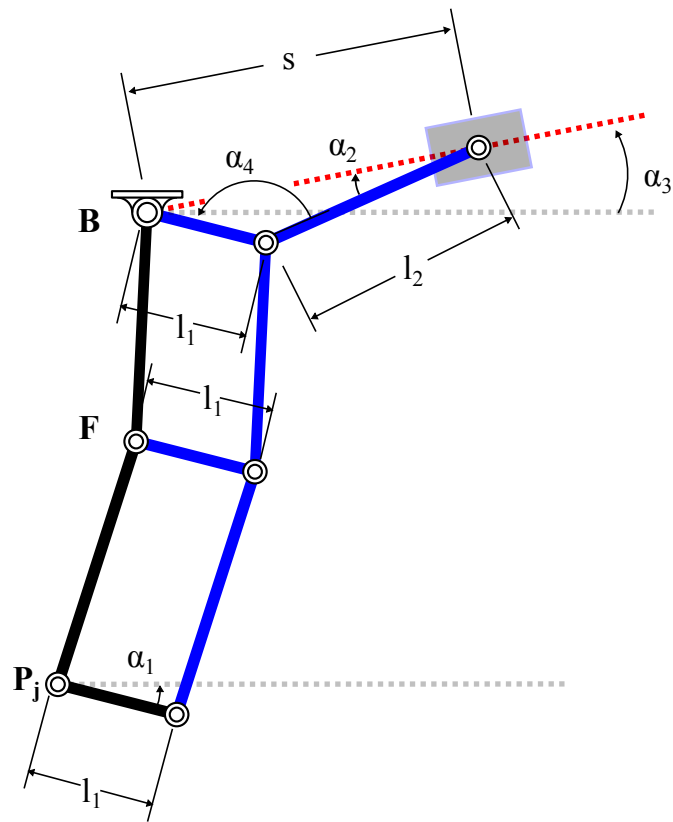


Figure 8.1: The foot orientation is controlled by a cam-driven parallelogram linkage.

ankle trajectory with the cam-driven parallelogram linkages for the foot orientation is shown in Figure 8.3.

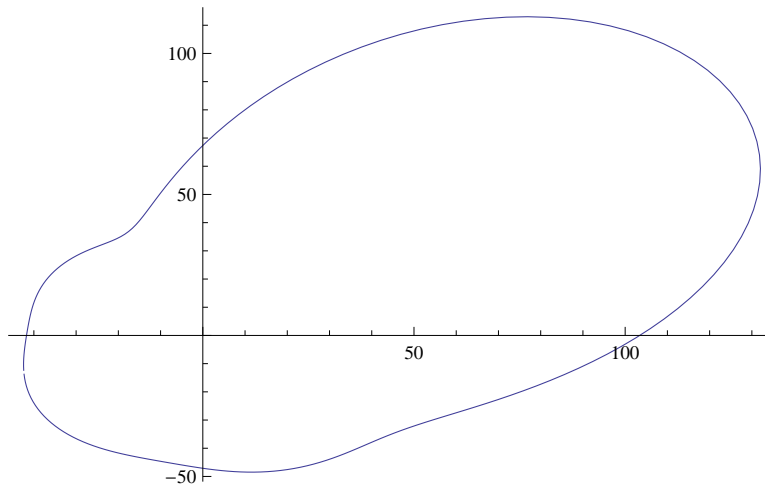


Figure 8.2: Cam Profile used to Actuate the Slider Crank Mechanism

8.3 Solid Model of the UCI Gait Mechanism

Figure 8.4 shows the rendered solid model of the UCI Gait Mechanism with a mounted attachment for use on a treadmill. The trunk of the user is supported by the wall-mounted parallelogram linkage. The six-bar linkage components are blue in color and the cam mechanism and parallelogram, foot orientation, linkage is colored in red. Figure 8.5 illustrates how the upper components of the device houses the slider crank cam mechanism and how the rotation of the input link of the six-bar linkage and cam are coupled by a belt. Figure 8.6 shows how the parallelogram mechanism ultimately moves the foot, by attaching to the six-bar linkage.

The black brackets that are attached to the linkage the attachment points that secure the user's leg to the mechanism. The brackets secure rigidly to the links six-bar mechanism; these brackets have slotted holes so that straps can be threaded through. The straps are

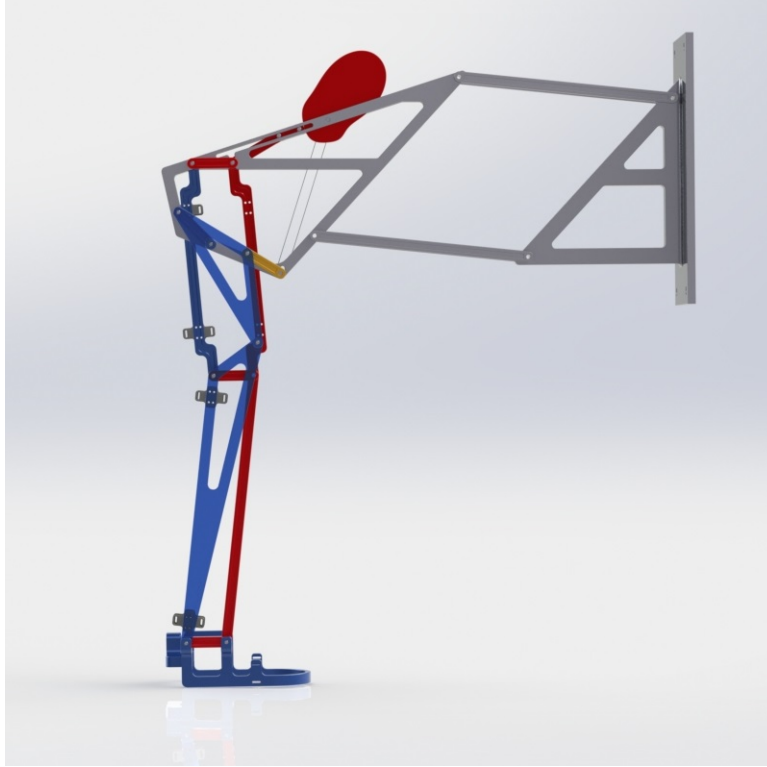


Figure 8.3: Assembly of the six-bar linkage that guides the ankle trajectory with the cam-driven parallelogram linkage that controls the foot orientation.

intended to secure the user's leg to the linkage. Lastly, figure 8.7 shows the foot bracket that also has slotted holes for straps to fix the foot to the device.

8.4 Adjustment for Variations in Trajectories

The similarity of the linkage designs for each of the 23 trajectories led to the seeking of an adjustment to the six-bar linkage that will cover the variation in trajectories. The adjustment to the coordinates of the joint **A** and the input link **AB** that allows the ankle trajectory to vary between the extremes is shown in Figure 8.8 and listed in Table 8.1.

The result is an adjustment to the fixed pivot, **A**, and the driving link, **AB**, that allows variation of the ankle trajectory through the 23 trajectories obtained from the motion capture

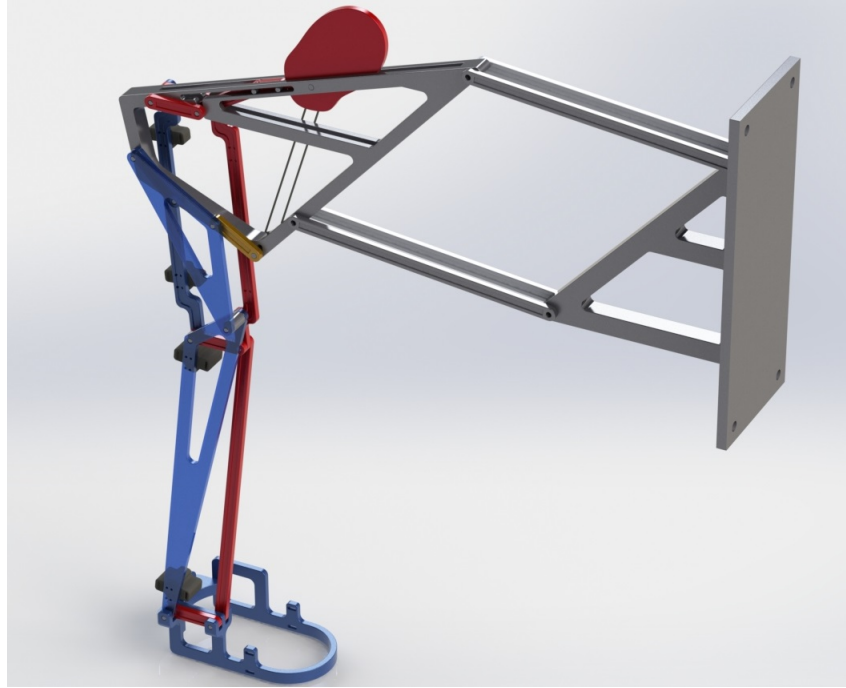


Figure 8.4: Solid Model of the UCI Gait Mechanism



Figure 8.5: Slider-crank mechanism that is actuated by a cam.

Table 8.1: Coordinates and link lengths of the adjustable drive link **AB** and pivot **A**.

Joint	Coordinates	Link Length
$\mathbf{A}_{\text{design}}$	(163.9, -204.5)	71.4mm
$\mathbf{A}_{\text{upper}}$	(167.9, -198.5)	72.1mm
$\mathbf{A}_{\text{lower}}$	(167.9, -194.5)	70.5mm



Figure 8.6: The parallelogram mechanism attaches to the six-bar linkage in order to control the foot orientation angle.

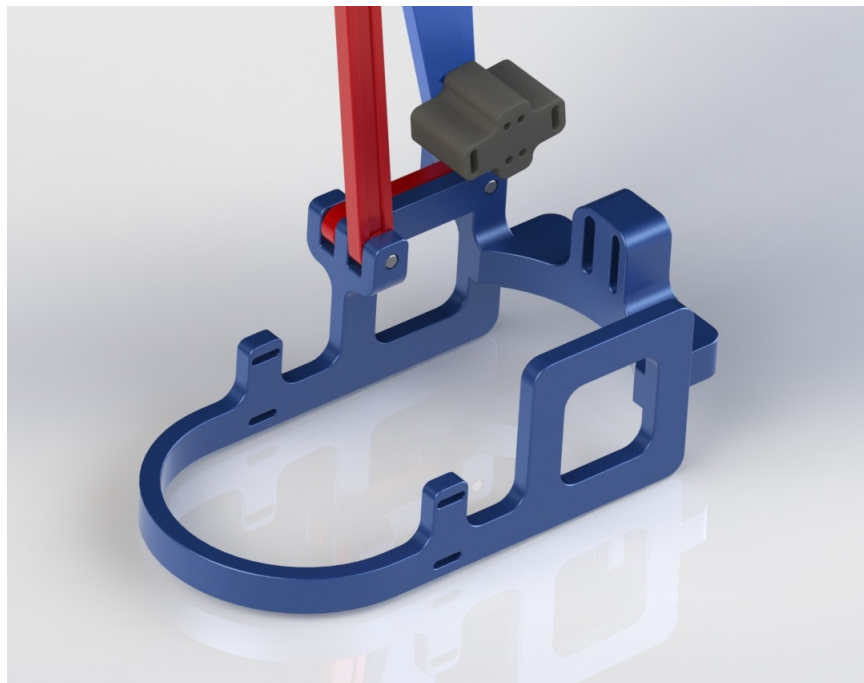
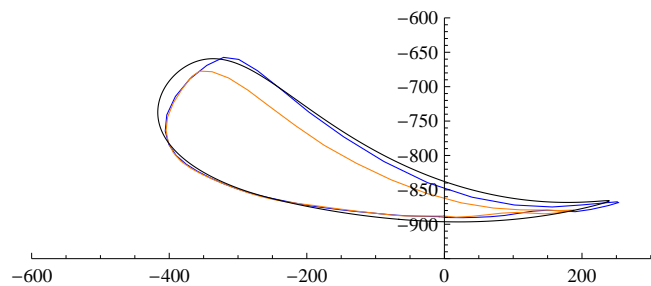
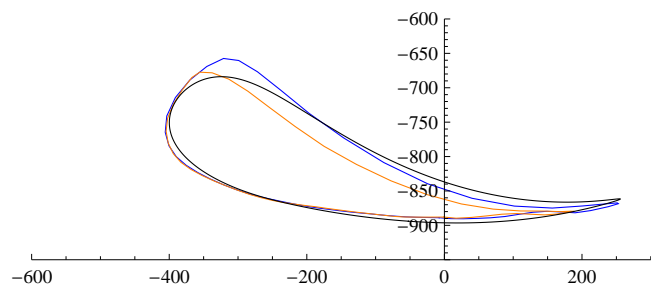


Figure 8.7: Foot bracket with slotted holes for straps that will secure the user's foot in place.



(a) Six-bar linkage trajectory (black) near upper ankle trajectory (blue).



(b) Six-bar linkage trajectory (black) near the lower ankle (orange).

Figure 8.8: An adjustment to joint \mathbf{A} introduces a variation of the ankle trajectory between two extremes, shown in blue and orange.

data.

8.5 Summary

UCI Gait Mechanism combines a six-bar linkage that traces a natural ankle trajectory with a cam-driven parallelogram linkage to control foot orientation. The similarity between linkages obtain for the 23 ankle trajectories led to the introduction of an adjustment of on base joint and crank angle. The result is a versatile mechanism for lower leg rehabilitation.

Chapter 9

Conclusion

This dissertation presented a linkage synthesis method that was intended to be used in treadmill training for rehabilitation. As a result of the final procedure being developed, additional linkage synthesis procedures were achieved. The first method was hybrid task position optimization. This was a motion generation method that consisted of constraining a 3R chain with two four-bar linkage to yield a six-bar, Watt I linkage. The four-bar linkages were found using approximation methods with randomization of task positions about small tolerance zone. The second method that was developed utilized path synthesis for a Stephenson III six-bar linkage. This procedure constrained a 2R chain with a four-bar linkage module; the four-bar linkage was solved using the 9 point path method and the homotopy solver, Bertini. This particular method was applied to an ankle trajectory. This trajectory was calculated using basis spline methods. The concept of using a four-bar linkage module can be extended to the 3R chain. Constraining the 3R chain with two four-bar linkages with path synthesis resulted in a 10 bar linkage. The resulting linkage matched a desired lower limb motion, but the overall linkage geometry was not desirable.

The design of a leg rehabilitation system imposes strict constraints on the ankle trajectory;

inverse kinematics defines the knee and hip trajectories. Four-bar and six-bar path synthesis do not provide the necessary resolution needed to control the ankle trajectory. Existing global optimization techniques rely on a random initial population and did not yield feasible designs. Homotopy directed optimization selects initial linkage designs that solve the synthesis equations and uses gradient optimization with design refinement to obtain feasible designs. Applying the design process to all 23 trajectories yielded 148 feasible designs clustered within 40mm per joint dimension. This provided the opportunity to introduce an adjustment to achieve a range of natural ankle trajectories.

9.1 Future Work

This mechanism has some interesting features. Rather than use the input crank to drive the user's leg, it may be possible to drive the system in reverse so the rotating link provides a resistance or used to drive a wheel chair, for example. The next step is to build and test the device.

If people have essential the same leg proportions and similar leg trajectories, we are confident that the design process will yield an effective gait mechanism adapted for individuals. It may be possible to simply scale one device to different users. However, this needs further study.

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Appendix A

Ankle Trajectory Data

Table A.1: Joint coordinates collected from motion capture (in mm).

Hip	Knee	Ankle	Toe
(0., 0.)	(43.814, -402.885)	(-7.431, -896.047)	(171.885, -883.947)
(0., 0.)	(41.836, -403.42)	(-12.321, -896.014)	(167.107, -884.926)
(0., 0.)	(39.848, -403.828)	(-17.093, -896.008)	(162.477, -885.852)
(0., 0.)	(37.874, -404.207)	(-21.771, -895.973)	(157.926, -886.638)
(0., 0.)	(35.93, -404.621)	(-26.368, -895.858)	(153.443, -887.325)
(0., 0.)	(34.029, -405.09)	(-30.873, -895.662)	(149.016, -887.902)
(0., 0.)	(32.192, -405.563)	(-35.266, -895.417)	(144.72, -888.393)
(0., 0.)	(30.45, -405.963)	(-39.538, -895.123)	(140.583, -888.854)
(0., 0.)	(28.803, -406.234)	(-43.708, -894.777)	(136.557, -889.32)
(0., 0.)	(27.234, -406.409)	(-47.84, -894.403)	(132.534, -889.641)
(0., 0.)	(25.739, -406.582)	(-51.985, -893.989)	(128.399, -889.672)
(0., 0.)	(24.309, -406.805)	(-56.129, -893.507)	(124.19, -889.55)
(0., 0.)	(22.939, -407.042)	(-60.251, -892.957)	(120.067, -889.571)
(0., 0.)	(21.618, -407.22)	(-64.38, -892.371)	(116.043, -889.763)
(0., 0.)	(20.337, -407.334)	(-68.529, -891.802)	(112.038, -889.937)
(0., 0.)	(19.056, -407.411)	(-72.659, -891.267)	(108.006, -889.953)

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Hip	Knee	Ankle	Toe
(0., 0.)	(17.736, -407.466)	(-76.718, -890.712)	(103.952, -889.819)
(0., 0.)	(16.358, -407.481)	(-80.658, -890.122)	(99.964, -889.651)
(0., 0.)	(14.932, -407.434)	(-84.478, -889.571)	(96.127, -889.554)
(0., 0.)	(13.466, -407.345)	(-88.215, -889.108)	(92.403, -889.472)
(0., 0.)	(11.952, -407.254)	(-91.9, -888.677)	(88.701, -889.297)
(0., 0.)	(10.372, -407.197)	(-95.538, -888.199)	(84.998, -889.049)
(0., 0.)	(8.715, -407.174)	(-99.151, -887.657)	(81.322, -888.831)
(0., 0.)	(6.97, -407.165)	(-102.777, -887.113)	(77.64, -888.654)
(0., 0.)	(5.133, -407.148)	(-106.47, -886.61)	(73.896, -888.49)
(0., 0.)	(3.213, -407.092)	(-110.294, -886.104)	(70.045, -888.301)
(0., 0.)	(1.238, -406.987)	(-114.261, -885.555)	(66.033, -888.022)
(0., 0.)	(-0.742, -406.861)	(-118.349, -884.97)	(61.87, -887.632)
(0., 0.)	(-2.701, -406.757)	(-122.555, -884.347)	(57.629, -887.226)
(0., 0.)	(-4.642, -406.671)	(-126.863, -883.704)	(53.348, -886.884)
(0., 0.)	(-6.586, -406.568)	(-131.249, -883.083)	(48.984, -886.567)
(0., 0.)	(-8.549, -406.401)	(-135.716, -882.476)	(44.484, -886.167)
(0., 0.)	(-10.509, -406.154)	(-140.252, -881.862)	(39.875, -885.681)
(0., 0.)	(-12.436, -405.871)	(-144.839, -881.222)	(35.245, -885.222)
(0., 0.)	(-14.314, -405.617)	(-149.483, -880.558)	(30.625, -884.832)
(0., 0.)	(-16.147, -405.384)	(-154.188, -879.895)	(25.934, -884.431)
(0., 0.)	(-17.944, -405.123)	(-158.944, -879.233)	(21.144, -884.01)
(0., 0.)	(-19.702, -404.812)	(-163.717, -878.57)	(16.313, -883.622)
(0., 0.)	(-21.418, -404.466)	(-168.499, -877.906)	(11.458, -883.242)
(0., 0.)	(-23.122, -404.084)	(-173.306, -877.251)	(6.578, -882.814)
(0., 0.)	(-24.882, -403.661)	(-178.141, -876.612)	(1.691, -882.326)
(0., 0.)	(-26.737, -403.206)	(-182.988, -875.963)	(-3.179, -881.819)
(0., 0.)	(-28.684, -402.717)	(-187.814, -875.292)	(-8.008, -881.379)
(0., 0.)	(-30.72, -402.159)	(-192.602, -874.588)	(-12.788, -881.012)
(0., 0.)	(-32.851, -401.493)	(-197.346, -873.84)	(-17.571, -880.613)
(0., 0.)	(-35.033, -400.736)	(-202.045, -873.044)	(-22.394, -880.129)

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Hip	Knee	Ankle	Toe
(0., 0.)	(-37.19, -399.977)	(-206.69, -872.25)	(-27.196, -879.649)
(0., 0.)	(-39.287, -399.296)	(-211.29, -871.469)	(-31.909, -879.27)
(0., 0.)	(-41.336, -398.751)	(-215.854, -870.691)	(-36.541, -878.995)
(0., 0.)	(-43.356, -398.364)	(-220.392, -869.886)	(-41.148, -878.756)
(0., 0.)	(-45.359, -398.081)	(-224.878, -869.025)	(-45.762, -878.485)
(0., 0.)	(-47.349, -397.811)	(-229.318, -868.095)	(-50.361, -878.217)
(0., 0.)	(-49.306, -397.508)	(-233.758, -867.136)	(-54.928, -878.024)
(0., 0.)	(-51.214, -397.179)	(-238.228, -866.167)	(-59.513, -877.883)
(0., 0.)	(-53.068, -396.866)	(-242.713, -865.145)	(-64.174, -877.735)
(0., 0.)	(-54.853, -396.589)	(-247.206, -864.051)	(-68.931, -877.568)
(0., 0.)	(-56.522, -396.34)	(-251.73, -862.876)	(-73.757, -877.398)
(0., 0.)	(-58.046, -396.096)	(-256.267, -861.632)	(-78.587, -877.258)
(0., 0.)	(-59.421, -395.841)	(-260.791, -860.344)	(-83.383, -877.172)
(0., 0.)	(-60.664, -395.582)	(-265.318, -859.027)	(-88.176, -877.142)
(0., 0.)	(-61.811, -395.311)	(-269.854, -857.703)	(-93.01, -877.163)
(0., 0.)	(-62.921, -395.006)	(-274.409, -856.358)	(-97.928, -877.223)
(0., 0.)	(-64.021, -394.66)	(-279.005, -854.997)	(-102.937, -877.339)
(0., 0.)	(-65.128, -394.276)	(-283.649, -853.671)	(-108.007, -877.542)
(0., 0.)	(-66.253, -393.874)	(-288.35, -852.347)	(-113.148, -877.813)
(0., 0.)	(-67.427, -393.497)	(-293.155, -850.92)	(-118.432, -878.078)
(0., 0.)	(-68.661, -393.173)	(-298.111, -849.351)	(-123.9, -878.269)
(0., 0.)	(-69.918, -392.85)	(-303.182, -847.662)	(-129.515, -878.39)
(0., 0.)	(-71.157, -392.454)	(-308.309, -845.905)	(-135.228, -878.525)
(0., 0.)	(-72.355, -392.)	(-313.491, -844.06)	(-141.066, -878.661)
(0., 0.)	(-73.509, -391.56)	(-318.775, -842.077)	(-147.074, -878.746)
(0., 0.)	(-74.631, -391.13)	(-324.147, -839.916)	(-153.247, -878.807)
(0., 0.)	(-75.762, -390.659)	(-329.572, -837.624)	(-159.566, -878.891)
(0., 0.)	(-76.952, -390.111)	(-335.043, -835.294)	(-166.044, -878.987)
(0., 0.)	(-78.21, -389.488)	(-340.546, -832.912)	(-172.657, -879.103)
(0., 0.)	(-79.468, -388.84)	(-346.063, -830.424)	(-179.348, -879.293)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-80.629, -388.202)	(-351.578, -827.811)	(-186.103, -879.527)
(0., 0.)	(-81.622, -387.616)	(-357.064, -825.104)	(-192.922, -879.714)
(0., 0.)	(-82.403, -387.112)	(-362.506, -822.304)	(-199.748, -879.811)
(0., 0.)	(-82.978, -386.676)	(-367.898, -819.355)	(-206.551, -879.826)
(0., 0.)	(-83.375, -386.298)	(-373.228, -816.187)	(-213.378, -879.778)
(0., 0.)	(-83.608, -385.973)	(-378.499, -812.841)	(-220.288, -879.711)
(0., 0.)	(-83.675, -385.66)	(-383.708, -809.397)	(-227.271, -879.65)
(0., 0.)	(-83.582, -385.313)	(-388.832, -805.843)	(-234.261, -879.568)
(0., 0.)	(-83.316, -384.936)	(-393.825, -802.182)	(-241.198, -879.454)
(0., 0.)	(-82.864, -384.57)	(-398.653, -798.413)	(-248.099, -879.301)
(0., 0.)	(-82.198, -384.29)	(-403.294, -794.511)	(-254.942, -879.096)
(0., 0.)	(-81.271, -384.142)	(-407.72, -790.433)	(-261.647, -878.767)
(0., 0.)	(-80.016, -384.099)	(-411.844, -786.151)	(-268.129, -878.333)
(0., 0.)	(-78.399, -384.126)	(-415.635, -781.648)	(-274.433, -877.752)
(0., 0.)	(-76.418, -384.227)	(-419.11, -776.914)	(-280.64, -876.914)
(0., 0.)	(-74.141, -384.383)	(-422.25, -771.926)	(-286.711, -875.838)
(0., 0.)	(-71.657, -384.554)	(-425.022, -766.693)	(-292.553, -874.589)
(0., 0.)	(-68.996, -384.748)	(-427.417, -761.275)	(-298.135, -873.196)
(0., 0.)	(-66.152, -385.014)	(-429.426, -755.762)	(-303.511, -871.698)
(0., 0.)	(-63.131, -385.379)	(-431.02, -750.22)	(-308.744, -870.133)
(0., 0.)	(-59.941, -385.83)	(-432.153, -744.68)	(-313.822, -868.556)
(0., 0.)	(-56.564, -386.337)	(-432.791, -739.092)	(-318.663, -866.972)
(0., 0.)	(-52.974, -386.874)	(-432.902, -733.399)	(-323.166, -865.267)
(0., 0.)	(-49.161, -387.43)	(-432.433, -727.614)	(-327.228, -863.391)
(0., 0.)	(-45.135, -387.996)	(-431.343, -721.77)	(-330.822, -861.401)
(0., 0.)	(-40.846, -388.584)	(-429.609, -715.879)	(-334.014, -859.278)
(0., 0.)	(-36.19, -389.222)	(-427.251, -709.939)	(-336.827, -857.049)
(0., 0.)	(-31.132, -389.892)	(-424.31, -704.014)	(-339.221, -854.701)
(0., 0.)	(-25.737, -390.491)	(-420.787, -698.183)	(-341.141, -852.239)
(0., 0.)	(-20.104, -390.896)	(-416.652, -692.464)	(-342.523, -849.681)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-14.278, -391.104)	(-411.928, -686.871)	(-343.327, -847.07)
(0., 0.)	(-8.211, -391.238)	(-406.702, -681.44)	(-343.632, -844.488)
(0., 0.)	(-1.826, -391.453)	(-401.071, -676.254)	(-343.557, -841.992)
(0., 0.)	(4.857, -391.754)	(-395.099, -671.367)	(-343.132, -839.613)
(0., 0.)	(11.676, -391.961)	(-388.853, -666.759)	(-342.401, -837.373)
(0., 0.)	(18.525, -391.904)	(-382.43, -662.451)	(-341.372, -835.189)
(0., 0.)	(25.404, -391.537)	(-375.971, -658.579)	(-339.739, -832.873)
(0., 0.)	(32.283, -390.906)	(-369.654, -655.348)	(-336.823, -830.512)
(0., 0.)	(39.036, -390.068)	(-363.552, -652.925)	(-332.084, -828.452)
(0., 0.)	(45.524, -389.111)	(-357.604, -651.392)	(-325.286, -826.895)
(0., 0.)	(51.708, -388.129)	(-351.674, -650.712)	(-316.546, -825.88)
(0., 0.)	(57.691, -387.131)	(-345.651, -650.788)	(-306.3, -825.286)
(0., 0.)	(63.597, -386.082)	(-339.565, -651.558)	(-295.051, -824.953)
(0., 0.)	(69.48, -384.97)	(-333.535, -653.011)	(-283.114, -824.842)
(0., 0.)	(75.331, -383.801)	(-327.636, -655.17)	(-270.589, -824.911)
(0., 0.)	(81.112, -382.567)	(-321.81, -658.052)	(-257.521, -825.064)
(0., 0.)	(86.77, -381.261)	(-315.87, -661.613)	(-243.954, -825.339)
(0., 0.)	(92.268, -379.913)	(-309.562, -665.783)	(-229.979, -825.758)
(0., 0.)	(97.595, -378.532)	(-302.672, -670.534)	(-215.74, -826.453)
(0., 0.)	(102.738, -377.121)	(-295.1, -675.865)	(-201.394, -827.704)
(0., 0.)	(107.658, -375.693)	(-286.862, -681.752)	(-187.024, -829.654)
(0., 0.)	(112.328, -374.299)	(-278.045, -688.138)	(-172.538, -832.17)
(0., 0.)	(116.773, -373.006)	(-268.701, -694.928)	(-157.744, -834.998)
(0., 0.)	(121.017, -371.812)	(-258.804, -702.058)	(-142.477, -837.956)
(0., 0.)	(125.062, -370.691)	(-248.327, -709.541)	(-126.629, -840.933)
(0., 0.)	(128.905, -369.65)	(-237.311, -717.4)	(-110.229, -843.838)
(0., 0.)	(132.534, -368.693)	(-225.851, -725.642)	(-93.384, -846.608)
(0., 0.)	(135.923, -367.805)	(-214.027, -734.253)	(-76.275, -849.263)
(0., 0.)	(139.113, -367.023)	(-201.83, -743.162)	(-59.08, -851.943)
(0., 0.)	(142.18, -366.412)	(-189.207, -752.202)	(-41.881, -854.785)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(145.047, -365.889)	(-176.133, -761.168)	(-24.699, -857.76)
(0., 0.)	(147.486, -365.233)	(-162.646, -769.966)	(-7.508, -860.643)
(0., 0.)	(149.441, -364.458)	(-148.794, -778.627)	(9.801, -863.152)
(0., 0.)	(151.019, -363.756)	(-134.615, -787.196)	(27.3, -865.138)
(0., 0.)	(152.319, -363.264)	(-120.115, -795.619)	(45.023, -866.71)
(0., 0.)	(153.376, -362.995)	(-105.28, -803.807)	(62.85, -868.05)
(0., 0.)	(154.192, -362.933)	(-90.128, -811.704)	(80.551, -869.282)
(0., 0.)	(154.784, -363.105)	(-74.75, -819.276)	(98.04, -870.442)
(0., 0.)	(155.182, -363.512)	(-59.231, -826.472)	(115.344, -871.477)
(0., 0.)	(155.381, -364.075)	(-43.587, -833.264)	(132.554, -872.36)
(0., 0.)	(155.267, -364.644)	(-27.841, -839.61)	(149.728, -873.093)
(0., 0.)	(154.682, -365.081)	(-12.065, -845.494)	(166.747, -873.479)
(0., 0.)	(153.642, -365.486)	(3.649, -850.923)	(183.444, -873.338)
(0., 0.)	(152.381, -366.168)	(19.221, -855.942)	(199.78, -872.762)
(0., 0.)	(151.047, -367.214)	(34.56, -860.565)	(215.716, -871.854)
(0., 0.)	(149.616, -368.456)	(49.6, -864.699)	(231.095, -870.533)
(0., 0.)	(148.024, -369.724)	(64.272, -868.242)	(245.877, -868.826)
(0., 0.)	(146.31, -370.947)	(78.495, -871.234)	(260.074, -866.902)
(0., 0.)	(144.589, -372.044)	(92.227, -873.802)	(273.631, -864.847)
(0., 0.)	(142.933, -372.922)	(105.427, -875.999)	(286.455, -862.813)
(0., 0.)	(141.34, -373.613)	(117.961, -877.691)	(298.534, -860.967)
(0., 0.)	(139.748, -374.23)	(129.762, -878.852)	(309.834, -859.42)
(0., 0.)	(138.109, -374.787)	(140.828, -879.539)	(320.342, -858.23)
(0., 0.)	(136.432, -375.208)	(151.157, -879.788)	(330.158, -857.354)
(0., 0.)	(134.742, -375.408)	(160.712, -879.576)	(339.35, -856.771)
(0., 0.)	(133.021, -375.346)	(169.42, -878.904)	(347.885, -856.421)
(0., 0.)	(131.231, -375.028)	(177.207, -877.838)	(355.611, -855.851)
(0., 0.)	(129.377, -374.484)	(184.05, -876.588)	(362.296, -854.271)
(0., 0.)	(127.522, -373.754)	(189.976, -875.453)	(367.774, -851.298)
(0., 0.)	(125.751, -372.951)	(195.029, -874.681)	(372.061, -847.148)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(124.121, -372.226)	(199.21, -874.341)	(375.253, -842.342)
(0., 0.)	(122.627, -371.719)	(202.411, -874.298)	(377.35, -837.616)
(0., 0.)	(121.198, -371.513)	(204.472, -874.401)	(378.286, -833.706)
(0., 0.)	(119.794, -371.602)	(205.258, -874.674)	(378.079, -831.015)
(0., 0.)	(118.485, -371.895)	(204.693, -875.315)	(376.758, -829.657)
(0., 0.)	(117.414, -372.297)	(202.774, -876.432)	(374.283, -829.644)
(0., 0.)	(116.636, -372.741)	(199.502, -877.85)	(370.695, -830.817)
(0., 0.)	(116.063, -373.21)	(194.929, -879.326)	(366.111, -832.848)
(0., 0.)	(115.53, -373.739)	(189.191, -880.717)	(360.627, -835.254)
(0., 0.)	(114.87, -374.416)	(182.469, -882.034)	(354.296, -837.583)
(0., 0.)	(113.935, -375.339)	(174.926, -883.345)	(347.208, -839.733)
(0., 0.)	(112.611, -376.515)	(166.857, -884.649)	(339.614, -841.847)
(0., 0.)	(110.835, -377.881)	(158.836, -885.839)	(332.133, -843.833)
(0., 0.)	(108.589, -379.378)	(151.514, -886.771)	(325.41, -845.307)
(0., 0.)	(105.892, -380.959)	(145.213, -887.271)	(319.586, -846.149)
(0., 0.)	(102.821, -382.522)	(139.696, -887.137)	(314.406, -846.825)
(0., 0.)	(99.51, -383.88)	(134.377, -886.432)	(309.497, -848.031)
(0., 0.)	(96.17, -384.896)	(128.835, -885.596)	(304.565, -849.997)
(0., 0.)	(93.018, -385.587)	(123.018, -885.042)	(299.357, -852.238)
(0., 0.)	(90.189, -386.052)	(117.062, -884.807)	(293.748, -854.125)
(0., 0.)	(87.745, -386.432)	(111.065, -884.674)	(287.877, -855.688)
(0., 0.)	(85.672, -386.88)	(105.07, -884.517)	(282.097, -857.501)
(0., 0.)	(83.836, -387.467)	(99.087, -884.416)	(276.487, -859.636)
(0., 0.)	(82.027, -388.178)	(93.113, -884.531)	(270.858, -861.759)
(0., 0.)	(80.137, -388.982)	(87.137, -884.915)	(265.115, -863.74)
(0., 0.)	(78.272, -389.866)	(81.156, -885.484)	(259.334, -865.73)
(0., 0.)	(76.602, -390.86)	(75.199, -886.149)	(253.632, -867.852)
(0., 0.)	(75.178, -391.979)	(69.259, -886.87)	(247.975, -869.976)
(0., 0.)	(73.916, -393.155)	(63.29, -887.589)	(242.274, -871.899)
(0., 0.)	(72.71, -394.284)	(57.295, -888.272)	(236.527, -873.666)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(71.435, -395.282)	(51.323, -888.925)	(230.728, -875.323)
(0., 0.)	(69.959, -396.137)	(45.333, -889.475)	(224.858, -876.811)
(0., 0.)	(68.193, -396.9)	(39.264, -889.86)	(218.891, -878.086)
(0., 0.)	(66.108, -397.607)	(33.094, -890.083)	(212.83, -879.196)
(0., 0.)	(63.742, -398.265)	(26.854, -890.193)	(206.692, -880.178)
(0., 0.)	(61.177, -398.878)	(20.593, -890.228)	(200.553, -881.111)
(0., 0.)	(58.501, -399.464)	(14.356, -890.206)	(194.479, -882.055)
(0., 0.)	(55.788, -400.02)	(8.172, -890.143)	(188.478, -882.966)
(0., 0.)	(53.088, -400.549)	(2.043, -890.055)	(182.535, -883.783)
(0., 0.)	(50.454, -401.051)	(-4.029, -889.955)	(176.62, -884.391)
(0., 0.)	(47.945, -401.526)	(-10.016, -889.841)	(170.74, -884.801)
(0., 0.)	(45.585, -401.987)	(-15.91, -889.691)	(164.964, -885.158)
(0., 0.)	(43.294, -402.425)	(-21.738, -889.513)	(159.257, -885.493)
(0., 0.)	(40.937, -402.814)	(-27.524, -889.339)	(153.511, -885.743)
(0., 0.)	(38.45, -403.184)	(-33.264, -889.194)	(147.795, -885.962)
(0., 0.)	(35.909, -403.601)	(-38.949, -889.065)	(142.205, -886.215)
(0., 0.)	(33.396, -404.064)	(-44.576, -888.938)	(136.673, -886.446)
(0., 0.)	(30.926, -404.501)	(-50.127, -888.821)	(131.172, -886.611)
(0., 0.)	(28.523, -404.844)	(-55.585, -888.714)	(125.804, -886.803)
(0., 0.)	(26.224, -405.104)	(-60.949, -888.598)	(120.592, -887.037)
(0., 0.)	(24.076, -405.314)	(-66.205, -888.424)	(115.441, -887.147)
(0., 0.)	(22.103, -405.48)	(-71.305, -888.166)	(110.293, -887.021)
(0., 0.)	(20.273, -405.601)	(-76.197, -887.823)	(105.268, -886.821)
(0., 0.)	(18.542, -405.678)	(-80.865, -887.411)	(100.588, -886.811)
(0., 0.)	(16.879, -405.705)	(-85.331, -886.96)	(96.211, -886.879)
(0., 0.)	(15.287, -405.711)	(-89.616, -886.497)	(92.002, -886.825)
(0., 0.)	(13.801, -405.728)	(-93.723, -886.038)	(87.95, -886.674)
(0., 0.)	(12.424, -405.766)	(-97.654, -885.592)	(84.082, -886.549)
(0., 0.)	(11.156, -405.815)	(-101.425, -885.172)	(80.338, -886.458)
(0., 0.)	(10.008, -405.846)	(-105.067, -884.787)	(76.666, -886.402)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(8.961, -405.837)	(-108.629, -884.421)	(73.092, -886.392)
(0., 0.)	(7.963, -405.818)	(-112.138, -884.043)	(69.596, -886.319)
(0., 0.)	(6.973, -405.827)	(-115.607, -883.618)	(66.099, -886.056)
(0., 0.)	(5.973, -405.854)	(-119.037, -883.138)	(62.614, -885.744)
(0., 0.)	(4.934, -405.842)	(-122.441, -882.605)	(59.19, -885.526)
(0., 0.)	(3.809, -405.762)	(-125.86, -882.04)	(55.775, -885.316)
(0., 0.)	(2.566, -405.623)	(-129.318, -881.476)	(52.294, -885.02)
(0., 0.)	(1.207, -405.467)	(-132.786, -880.949)	(48.784, -884.678)
(0., 0.)	(-0.246, -405.325)	(-136.237, -880.465)	(45.322, -884.334)
(0., 0.)	(-1.8, -405.177)	(-139.674, -879.978)	(41.882, -883.942)
(0., 0.)	(-3.485, -404.995)	(-143.105, -879.459)	(38.394, -883.513)
(0., 0.)	(-5.34, -404.781)	(-146.551, -878.925)	(34.853, -883.142)
(0., 0.)	(-7.368, -404.541)	(-150.024, -878.41)	(31.336, -882.856)
(0., 0.)	(-9.537, -404.285)	(-153.518, -877.928)	(27.851, -882.591)
(0., 0.)	(-11.814, -404.004)	(-157.022, -877.476)	(24.344, -882.25)
(0., 0.)	(-14.175, -403.687)	(-160.512, -877.048)	(20.847, -881.846)
(0., 0.)	(-16.581, -403.33)	(-163.966, -876.627)	(17.407, -881.459)
(0., 0.)	(-18.986, -402.917)	(-167.385, -876.19)	(13.976, -881.089)
(0., 0.)	(-21.34, -402.447)	(-170.787, -875.73)	(10.546, -880.754)
(0., 0.)	(-23.613, -401.937)	(-174.178, -875.265)	(7.141, -880.465)
(0., 0.)	(-25.768, -401.388)	(-177.565, -874.801)	(3.75, -880.16)
(0., 0.)	(-27.779, -400.801)	(-180.944, -874.324)	(0.364, -879.815)
(0., 0.)	(-29.639, -400.205)	(-184.313, -873.843)	(-3.011, -879.468)
(0., 0.)	(-31.36, -399.675)	(-187.68, -873.371)	(-6.39, -879.143)
(0., 0.)	(-32.947, -399.259)	(-191.058, -872.897)	(-9.821, -878.791)
(0., 0.)	(-34.397, -398.938)	(-194.473, -872.388)	(-13.304, -878.44)
(0., 0.)	(-35.726, -398.668)	(-197.938, -871.845)	(-16.81, -878.149)
(0., 0.)	(-36.987, -398.42)	(-201.479, -871.288)	(-20.398, -877.857)
(0., 0.)	(-38.249, -398.172)	(-205.113, -870.751)	(-24.103, -877.548)
(0., 0.)	(-39.538, -397.937)	(-208.825, -870.263)	(-27.878, -877.297)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-40.84, -397.734)	(-212.577, -869.815)	(-31.668, -877.152)
(0., 0.)	(-42.153, -397.564)	(-216.355, -869.38)	(-35.495, -877.059)
(0., 0.)	(-43.515, -397.402)	(-220.188, -868.92)	(-39.421, -876.947)
(0., 0.)	(-44.963, -397.206)	(-224.083, -868.401)	(-43.43, -876.854)
(0., 0.)	(-46.504, -396.951)	(-228.028, -867.813)	(-47.482, -876.818)
(0., 0.)	(-48.1, -396.661)	(-231.997, -867.175)	(-51.569, -876.799)
(0., 0.)	(-49.718, -396.392)	(-235.992, -866.486)	(-55.705, -876.776)
(0., 0.)	(-51.353, -396.142)	(-240.019, -865.729)	(-59.881, -876.788)
(0., 0.)	(-52.985, -395.88)	(-244.095, -864.882)	(-64.104, -876.857)
(0., 0.)	(-54.567, -395.605)	(-248.219, -863.98)	(-68.409, -876.927)
(0., 0.)	(-56.067, -395.364)	(-252.37, -863.066)	(-72.803, -876.988)
(0., 0.)	(-57.481, -395.176)	(-256.555, -862.125)	(-77.265, -877.111)
(0., 0.)	(-58.814, -394.995)	(-260.796, -861.167)	(-81.773, -877.348)
(0., 0.)	(-60.06, -394.794)	(-265.105, -860.179)	(-86.365, -877.622)
(0., 0.)	(-61.225, -394.603)	(-269.47, -859.122)	(-91.077, -877.859)
(0., 0.)	(-62.311, -394.422)	(-273.87, -857.982)	(-95.88, -878.062)
(0., 0.)	(-63.36, -394.247)	(-278.321, -856.744)	(-100.746, -878.261)
(0., 0.)	(-64.403, -394.063)	(-282.853, -855.404)	(-105.688, -878.477)
(0., 0.)	(-65.435, -393.834)	(-287.469, -853.991)	(-110.723, -878.715)
(0., 0.)	(-66.464, -393.546)	(-292.155, -852.526)	(-115.909, -878.96)
(0., 0.)	(-67.481, -393.225)	(-296.93, -850.986)	(-121.318, -879.178)
(0., 0.)	(-68.449, -392.88)	(-301.81, -849.286)	(-126.913, -879.356)
(0., 0.)	(-69.316, -392.526)	(-306.81, -847.403)	(-132.614, -879.49)
(0., 0.)	(-70.088, -392.182)	(-311.911, -845.393)	(-138.448, -879.64)
(0., 0.)	(-70.846, -391.85)	(-317.089, -843.306)	(-144.514, -879.874)
(0., 0.)	(-71.625, -391.516)	(-322.387, -841.172)	(-150.828, -880.178)
(0., 0.)	(-72.375, -391.146)	(-327.828, -838.956)	(-157.338, -880.478)
(0., 0.)	(-73.049, -390.743)	(-333.374, -836.589)	(-164., -880.765)
(0., 0.)	(-73.597, -390.333)	(-338.981, -834.07)	(-170.776, -881.06)
(0., 0.)	(-73.978, -389.923)	(-344.609, -831.446)	(-177.614, -881.35)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-74.17, -389.529)	(-350.206, -828.724)	(-184.51, -881.581)
(0., 0.)	(-74.198, -389.165)	(-355.729, -825.873)	(-191.473, -881.774)
(0., 0.)	(-74.101, -388.837)	(-361.149, -822.885)	(-198.455, -882.006)
(0., 0.)	(-73.839, -388.564)	(-366.445, -819.755)	(-205.402, -882.259)
(0., 0.)	(-73.345, -388.34)	(-371.561, -816.47)	(-212.278, -882.46)
(0., 0.)	(-72.562, -388.174)	(-376.445, -813.031)	(-219.037, -882.562)
(0., 0.)	(-71.473, -388.089)	(-381.053, -809.413)	(-225.669, -882.55)
(0., 0.)	(-70.068, -388.081)	(-385.336, -805.569)	(-232.13, -882.463)
(0., 0.)	(-68.315, -388.121)	(-389.273, -801.438)	(-238.394, -882.282)
(0., 0.)	(-66.159, -388.206)	(-392.833, -796.995)	(-244.461, -881.949)
(0., 0.)	(-63.578, -388.374)	(-395.982, -792.242)	(-250.311, -881.39)
(0., 0.)	(-60.571, -388.646)	(-398.712, -787.166)	(-255.933, -880.537)
(0., 0.)	(-57.123, -389.)	(-401.016, -781.749)	(-261.294, -879.397)
(0., 0.)	(-53.177, -389.452)	(-402.841, -776.)	(-266.34, -878.016)
(0., 0.)	(-48.66, -390.041)	(-404.107, -769.941)	(-271.094, -876.396)
(0., 0.)	(-43.552, -390.75)	(-404.747, -763.581)	(-275.599, -874.546)
(0., 0.)	(-37.938, -391.498)	(-404.717, -756.9)	(-279.818, -872.49)
(0., 0.)	(-32.004, -392.187)	(-404.003, -749.897)	(-283.718, -870.284)
(0., 0.)	(-25.9, -392.761)	(-402.592, -742.656)	(-287.254, -867.964)
(0., 0.)	(-19.678, -393.182)	(-400.447, -735.274)	(-290.345, -865.531)
(0., 0.)	(-13.269, -393.455)	(-397.521, -727.808)	(-293.001, -862.999)
(0., 0.)	(-6.592, -393.614)	(-393.775, -720.239)	(-295.237, -860.298)
(0., 0.)	(0.339, -393.641)	(-389.217, -712.604)	(-297.064, -857.432)
(0., 0.)	(7.406, -393.496)	(-383.939, -705.085)	(-298.497, -854.455)
(0., 0.)	(14.481, -393.199)	(-378.082, -697.904)	(-299.497, -851.433)
(0., 0.)	(21.518, -392.819)	(-371.832, -691.16)	(-300.03, -848.383)
(0., 0.)	(28.559, -392.398)	(-365.329, -684.823)	(-300.083, -845.466)
(0., 0.)	(35.61, -391.884)	(-358.633, -678.895)	(-299.666, -842.814)
(0., 0.)	(42.587, -391.154)	(-351.876, -673.492)	(-298.784, -840.311)
(0., 0.)	(49.407, -390.162)	(-345.405, -668.859)	(-297.131, -837.721)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(56.024, -388.97)	(-339.618, -665.25)	(-293.823, -834.82)
(0., 0.)	(62.453, -387.683)	(-334.539, -662.792)	(-287.965, -831.844)
(0., 0.)	(68.784, -386.393)	(-329.777, -661.508)	(-279.457, -829.23)
(0., 0.)	(75.077, -385.091)	(-324.877, -661.354)	(-268.854, -827.186)
(0., 0.)	(81.291, -383.701)	(-319.561, -662.261)	(-256.688, -825.671)
(0., 0.)	(87.362, -382.194)	(-313.696, -664.167)	(-243.302, -824.559)
(0., 0.)	(93.263, -380.612)	(-307.207, -667.035)	(-229.046, -823.913)
(0., 0.)	(98.972, -379.005)	(-300.047, -670.854)	(-214.374, -823.984)
(0., 0.)	(104.437, -377.395)	(-292.223, -675.576)	(-199.663, -824.953)
(0., 0.)	(109.627, -375.855)	(-283.78, -681.125)	(-185.022, -826.864)
(0., 0.)	(114.56, -374.467)	(-274.769, -687.439)	(-170.331, -829.62)
(0., 0.)	(119.248, -373.246)	(-265.228, -694.487)	(-155.297, -832.954)
(0., 0.)	(123.706, -372.159)	(-255.157, -702.229)	(-139.623, -836.597)
(0., 0.)	(127.934, -371.168)	(-244.52, -710.548)	(-123.162, -840.281)
(0., 0.)	(131.89, -370.238)	(-233.297, -719.265)	(-105.998, -843.708)
(0., 0.)	(135.532, -369.318)	(-221.509, -728.227)	(-88.407, -846.718)
(0., 0.)	(138.82, -368.383)	(-209.199, -737.362)	(-70.67, -849.429)
(0., 0.)	(141.746, -367.44)	(-196.393, -746.62)	(-52.928, -852.13)
(0., 0.)	(144.324, -366.499)	(-183.155, -755.897)	(-35.252, -854.913)
(0., 0.)	(146.575, -365.599)	(-169.592, -765.119)	(-17.696, -857.726)
(0., 0.)	(148.477, -364.822)	(-155.722, -774.242)	(-0.199, -860.455)
(0., 0.)	(149.991, -364.22)	(-141.474, -783.28)	(17.381, -862.916)
(0., 0.)	(151.104, -363.83)	(-126.8, -792.217)	(35.148, -865.071)
(0., 0.)	(151.837, -363.666)	(-111.725, -800.982)	(53.134, -867.003)
(0., 0.)	(152.253, -363.715)	(-96.329, -809.495)	(71.286, -868.798)
(0., 0.)	(152.385, -363.971)	(-80.723, -817.723)	(89.388, -870.385)
(0., 0.)	(152.263, -364.394)	(-65.011, -825.619)	(107.225, -871.567)
(0., 0.)	(151.95, -364.931)	(-49.258, -833.063)	(124.691, -872.258)
(0., 0.)	(151.491, -365.564)	(-33.495, -839.884)	(141.801, -872.477)
(0., 0.)	(150.853, -366.32)	(-17.757, -845.976)	(158.691, -872.42)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(149.967, -367.228)	(-2.086, -851.368)	(175.427, -872.398)
(0., 0.)	(148.779, -368.307)	(13.459, -856.164)	(191.762, -872.328)
(0., 0.)	(147.281, -369.555)	(28.806, -860.454)	(207.637, -872.186)
(0., 0.)	(145.488, -370.939)	(43.919, -864.212)	(223.164, -872.071)
(0., 0.)	(143.464, -372.379)	(58.713, -867.388)	(238.313, -871.976)
(0., 0.)	(141.363, -373.72)	(73.054, -869.968)	(253.009, -871.732)
(0., 0.)	(139.373, -374.797)	(86.857, -872.025)	(267.111, -870.967)
(0., 0.)	(137.619, -375.524)	(100.099, -873.838)	(280.442, -869.275)
(0., 0.)	(136.118, -375.923)	(112.758, -875.599)	(292.889, -866.482)
(0., 0.)	(134.838, -376.111)	(124.723, -877.101)	(304.387, -862.666)
(0., 0.)	(133.705, -376.194)	(135.904, -878.098)	(314.934, -858.274)
(0., 0.)	(132.63, -376.162)	(146.277, -878.595)	(324.604, -853.788)
(0., 0.)	(131.582, -375.937)	(155.81, -878.694)	(333.339, -849.475)
(0., 0.)	(130.59, -375.489)	(164.439, -878.486)	(341.061, -845.387)
(0., 0.)	(129.656, -374.888)	(172.109, -878.076)	(347.852, -841.667)
(0., 0.)	(128.711, -374.241)	(178.838, -877.58)	(353.753, -838.376)
(0., 0.)	(127.711, -373.596)	(184.647, -877.118)	(358.741, -835.564)
(0., 0.)	(126.684, -372.944)	(189.514, -876.794)	(362.789, -833.212)
(0., 0.)	(125.684, -372.327)	(193.385, -876.656)	(365.87, -831.297)
(0., 0.)	(124.696, -371.845)	(196.236, -876.775)	(367.944, -829.723)
(0., 0.)	(123.651, -371.579)	(198.045, -877.193)	(368.963, -828.504)
(0., 0.)	(122.521, -371.564)	(198.75, -877.806)	(368.926, -827.777)
(0., 0.)	(121.304, -371.787)	(198.253, -878.412)	(367.918, -827.669)
(0., 0.)	(120.011, -372.2)	(196.476, -878.894)	(365.975, -828.239)
(0., 0.)	(118.665, -372.754)	(193.42, -879.295)	(363.097, -829.431)
(0., 0.)	(117.294, -373.4)	(189.24, -879.803)	(359.347, -831.065)
(0., 0.)	(115.909, -374.116)	(184.206, -880.649)	(354.871, -832.958)
(0., 0.)	(114.481, -374.935)	(178.569, -881.839)	(349.84, -834.996)
(0., 0.)	(112.935, -375.9)	(172.535, -883.083)	(344.463, -837.155)
(0., 0.)	(111.16, -377.016)	(166.454, -884.115)	(339.166, -839.287)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(109.052, -378.25)	(160.706, -884.836)	(334.297, -841.183)
(0., 0.)	(106.575, -379.566)	(155.355, -885.179)	(329.714, -842.857)
(0., 0.)	(103.793, -380.887)	(150.127, -885.079)	(325.106, -844.536)
(0., 0.)	(100.824, -382.084)	(144.745, -884.706)	(320.331, -846.456)
(0., 0.)	(97.844, -383.06)	(139.114, -884.298)	(315.332, -848.621)
(0., 0.)	(95.029, -383.838)	(133.252, -883.913)	(310.05, -850.879)
(0., 0.)	(92.478, -384.51)	(127.185, -883.494)	(304.515, -853.11)
(0., 0.)	(90.195, -385.16)	(120.963, -883.069)	(298.786, -855.336)
(0., 0.)	(88.102, -385.855)	(114.659, -882.755)	(292.832, -857.503)
(0., 0.)	(86.105, -386.626)	(108.29, -882.603)	(286.672, -859.587)
(0., 0.)	(84.15, -387.463)	(101.823, -882.58)	(280.464, -861.745)
(0., 0.)	(82.268, -388.368)	(95.28, -882.689)	(274.241, -863.977)
(0., 0.)	(80.528, -389.358)	(88.726, -883.019)	(267.997, -866.174)
(0., 0.)	(79.008, -390.462)	(82.182, -883.584)	(261.73, -868.262)
(0., 0.)	(77.701, -391.697)	(75.61, -884.24)	(255.45, -870.267)
(0., 0.)	(76.502, -393.015)	(69.005, -884.89)	(249.182, -872.217)
(0., 0.)	(75.245, -394.315)	(62.461, -885.609)	(242.891, -874.05)
(0., 0.)	(73.757, -395.504)	(56.002, -886.418)	(236.551, -875.719)
(0., 0.)	(71.9, -396.546)	(49.554, -887.175)	(230.163, -877.213)
(0., 0.)	(69.63, -397.441)	(43.068, -887.758)	(223.785, -878.564)
(0., 0.)	(66.993, -398.192)	(36.564, -888.154)	(217.418, -879.778)
(0., 0.)	(64.092, -398.82)	(30.087, -888.414)	(211.082, -880.9)
(0., 0.)	(61.064, -399.363)	(23.669, -888.585)	(204.802, -881.92)
(0., 0.)	(58.061, -399.875)	(17.341, -888.698)	(198.594, -882.75)
(0., 0.)	(55.2, -400.395)	(11.13, -888.759)	(192.515, -883.403)
(0., 0.)	(52.512, -400.952)	(5.036, -888.764)	(186.552, -883.92)
(0., 0.)	(49.954, -401.521)	(-0.959, -888.724)	(180.67, -884.315)
(0., 0.)	(47.463, -402.025)	(-6.873, -888.66)	(174.876, -884.686)
(0., 0.)	(45.002, -402.452)	(-12.688, -888.586)	(169.159, -885.083)
(0., 0.)	(42.556, -402.864)	(-18.382, -888.516)	(163.542, -885.443)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(40.125, -403.312)	(-23.956, -888.453)	(158.067, -885.761)
(0., 0.)	(37.7, -403.753)	(-29.432, -888.378)	(152.681, -886.022)
(0., 0.)	(35.276, -404.085)	(-34.818, -888.267)	(147.338, -886.175)
(0., 0.)	(32.922, -404.325)	(-40.092, -888.105)	(142.124, -886.296)
(0., 0.)	(30.713, -404.583)	(-45.223, -887.907)	(137.119, -886.51)
(0., 0.)	(28.626, -404.876)	(-50.218, -887.693)	(132.254, -886.742)
(0., 0.)	(26.597, -405.163)	(-55.116, -887.479)	(127.408, -886.85)
(0., 0.)	(24.599, -405.404)	(-59.912, -887.279)	(122.644, -886.9)
(0., 0.)	(22.641, -405.574)	(-64.566, -887.092)	(118.086, -887.014)
(0., 0.)	(20.746, -405.672)	(-69.047, -886.879)	(113.672, -887.088)
(0., 0.)	(18.916, -405.722)	(-73.364, -886.586)	(109.23, -886.893)
(0., 0.)	(17.157, -405.75)	(-77.531, -886.236)	(104.827, -886.557)
(0., 0.)	(15.509, -405.788)	(-81.568, -885.902)	(100.739, -886.451)
(0., 0.)	(14.004, -405.851)	(-85.493, -885.603)	(96.958, -886.535)
(0., 0.)	(12.624, -405.905)	(-89.308, -885.31)	(93.287, -886.593)
(0., 0.)	(11.304, -405.935)	(-93.009, -884.99)	(89.647, -886.556)
(0., 0.)	(9.999, -405.974)	(-96.595, -884.63)	(86.074, -886.469)
(0., 0.)	(8.703, -406.028)	(-100.067, -884.231)	(82.595, -886.38)
(0., 0.)	(7.403, -406.09)	(-103.456, -883.799)	(79.186, -886.25)
(0., 0.)	(6.083, -406.143)	(-106.814, -883.35)	(75.817, -886.064)
(0., 0.)	(4.743, -406.168)	(-110.189, -882.91)	(72.446, -885.903)
(0., 0.)	(3.404, -406.157)	(-113.572, -882.498)	(69.052, -885.768)
(0., 0.)	(2.091, -406.115)	(-116.94, -882.11)	(65.658, -885.615)
(0., 0.)	(0.817, -406.045)	(-120.267, -881.735)	(62.305, -885.465)
(0., 0.)	(-0.456, -405.955)	(-123.573, -881.384)	(58.955, -885.291)
(0., 0.)	(-1.747, -405.846)	(-126.901, -881.062)	(55.58, -885.113)
(0., 0.)	(-3.037, -405.712)	(-130.274, -880.749)	(52.203, -885.029)
(0., 0.)	(-4.318, -405.568)	(-133.681, -880.417)	(48.811, -884.964)
(0., 0.)	(-5.628, -405.418)	(-137.088, -880.064)	(45.403, -884.776)
(0., 0.)	(-7.015, -405.252)	(-140.478, -879.681)	(41.99, -884.529)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-8.499, -405.065)	(-143.885, -879.248)	(38.524, -884.337)
(0., 0.)	(-10.078, -404.858)	(-147.335, -878.776)	(34.976, -884.156)
(0., 0.)	(-11.737, -404.638)	(-150.819, -878.3)	(31.396, -883.918)
(0., 0.)	(-13.453, -404.42)	(-154.314, -877.841)	(27.83, -883.623)
(0., 0.)	(-15.19, -404.186)	(-157.808, -877.401)	(24.312, -883.332)
(0., 0.)	(-16.915, -403.874)	(-161.294, -876.971)	(20.814, -883.031)
(0., 0.)	(-18.608, -403.483)	(-164.761, -876.536)	(17.32, -882.751)
(0., 0.)	(-20.264, -403.062)	(-168.183, -876.085)	(13.87, -882.573)
(0., 0.)	(-21.9, -402.646)	(-171.565, -875.602)	(10.437, -882.432)
(0., 0.)	(-23.513, -402.211)	(-174.913, -875.112)	(6.999, -882.235)
(0., 0.)	(-25.104, -401.746)	(-178.248, -874.644)	(3.579, -882.005)
(0., 0.)	(-26.705, -401.281)	(-181.592, -874.197)	(0.173, -881.771)
(0., 0.)	(-28.343, -400.855)	(-184.954, -873.735)	(-3.239, -881.539)
(0., 0.)	(-30.016, -400.477)	(-188.343, -873.232)	(-6.697, -881.289)
(0., 0.)	(-31.703, -400.115)	(-191.76, -872.706)	(-10.196, -881.035)
(0., 0.)	(-33.388, -399.758)	(-195.193, -872.184)	(-13.682, -880.85)
(0., 0.)	(-35.075, -399.427)	(-198.627, -871.666)	(-17.159, -880.73)
(0., 0.)	(-36.773, -399.127)	(-202.065, -871.094)	(-20.676, -880.606)
(0., 0.)	(-38.467, -398.828)	(-205.525, -870.454)	(-24.265, -880.438)
(0., 0.)	(-40.115, -398.54)	(-209.036, -869.79)	(-27.915, -880.253)
(0., 0.)	(-41.695, -398.313)	(-212.606, -869.137)	(-31.586, -880.146)
(0., 0.)	(-43.226, -398.155)	(-216.218, -868.46)	(-35.283, -880.113)
(0., 0.)	(-44.754, -398.029)	(-219.866, -867.742)	(-39.08, -880.074)
(0., 0.)	(-46.324, -397.893)	(-223.569, -866.989)	(-43., -880.013)
(0., 0.)	(-47.945, -397.722)	(-227.344, -866.203)	(-47.001, -879.984)
(0., 0.)	(-49.598, -397.522)	(-231.179, -865.386)	(-51.03, -880.042)
(0., 0.)	(-51.246, -397.32)	(-235.058, -864.532)	(-55.082, -880.18)
(0., 0.)	(-52.878, -397.133)	(-238.982, -863.676)	(-59.221, -880.3)
(0., 0.)	(-54.497, -396.934)	(-242.967, -862.803)	(-63.481, -880.37)
(0., 0.)	(-56.119, -396.698)	(-247.04, -861.886)	(-67.843, -880.485)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-57.724, -396.441)	(-251.185, -860.964)	(-72.291, -880.686)
(0., 0.)	(-59.275, -396.198)	(-255.404, -860.048)	(-76.805, -880.93)
(0., 0.)	(-60.763, -395.986)	(-259.712, -859.086)	(-81.381, -881.183)
(0., 0.)	(-62.21, -395.795)	(-264.092, -858.057)	(-86.068, -881.419)
(0., 0.)	(-63.638, -395.581)	(-268.516, -856.993)	(-90.92, -881.601)
(0., 0.)	(-65.065, -395.324)	(-273.012, -855.901)	(-95.913, -881.758)
(0., 0.)	(-66.486, -395.041)	(-277.609, -854.752)	(-100.978, -881.951)
(0., 0.)	(-67.885, -394.765)	(-282.282, -853.544)	(-106.077, -882.172)
(0., 0.)	(-69.26, -394.493)	(-286.988, -852.275)	(-111.21, -882.364)
(0., 0.)	(-70.635, -394.19)	(-291.729, -850.929)	(-116.427, -882.51)
(0., 0.)	(-72.029, -393.834)	(-296.535, -849.478)	(-121.791, -882.645)
(0., 0.)	(-73.464, -393.443)	(-301.408, -847.934)	(-127.282, -882.809)
(0., 0.)	(-74.949, -393.041)	(-306.312, -846.354)	(-132.854, -882.96)
(0., 0.)	(-76.461, -392.622)	(-311.255, -844.759)	(-138.533, -883.115)
(0., 0.)	(-77.961, -392.158)	(-316.277, -843.117)	(-144.33, -883.321)
(0., 0.)	(-79.461, -391.634)	(-321.403, -841.369)	(-150.237, -883.535)
(0., 0.)	(-80.955, -391.063)	(-326.626, -839.499)	(-156.253, -883.732)
(0., 0.)	(-82.436, -390.44)	(-331.924, -837.514)	(-162.453, -883.932)
(0., 0.)	(-83.866, -389.796)	(-337.265, -835.439)	(-168.823, -884.144)
(0., 0.)	(-85.191, -389.199)	(-342.636, -833.295)	(-175.257, -884.337)
(0., 0.)	(-86.328, -388.691)	(-348.027, -831.082)	(-181.739, -884.52)
(0., 0.)	(-87.245, -388.226)	(-353.419, -828.745)	(-188.334, -884.699)
(0., 0.)	(-87.962, -387.759)	(-358.804, -826.223)	(-195.04, -884.813)
(0., 0.)	(-88.482, -387.281)	(-364.169, -823.555)	(-201.812, -884.891)
(0., 0.)	(-88.792, -386.814)	(-369.484, -820.81)	(-208.614, -885.02)
(0., 0.)	(-88.888, -386.351)	(-374.741, -817.989)	(-215.431, -885.165)
(0., 0.)	(-88.751, -385.888)	(-379.936, -815.043)	(-222.275, -885.285)
(0., 0.)	(-88.356, -385.488)	(-385.014, -811.953)	(-229.134, -885.427)
(0., 0.)	(-87.681, -385.197)	(-389.883, -808.724)	(-235.973, -885.599)
(0., 0.)	(-86.697, -384.987)	(-394.511, -805.362)	(-242.715, -885.764)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-85.377, -384.826)	(-398.894, -801.853)	(-249.286, -885.908)
(0., 0.)	(-83.707, -384.75)	(-402.965, -798.136)	(-255.643, -885.937)
(0., 0.)	(-81.677, -384.79)	(-406.646, -794.15)	(-261.736, -885.754)
(0., 0.)	(-79.251, -384.911)	(-409.902, -789.897)	(-267.55, -885.384)
(0., 0.)	(-76.373, -385.072)	(-412.74, -785.348)	(-273.113, -884.877)
(0., 0.)	(-73.026, -385.284)	(-415.146, -780.419)	(-278.446, -884.085)
(0., 0.)	(-69.24, -385.598)	(-417.073, -775.064)	(-283.518, -882.934)
(0., 0.)	(-65.033, -386.034)	(-418.491, -769.316)	(-288.34, -881.479)
(0., 0.)	(-60.36, -386.64)	(-419.389, -763.251)	(-292.906, -879.785)
(0., 0.)	(-55.192, -387.431)	(-419.734, -756.899)	(-297.204, -877.89)
(0., 0.)	(-49.609, -388.316)	(-419.502, -750.237)	(-301.26, -875.76)
(0., 0.)	(-43.762, -389.166)	(-418.641, -743.284)	(-305.026, -873.303)
(0., 0.)	(-37.775, -389.949)	(-417.067, -736.12)	(-308.345, -870.554)
(0., 0.)	(-31.686, -390.657)	(-414.731, -728.784)	(-311.137, -867.68)
(0., 0.)	(-25.466, -391.23)	(-411.678, -721.326)	(-313.489, -864.721)
(0., 0.)	(-19.048, -391.617)	(-407.973, -713.862)	(-315.507, -861.618)
(0., 0.)	(-12.379, -391.826)	(-403.671, -706.55)	(-317.255, -858.454)
(0., 0.)	(-5.477, -391.904)	(-398.825, -699.542)	(-318.636, -855.407)
(0., 0.)	(1.573, -391.928)	(-393.498, -692.929)	(-319.55, -852.476)
(0., 0.)	(8.653, -391.944)	(-387.818, -686.734)	(-320.071, -849.679)
(0., 0.)	(15.684, -391.921)	(-381.877, -680.974)	(-320.351, -847.149)
(0., 0.)	(22.715, -391.81)	(-375.671, -675.686)	(-320.49, -844.871)
(0., 0.)	(29.806, -391.528)	(-369.22, -670.897)	(-320.373, -842.562)
(0., 0.)	(36.879, -390.957)	(-362.693, -666.676)	(-319.522, -840.065)
(0., 0.)	(43.804, -390.097)	(-356.311, -663.183)	(-317.332, -837.645)
(0., 0.)	(50.481, -389.024)	(-350.173, -660.638)	(-313.323, -835.661)
(0., 0.)	(56.922, -387.829)	(-344.181, -659.189)	(-307.137, -834.309)
(0., 0.)	(63.238, -386.608)	(-338.139, -658.882)	(-298.653, -833.647)
(0., 0.)	(69.491, -385.39)	(-331.879, -659.684)	(-288.051, -833.617)
(0., 0.)	(75.647, -384.121)	(-325.319, -661.529)	(-275.663, -834.119)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(81.633, -382.761)	(-318.447, -664.349)	(-261.813, -835.039)
(0., 0.)	(87.393, -381.327)	(-311.257, -668.084)	(-246.769, -836.187)
(0., 0.)	(92.936, -379.883)	(-303.707, -672.686)	(-230.802, -837.467)
(0., 0.)	(98.274, -378.482)	(-295.722, -678.076)	(-214.163, -838.864)
(0., 0.)	(103.376, -377.135)	(-287.194, -684.17)	(-197.067, -840.386)
(0., 0.)	(108.214, -375.849)	(-278.062, -690.942)	(-179.752, -842.1)
(0., 0.)	(112.789, -374.66)	(-268.306, -698.379)	(-162.433, -844.228)
(0., 0.)	(117.141, -373.612)	(-257.924, -706.448)	(-145.153, -846.964)
(0., 0.)	(121.289, -372.699)	(-246.926, -715.103)	(-127.802, -850.226)
(0., 0.)	(125.187, -371.913)	(-235.332, -724.316)	(-110.229, -853.793)
(0., 0.)	(128.771, -371.274)	(-223.134, -734.024)	(-92.246, -857.531)
(0., 0.)	(131.978, -370.744)	(-210.305, -744.084)	(-73.746, -861.259)
(0., 0.)	(134.781, -370.24)	(-196.82, -754.302)	(-54.77, -864.678)
(0., 0.)	(137.168, -369.737)	(-182.744, -764.562)	(-35.43, -867.584)
(0., 0.)	(139.132, -369.29)	(-168.191, -774.795)	(-15.923, -870.056)
(0., 0.)	(140.673, -368.98)	(-153.23, -784.966)	(3.53, -872.344)
(0., 0.)	(141.804, -368.835)	(-137.851, -794.997)	(22.815, -874.58)
(0., 0.)	(142.527, -368.846)	(-122.04, -804.785)	(41.971, -876.778)
(0., 0.)	(142.852, -369.062)	(-105.779, -814.224)	(61.128, -878.97)
(0., 0.)	(142.791, -369.513)	(-89.107, -823.24)	(80.344, -881.08)
(0., 0.)	(142.377, -370.182)	(-72.139, -831.775)	(99.574, -882.837)
(0., 0.)	(141.644, -371.039)	(-54.969, -839.751)	(118.712, -883.982)
(0., 0.)	(140.626, -372.066)	(-37.654, -847.099)	(137.654, -884.457)
(0., 0.)	(139.376, -373.268)	(-20.261, -853.786)	(156.404, -884.409)
(0., 0.)	(137.936, -374.6)	(-2.911, -859.78)	(174.961, -884.001)
(0., 0.)	(136.368, -375.969)	(14.272, -865.043)	(193.111, -883.104)
(0., 0.)	(134.75, -377.286)	(31.203, -869.575)	(210.684, -881.622)
(0., 0.)	(133.174, -378.441)	(47.812, -873.412)	(227.614, -879.625)
(0., 0.)	(131.765, -379.271)	(64.005, -876.567)	(243.9, -877.257)
(0., 0.)	(130.617, -379.71)	(79.655, -878.989)	(259.553, -874.694)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(129.74, -379.854)	(94.624, -880.6)	(274.508, -872.057)
(0., 0.)	(129.076, -379.842)	(108.879, -881.447)	(288.631, -869.343)
(0., 0.)	(128.56, -379.696)	(122.488, -881.751)	(301.903, -866.522)
(0., 0.)	(128.167, -379.351)	(135.418, -881.706)	(314.366, -863.531)
(0., 0.)	(127.894, -378.771)	(147.527, -881.394)	(325.966, -860.186)
(0., 0.)	(127.706, -377.988)	(158.742, -880.945)	(336.509, -856.141)
(0., 0.)	(127.586, -377.055)	(169.07, -880.457)	(345.804, -851.265)
(0., 0.)	(127.535, -376.015)	(178.542, -879.932)	(353.983, -846.007)
(0., 0.)	(127.511, -374.919)	(187.111, -879.29)	(361.212, -840.935)
(0., 0.)	(127.451, -373.846)	(194.67, -878.478)	(367.508, -836.483)
(0., 0.)	(127.297, -372.897)	(201.151, -877.585)	(372.818, -832.768)
(0., 0.)	(127.008, -372.137)	(206.557, -876.814)	(377.097, -829.696)
(0., 0.)	(126.55, -371.569)	(210.884, -876.353)	(380.318, -827.155)
(0., 0.)	(125.961, -371.192)	(214.058, -876.259)	(382.41, -825.131)
(0., 0.)	(125.329, -370.999)	(215.97, -876.466)	(383.314, -823.658)
(0., 0.)	(124.73, -370.971)	(216.525, -876.825)	(383.035, -822.866)
(0., 0.)	(124.185, -371.087)	(215.646, -877.185)	(381.66, -822.889)
(0., 0.)	(123.662, -371.346)	(213.338, -877.548)	(379.251, -823.667)
(0., 0.)	(123.124, -371.736)	(209.7, -877.986)	(375.881, -824.95)
(0., 0.)	(122.518, -372.256)	(204.962, -878.643)	(371.711, -826.52)
(0., 0.)	(121.761, -372.957)	(199.499, -879.686)	(367.04, -828.347)
(0., 0.)	(120.744, -373.888)	(193.712, -880.977)	(362.198, -830.357)
(0., 0.)	(119.349, -375.027)	(187.943, -882.132)	(357.506, -832.27)
(0., 0.)	(117.476, -376.319)	(182.38, -882.931)	(352.983, -833.883)
(0., 0.)	(115.105, -377.669)	(176.907, -883.268)	(348.392, -835.317)
(0., 0.)	(112.338, -378.97)	(171.325, -883.186)	(343.602, -836.86)
(0., 0.)	(109.353, -380.146)	(165.527, -882.893)	(338.563, -838.719)
(0., 0.)	(106.348, -381.174)	(159.458, -882.549)	(333.164, -840.822)
(0., 0.)	(103.486, -382.063)	(153.141, -882.212)	(327.394, -842.933)
(0., 0.)	(100.826, -382.846)	(146.686, -881.933)	(321.385, -845.01)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(98.339, -383.577)	(140.182, -881.768)	(315.313, -847.238)
(0., 0.)	(95.979, -384.327)	(133.661, -881.725)	(309.302, -849.675)
(0., 0.)	(93.715, -385.134)	(127.142, -881.81)	(303.321, -852.196)
(0., 0.)	(91.551, -386.002)	(120.688, -882.076)	(297.315, -854.781)
(0., 0.)	(89.544, -386.952)	(114.352, -882.59)	(291.367, -857.528)
(0., 0.)	(87.785, -388.002)	(108.137, -883.339)	(285.582, -860.413)
(0., 0.)	(86.323, -389.159)	(102.007, -884.228)	(279.909, -863.245)
(0., 0.)	(85.108, -390.399)	(95.93, -885.179)	(274.149, -865.767)
(0., 0.)	(84., -391.629)	(89.904, -886.147)	(268.26, -867.877)
(0., 0.)	(82.8, -392.795)	(83.915, -887.083)	(262.414, -869.81)
(0., 0.)	(81.306, -393.899)	(77.932, -887.947)	(256.625, -871.712)
(0., 0.)	(79.384, -394.939)	(71.924, -888.745)	(250.788, -873.497)
(0., 0.)	(77.015, -395.872)	(65.887, -889.462)	(244.892, -875.142)
(0., 0.)	(74.293, -396.694)	(59.822, -890.034)	(238.991, -876.68)
(0., 0.)	(71.356, -397.464)	(53.743, -890.459)	(233.141, -878.117)
(0., 0.)	(68.322, -398.202)	(47.688, -890.774)	(227.361, -879.386)
(0., 0.)	(65.301, -398.881)	(41.698, -890.982)	(221.627, -880.467)
(0., 0.)	(62.396, -399.482)	(35.896, -891.204)	(216., -881.474)
(0., 0.)	(59.676, -400.003)	(30.305, -891.441)	(210.526, -882.465)
(0., 0.)	(57.167, -400.463)	(24.838, -891.571)	(205.191, -883.385)
(0., 0.)	(54.857, -400.923)	(19.442, -891.563)	(199.969, -884.188)
(0., 0.)	(52.688, -401.417)	(14.129, -891.493)	(194.83, -884.888)
(0., 0.)	(50.595, -401.935)	(8.903, -891.448)	(189.723, -885.461)
(0., 0.)	(48.546, -402.448)	(3.744, -891.449)	(184.607, -885.873)
(0., 0.)	(46.506, -402.935)	(-1.366, -891.437)	(179.547, -886.191)
(0., 0.)	(44.466, -403.4)	(-6.405, -891.331)	(174.612, -886.515)
(0., 0.)	(42.442, -403.813)	(-11.322, -891.094)	(169.802, -886.848)
(0., 0.)	(40.454, -404.141)	(-16.09, -890.789)	(165.142, -887.168)
(0., 0.)	(38.532, -404.411)	(-20.724, -890.502)	(160.64, -887.426)
(0., 0.)	(36.686, -404.674)	(-25.228, -890.236)	(156.221, -887.535)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(34.875, -404.913)	(-29.576, -889.995)	(151.914, -887.598)
(0., 0.)	(33.068, -405.079)	(-33.755, -889.836)	(147.811, -887.791)
(0., 0.)	(31.304, -405.195)	(-37.778, -889.772)	(143.886, -888.097)
(0., 0.)	(29.65, -405.331)	(-41.662, -889.747)	(140.035, -888.33)
(0., 0.)	(28.077, -405.506)	(-45.411, -889.702)	(136.261, -888.471)
(0., 0.)	(26.49, -405.683)	(-49.035, -889.603)	(132.621, -888.619)
(0., 0.)	(24.847, -405.826)	(-52.552, -889.461)	(129.115, -888.791)
(0., 0.)	(23.183, -405.931)	(-55.976, -889.318)	(125.682, -888.903)
(0., 0.)	(21.564, -406.028)	(-59.335, -889.192)	(122.282, -888.959)
(0., 0.)	(20.024, -406.145)	(-62.668, -889.048)	(118.925, -888.967)
(0., 0.)	(18.56, -406.261)	(-65.998, -888.853)	(115.558, -888.844)
(0., 0.)	(17.131, -406.339)	(-69.328, -888.581)	(112.13, -888.635)
(0., 0.)	(15.697, -406.373)	(-72.675, -888.231)	(108.722, -888.561)
(0., 0.)	(14.245, -406.392)	(-76.07, -887.852)	(105.315, -888.584)
(0., 0.)	(12.783, -406.406)	(-79.556, -887.491)	(101.85, -888.597)
(0., 0.)	(11.306, -406.412)	(-83.152, -887.159)	(98.301, -888.58)
(0., 0.)	(9.828, -406.411)	(-86.842, -886.829)	(94.647, -888.5)
(0., 0.)	(8.368, -406.41)	(-90.581, -886.466)	(90.905, -888.315)
(0., 0.)	(6.918, -406.418)	(-94.345, -886.052)	(87.109, -888.078)
(0., 0.)	(5.465, -406.412)	(-98.154, -885.625)	(83.281, -887.913)
(0., 0.)	(4.012, -406.379)	(-102.045, -885.224)	(79.391, -887.839)
(0., 0.)	(2.558, -406.336)	(-106.036, -884.846)	(75.391, -887.731)
(0., 0.)	(1.078, -406.296)	(-110.12, -884.463)	(71.294, -887.526)
(0., 0.)	(-0.449, -406.238)	(-114.262, -884.076)	(67.164, -887.299)
(0., 0.)	(-2.031, -406.162)	(-118.432, -883.703)	(63.018, -887.109)
(0., 0.)	(-3.672, -406.088)	(-122.628, -883.327)	(58.798, -886.905)
(0., 0.)	(-5.379, -406.008)	(-126.857, -882.919)	(54.508, -886.656)
(0., 0.)	(-7.169, -405.89)	(-131.121, -882.472)	(50.219, -886.424)
(0., 0.)	(-9.042, -405.715)	(-135.407, -881.992)	(45.953, -886.199)
(0., 0.)	(-10.976, -405.493)	(-139.7, -881.507)	(41.654, -885.905)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-12.933, -405.24)	(-144.002, -881.026)	(37.305, -885.57)
(0., 0.)	(-14.885, -404.957)	(-148.312, -880.531)	(32.952, -885.259)
(0., 0.)	(-16.823, -404.649)	(-152.63, -879.994)	(28.617, -884.963)
(0., 0.)	(-18.735, -404.314)	(-156.949, -879.425)	(24.26, -884.62)
(0., 0.)	(-20.607, -403.94)	(-161.275, -878.847)	(19.861, -884.232)
(0., 0.)	(-22.431, -403.54)	(-165.618, -878.25)	(15.416, -883.822)
(0., 0.)	(-24.21, -403.141)	(-170.004, -877.601)	(10.926, -883.386)
(0., 0.)	(-25.938, -402.75)	(-174.459, -876.915)	(6.418, -882.946)
(0., 0.)	(-27.598, -402.361)	(-178.982, -876.235)	(1.923, -882.553)
(0., 0.)	(-29.167, -401.987)	(-183.542, -875.573)	(-2.587, -882.191)
(0., 0.)	(-30.636, -401.647)	(-188.088, -874.904)	(-7.169, -881.778)
(0., 0.)	(-32.024, -401.335)	(-192.595, -874.199)	(-11.82, -881.339)
(0., 0.)	(-33.343, -401.024)	(-197.08, -873.449)	(-16.471, -880.98)
(0., 0.)	(-34.582, -400.708)	(-201.576, -872.662)	(-21.094, -880.735)
(0., 0.)	(-35.772, -400.409)	(-206.118, -871.864)	(-25.725, -880.538)
(0., 0.)	(-36.985, -400.142)	(-210.717, -871.083)	(-30.421, -880.327)
(0., 0.)	(-38.263, -399.9)	(-215.352, -870.284)	(-35.213, -880.09)
(0., 0.)	(-39.618, -399.656)	(-219.993, -869.392)	(-40.075, -879.873)
(0., 0.)	(-41.052, -399.385)	(-224.63, -868.362)	(-44.934, -879.772)
(0., 0.)	(-42.569, -399.078)	(-229.265, -867.272)	(-49.788, -879.813)
(0., 0.)	(-44.156, -398.718)	(-233.929, -866.198)	(-54.702, -879.944)
(0., 0.)	(-45.768, -398.29)	(-238.633, -865.173)	(-59.708, -880.129)
(0., 0.)	(-47.369, -397.817)	(-243.354, -864.139)	(-64.77, -880.378)
(0., 0.)	(-48.917, -397.365)	(-248.072, -863.044)	(-69.83, -880.691)
(0., 0.)	(-50.364, -396.995)	(-252.782, -861.917)	(-74.854, -881.067)
(0., 0.)	(-51.691, -396.706)	(-257.486, -860.78)	(-79.875, -881.457)
(0., 0.)	(-52.91, -396.451)	(-262.207, -859.583)	(-84.974, -881.796)
(0., 0.)	(-54.043, -396.215)	(-266.967, -858.281)	(-90.177, -882.143)
(0., 0.)	(-55.121, -395.991)	(-271.772, -856.885)	(-95.475, -882.56)
(0., 0.)	(-56.157, -395.785)	(-276.611, -855.437)	(-100.872, -882.994)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-57.169, -395.573)	(-281.488, -853.899)	(-106.364, -883.359)
(0., 0.)	(-58.184, -395.281)	(-286.442, -852.194)	(-111.964, -883.589)
(0., 0.)	(-59.194, -394.875)	(-291.494, -850.306)	(-117.714, -883.709)
(0., 0.)	(-60.166, -394.401)	(-296.605, -848.283)	(-123.609, -883.848)
(0., 0.)	(-61.092, -393.906)	(-301.727, -846.179)	(-129.613, -884.06)
(0., 0.)	(-61.975, -393.401)	(-306.859, -843.983)	(-135.72, -884.267)
(0., 0.)	(-62.783, -392.9)	(-312.03, -841.641)	(-141.907, -884.377)
(0., 0.)	(-63.457, -392.413)	(-317.252, -839.178)	(-148.15, -884.392)
(0., 0.)	(-63.956, -391.948)	(-322.486, -836.665)	(-154.424, -884.372)
(0., 0.)	(-64.305, -391.486)	(-327.688, -834.102)	(-160.738, -884.348)
(0., 0.)	(-64.555, -391.006)	(-332.852, -831.438)	(-167.102, -884.331)
(0., 0.)	(-64.728, -390.522)	(-337.973, -828.632)	(-173.498, -884.326)
(0., 0.)	(-64.798, -390.074)	(-343.033, -825.687)	(-179.92, -884.297)
(0., 0.)	(-64.75, -389.684)	(-348.003, -822.64)	(-186.357, -884.226)
(0., 0.)	(-64.59, -389.36)	(-352.866, -819.515)	(-192.753, -884.161)
(0., 0.)	(-64.306, -389.132)	(-357.602, -816.345)	(-199.077, -884.116)
(0., 0.)	(-63.889, -388.996)	(-362.19, -813.09)	(-205.336, -884.053)
(0., 0.)	(-63.327, -388.877)	(-366.616, -809.7)	(-211.539, -883.954)
(0., 0.)	(-62.577, -388.74)	(-370.849, -806.12)	(-217.682, -883.754)
(0., 0.)	(-61.588, -388.6)	(-374.832, -802.336)	(-223.695, -883.386)
(0., 0.)	(-60.301, -388.482)	(-378.514, -798.336)	(-229.533, -882.875)
(0., 0.)	(-58.661, -388.395)	(-381.862, -794.077)	(-235.181, -882.242)
(0., 0.)	(-56.621, -388.353)	(-384.84, -789.523)	(-240.614, -881.409)
(0., 0.)	(-54.124, -388.418)	(-387.403, -784.669)	(-245.863, -880.402)
(0., 0.)	(-51.091, -388.653)	(-389.482, -779.472)	(-250.893, -879.194)
(0., 0.)	(-47.446, -389.086)	(-391.032, -773.897)	(-255.64, -877.732)
(0., 0.)	(-43.186, -389.663)	(-392.031, -767.989)	(-260.076, -876.103)
(0., 0.)	(-38.429, -390.289)	(-392.448, -761.837)	(-264.227, -874.39)
(0., 0.)	(-33.331, -390.924)	(-392.261, -755.465)	(-268.135, -872.534)
(0., 0.)	(-27.995, -391.554)	(-391.449, -748.834)	(-271.743, -870.431)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-22.445, -392.163)	(-389.986, -741.91)	(-274.909, -868.072)
(0., 0.)	(-16.649, -392.707)	(-387.833, -734.752)	(-277.594, -865.552)
(0., 0.)	(-10.592, -393.11)	(-384.969, -727.473)	(-279.804, -862.89)
(0., 0.)	(-4.286, -393.343)	(-381.43, -720.171)	(-281.582, -860.11)
(0., 0.)	(2.249, -393.428)	(-377.323, -712.972)	(-283.069, -857.212)
(0., 0.)	(8.998, -393.407)	(-372.769, -706.)	(-284.283, -854.299)
(0., 0.)	(15.952, -393.301)	(-367.835, -699.311)	(-285.137, -851.443)
(0., 0.)	(23.075, -393.042)	(-362.529, -692.937)	(-285.624, -848.67)
(0., 0.)	(30.203, -392.503)	(-356.859, -686.917)	(-285.756, -846.013)
(0., 0.)	(37.182, -391.691)	(-350.859, -681.298)	(-285.53, -843.565)
(0., 0.)	(43.966, -390.706)	(-344.584, -676.102)	(-285.068, -841.393)
(0., 0.)	(50.629, -389.573)	(-338.108, -671.313)	(-284.583, -839.397)
(0., 0.)	(57.276, -388.252)	(-331.572, -666.967)	(-284.011, -837.433)
(0., 0.)	(63.944, -386.782)	(-325.171, -663.222)	(-282.886, -835.429)
(0., 0.)	(70.584, -385.285)	(-319.06, -660.248)	(-280.536, -833.573)
(0., 0.)	(77.102, -383.79)	(-313.264, -658.17)	(-276.343, -832.096)
(0., 0.)	(83.42, -382.238)	(-307.66, -657.056)	(-269.814, -831.08)
(0., 0.)	(89.489, -380.629)	(-302.073, -656.966)	(-260.812, -830.481)
(0., 0.)	(95.267, -378.984)	(-296.402, -657.927)	(-249.531, -830.314)
(0., 0.)	(100.768, -377.341)	(-290.631, -659.948)	(-236.267, -830.47)
(0., 0.)	(106.034, -375.746)	(-284.715, -662.943)	(-221.499, -830.674)
(0., 0.)	(111.09, -374.24)	(-278.541, -666.713)	(-205.767, -830.69)
(0., 0.)	(115.927, -372.816)	(-272.035, -671.122)	(-189.557, -830.554)
(0., 0.)	(120.512, -371.446)	(-265.158, -676.166)	(-173.276, -830.435)
(0., 0.)	(124.826, -370.164)	(-257.874, -681.938)	(-157.246, -830.524)
(0., 0.)	(128.855, -369.018)	(-250.139, -688.459)	(-141.645, -831.058)
(0., 0.)	(132.608, -368.001)	(-241.898, -695.624)	(-126.446, -832.287)
(0., 0.)	(136.088, -367.078)	(-233.06, -703.333)	(-111.435, -834.285)
(0., 0.)	(139.276, -366.237)	(-223.53, -711.521)	(-96.302, -836.898)
(0., 0.)	(142.149, -365.492)	(-213.253, -720.142)	(-80.744, -839.895)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(144.667, -364.837)	(-202.221, -729.14)	(-64.566, -843.087)
(0., 0.)	(146.786, -364.242)	(-190.494, -738.461)	(-47.787, -846.376)
(0., 0.)	(148.492, -363.691)	(-178.188, -748.073)	(-30.556, -849.701)
(0., 0.)	(149.82, -363.248)	(-165.393, -757.967)	(-13.042, -853.054)
(0., 0.)	(150.836, -362.978)	(-152.121, -768.076)	(4.638, -856.419)
(0., 0.)	(151.589, -362.832)	(-138.353, -778.214)	(22.42, -859.792)
(0., 0.)	(152.115, -362.761)	(-124.122, -788.157)	(40.214, -863.111)
(0., 0.)	(152.414, -362.797)	(-109.469, -797.697)	(57.997, -866.178)
(0., 0.)	(152.449, -362.981)	(-94.412, -806.756)	(75.769, -868.831)
(0., 0.)	(152.176, -363.375)	(-78.998, -815.345)	(93.527, -871.017)
(0., 0.)	(151.582, -364.025)	(-63.317, -823.481)	(111.281, -872.831)
(0., 0.)	(150.685, -364.919)	(-47.459, -831.162)	(128.934, -874.345)
(0., 0.)	(149.522, -366.004)	(-31.474, -838.372)	(146.376, -875.603)
(0., 0.)	(148.145, -367.232)	(-15.396, -845.108)	(163.665, -876.738)
(0., 0.)	(146.592, -368.579)	(0.722, -851.317)	(180.916, -877.819)
(0., 0.)	(144.882, -370.055)	(16.82, -856.851)	(197.954, -878.518)
(0., 0.)	(143.033, -371.644)	(32.799, -861.592)	(214.601, -878.639)
(0., 0.)	(141.092, -373.224)	(48.534, -865.565)	(230.782, -878.285)
(0., 0.)	(139.143, -374.638)	(63.906, -868.893)	(246.363, -877.583)
(0., 0.)	(137.301, -375.802)	(78.791, -871.622)	(261.244, -876.706)
(0., 0.)	(135.655, -376.706)	(93.089, -873.675)	(275.435, -875.838)
(0., 0.)	(134.203, -377.38)	(106.749, -875.022)	(288.955, -874.954)
(0., 0.)	(132.897, -377.864)	(119.813, -875.843)	(301.766, -873.883)
(0., 0.)	(131.721, -378.198)	(132.335, -876.368)	(313.806, -872.407)
(0., 0.)	(130.704, -378.35)	(144.168, -876.618)	(325.072, -870.416)
(0., 0.)	(129.848, -378.204)	(155.199, -876.632)	(335.506, -867.808)
(0., 0.)	(129.122, -377.692)	(165.491, -876.615)	(345.007, -864.393)
(0., 0.)	(128.532, -376.869)	(175.119, -876.741)	(353.651, -860.251)
(0., 0.)	(128.137, -375.884)	(184.058, -876.93)	(361.51, -855.631)
(0., 0.)	(127.971, -374.874)	(192.222, -876.986)	(368.561, -850.74)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(127.951, -373.916)	(199.531, -876.8)	(374.71, -845.821)
(0., 0.)	(127.915, -373.091)	(205.887, -876.402)	(379.905, -841.132)
(0., 0.)	(127.725, -372.477)	(211.18, -875.926)	(384.145, -836.835)
(0., 0.)	(127.345, -372.099)	(215.346, -875.571)	(387.305, -833.021)
(0., 0.)	(126.859, -371.945)	(218.295, -875.492)	(389.227, -829.866)
(0., 0.)	(126.399, -371.93)	(219.903, -875.729)	(389.899, -827.674)
(0., 0.)	(126.087, -371.947)	(220.094, -876.244)	(389.403, -826.763)
(0., 0.)	(125.941, -371.941)	(218.85, -876.932)	(387.819, -827.179)
(0., 0.)	(125.86, -371.983)	(216.226, -877.66)	(385.205, -828.532)
(0., 0.)	(125.686, -372.207)	(212.373, -878.431)	(381.626, -830.196)
(0., 0.)	(125.258, -372.679)	(207.503, -879.378)	(377.187, -831.773)
(0., 0.)	(124.471, -373.373)	(201.79, -880.551)	(372.011, -833.305)
(0., 0.)	(123.298, -374.28)	(195.467, -881.789)	(366.362, -835.055)
(0., 0.)	(121.727, -375.402)	(188.997, -882.872)	(360.728, -836.998)
(0., 0.)	(119.729, -376.695)	(182.867, -883.694)	(355.54, -838.801)
(0., 0.)	(117.323, -378.076)	(177.192, -884.22)	(350.741, -840.244)
(0., 0.)	(114.564, -379.44)	(171.73, -884.341)	(345.993, -841.413)
(0., 0.)	(111.556, -380.675)	(166.191, -884.079)	(341.078, -842.624)
(0., 0.)	(108.472, -381.722)	(160.445, -883.646)	(335.935, -844.085)
(0., 0.)	(105.516, -382.596)	(154.539, -883.239)	(330.537, -845.821)
(0., 0.)	(102.841, -383.35)	(148.541, -882.864)	(324.955, -847.71)
(0., 0.)	(100.47, -384.034)	(142.469, -882.468)	(319.306, -849.72)
(0., 0.)	(98.304, -384.692)	(136.346, -882.135)	(313.65, -851.979)
(0., 0.)	(96.176, -385.374)	(130.183, -881.988)	(307.963, -854.516)
(0., 0.)	(93.989, -386.107)	(123.998, -882.057)	(302.208, -857.122)
(0., 0.)	(91.788, -386.936)	(117.802, -882.296)	(296.396, -859.657)
(0., 0.)	(89.698, -387.9)	(111.593, -882.664)	(290.555, -862.142)
(0., 0.)	(87.79, -389.)	(105.392, -883.162)	(284.735, -864.579)
(0., 0.)	(86.035, -390.203)	(99.223, -883.827)	(278.91, -866.887)
(0., 0.)	(84.363, -391.436)	(93.072, -884.648)	(273.023, -869.06)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(82.678, -392.639)	(86.889, -885.548)	(267.093, -871.154)
(0., 0.)	(80.87, -393.794)	(80.645, -886.433)	(261.183, -873.183)
(0., 0.)	(78.823, -394.864)	(74.359, -887.239)	(255.214, -875.034)
(0., 0.)	(76.463, -395.841)	(68.044, -887.935)	(249.047, -876.562)
(0., 0.)	(73.8, -396.744)	(61.713, -888.504)	(242.717, -877.826)
(0., 0.)	(70.928, -397.561)	(55.388, -888.931)	(236.44, -879.015)
(0., 0.)	(67.979, -398.269)	(49.093, -889.218)	(230.298, -880.167)
(0., 0.)	(65.059, -398.867)	(42.862, -889.367)	(224.258, -881.213)
(0., 0.)	(62.252, -399.374)	(36.748, -889.406)	(218.345, -882.136)
(0., 0.)	(59.607, -399.8)	(30.78, -889.356)	(212.564, -882.919)
(0., 0.)	(57.16, -400.174)	(24.933, -889.228)	(206.893, -883.518)
(0., 0.)	(54.935, -400.555)	(19.253, -889.169)	(201.342, -884.013)
(0., 0.)	(52.894, -400.958)	(13.744, -889.221)	(195.878, -884.475)
(0., 0.)	(50.953, -401.365)	(8.342, -889.265)	(190.501, -884.918)
(0., 0.)	(49.038, -401.795)	(3., -889.222)	(185.264, -885.361)
(0., 0.)	(47.106, -402.263)	(-2.305, -889.1)	(180.086, -885.729)
(0., 0.)	(45.141, -402.751)	(-7.553, -888.944)	(174.888, -885.971)
(0., 0.)	(43.115, -403.22)	(-12.71, -888.796)	(169.777, -886.216)
(0., 0.)	(41.007, -403.611)	(-17.761, -888.681)	(164.836, -886.51)
(0., 0.)	(38.837, -403.935)	(-22.718, -888.594)	(160.017, -886.788)
(0., 0.)	(36.639, -404.22)	(-27.583, -888.514)	(155.287, -887.071)
(0., 0.)	(34.435, -404.469)	(-32.327, -888.436)	(150.649, -887.369)
(0., 0.)	(32.232, -404.71)	(-36.927, -888.349)	(146.12, -887.666)
(0., 0.)	(30.046, -404.948)	(-41.375, -888.234)	(141.724, -887.947)
(0., 0.)	(27.852, -405.106)	(-45.683, -888.08)	(137.423, -888.114)
(0., 0.)	(25.66, -405.153)	(-49.873, -887.908)	(133.218, -888.166)
(0., 0.)	(23.594, -405.175)	(-53.938, -887.751)	(129.216, -888.227)
(0., 0.)	(21.762, -405.255)	(-57.844, -887.599)	(125.419, -888.33)
(0., 0.)	(20.14, -405.369)	(-61.59, -887.389)	(121.708, -888.393)
(0., 0.)	(18.65, -405.444)	(-65.232, -887.12)	(118.045, -888.424)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(17.257, -405.462)	(-68.823, -886.849)	(114.456, -888.48)
(0., 0.)	(15.944, -405.481)	(-72.388, -886.596)	(110.895, -888.507)
(0., 0.)	(14.691, -405.554)	(-75.932, -886.335)	(107.334, -888.5)
(0., 0.)	(13.451, -405.662)	(-79.47, -886.049)	(103.805, -888.523)
(0., 0.)	(12.177, -405.758)	(-83.038, -885.736)	(100.261, -888.52)
(0., 0.)	(10.861, -405.801)	(-86.671, -885.403)	(96.643, -888.428)
(0., 0.)	(9.52, -405.808)	(-90.384, -885.057)	(92.946, -888.263)
(0., 0.)	(8.159, -405.816)	(-94.166, -884.695)	(89.081, -887.954)
(0., 0.)	(6.759, -405.816)	(-97.989, -884.306)	(85.045, -887.469)
(0., 0.)	(5.311, -405.796)	(-101.824, -883.897)	(81.104, -887.108)
(0., 0.)	(3.824, -405.763)	(-105.69, -883.478)	(77.308, -886.981)
(0., 0.)	(2.309, -405.712)	(-109.612, -883.079)	(73.463, -886.876)
(0., 0.)	(0.774, -405.632)	(-113.578, -882.722)	(69.504, -886.691)
(0., 0.)	(-0.767, -405.524)	(-117.572, -882.397)	(65.503, -886.521)
(0., 0.)	(-2.312, -405.394)	(-121.6, -882.062)	(61.478, -886.376)
(0., 0.)	(-3.882, -405.242)	(-125.66, -881.696)	(57.409, -886.159)
(0., 0.)	(-5.502, -405.085)	(-129.742, -881.294)	(53.308, -885.871)
(0., 0.)	(-7.184, -404.929)	(-133.845, -880.865)	(49.171, -885.604)
(0., 0.)	(-8.93, -404.749)	(-137.981, -880.425)	(44.95, -885.361)
(0., 0.)	(-10.758, -404.52)	(-142.156, -879.97)	(40.687, -885.1)
(0., 0.)	(-12.668, -404.24)	(-146.358, -879.493)	(36.441, -884.822)
(0., 0.)	(-14.616, -403.907)	(-150.562, -878.978)	(32.186, -884.502)
(0., 0.)	(-16.547, -403.527)	(-154.74, -878.453)	(27.927, -884.137)
(0., 0.)	(-18.431, -403.124)	(-158.897, -877.937)	(23.733, -883.806)
(0., 0.)	(-20.244, -402.727)	(-163.034, -877.413)	(19.602, -883.514)
(0., 0.)	(-21.989, -402.357)	(-167.151, -876.857)	(15.454, -883.171)
(0., 0.)	(-23.709, -402.)	(-171.253, -876.301)	(11.26, -882.778)
(0., 0.)	(-25.457, -401.622)	(-175.368, -875.792)	(7.074, -882.443)
(0., 0.)	(-27.271, -401.196)	(-179.53, -875.319)	(2.908, -882.191)
(0., 0.)	(-29.162, -400.722)	(-183.737, -874.823)	(-1.286, -881.941)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-31.078, -400.255)	(-187.965, -874.255)	(-5.557, -881.644)
(0., 0.)	(-32.963, -399.816)	(-192.186, -873.616)	(-9.905, -881.297)
(0., 0.)	(-34.788, -399.383)	(-196.392, -872.918)	(-14.283, -880.935)
(0., 0.)	(-36.555, -398.94)	(-200.599, -872.196)	(-18.626, -880.673)
(0., 0.)	(-38.263, -398.506)	(-204.844, -871.473)	(-22.936, -880.533)
(0., 0.)	(-39.929, -398.117)	(-209.121, -870.754)	(-27.288, -880.4)
(0., 0.)	(-41.586, -397.792)	(-213.386, -869.991)	(-31.714, -880.192)
(0., 0.)	(-43.241, -397.537)	(-217.611, -869.173)	(-36.147, -879.997)
(0., 0.)	(-44.874, -397.324)	(-221.811, -868.318)	(-40.526, -879.939)
(0., 0.)	(-46.465, -397.095)	(-226.01, -867.439)	(-44.869, -880.032)
(0., 0.)	(-48.011, -396.828)	(-230.213, -866.58)	(-49.246, -880.203)
(0., 0.)	(-49.522, -396.589)	(-234.449, -865.747)	(-53.716, -880.394)
(0., 0.)	(-51.015, -396.417)	(-238.735, -864.898)	(-58.274, -880.586)
(0., 0.)	(-52.506, -396.275)	(-243.044, -864.023)	(-62.86, -880.803)
(0., 0.)	(-53.998, -396.099)	(-247.358, -863.113)	(-67.424, -881.071)
(0., 0.)	(-55.473, -395.888)	(-251.72, -862.163)	(-72.039, -881.349)
(0., 0.)	(-56.901, -395.711)	(-256.154, -861.207)	(-76.792, -881.631)
(0., 0.)	(-58.259, -395.587)	(-260.63, -860.247)	(-81.672, -881.976)
(0., 0.)	(-59.55, -395.467)	(-265.135, -859.226)	(-86.605, -882.35)
(0., 0.)	(-60.813, -395.287)	(-269.712, -858.111)	(-91.572, -882.65)
(0., 0.)	(-62.104, -395.032)	(-274.373, -856.904)	(-96.62, -882.83)
(0., 0.)	(-63.473, -394.728)	(-279.102, -855.589)	(-101.827, -882.954)
(0., 0.)	(-64.932, -394.409)	(-283.92, -854.164)	(-107.222, -883.098)
(0., 0.)	(-66.446, -394.034)	(-288.879, -852.634)	(-112.747, -883.239)
(0., 0.)	(-67.961, -393.552)	(-293.98, -851.01)	(-118.352, -883.313)
(0., 0.)	(-69.436, -393.008)	(-299.157, -849.285)	(-124.075, -883.339)
(0., 0.)	(-70.831, -392.48)	(-304.358, -847.465)	(-129.988, -883.367)
(0., 0.)	(-72.11, -391.995)	(-309.592, -845.559)	(-136.072, -883.412)
(0., 0.)	(-73.27, -391.515)	(-314.881, -843.555)	(-142.242, -883.478)
(0., 0.)	(-74.343, -390.986)	(-320.212, -841.429)	(-148.452, -883.565)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-75.327, -390.413)	(-325.558, -839.192)	(-154.732, -883.659)
(0., 0.)	(-76.171, -389.842)	(-330.903, -836.876)	(-161.11, -883.738)
(0., 0.)	(-76.841, -389.3)	(-336.253, -834.51)	(-167.581, -883.821)
(0., 0.)	(-77.312, -388.803)	(-341.597, -832.064)	(-174.118, -883.963)
(0., 0.)	(-77.578, -388.353)	(-346.897, -829.481)	(-180.702, -884.14)
(0., 0.)	(-77.657, -387.931)	(-352.116, -826.765)	(-187.283, -884.269)
(0., 0.)	(-77.561, -387.537)	(-357.223, -823.989)	(-193.799, -884.364)
(0., 0.)	(-77.294, -387.197)	(-362.215, -821.158)	(-200.28, -884.489)
(0., 0.)	(-76.839, -386.914)	(-367.078, -818.235)	(-206.767, -884.69)
(0., 0.)	(-76.164, -386.688)	(-371.79, -815.208)	(-213.226, -884.989)
(0., 0.)	(-75.258, -386.523)	(-376.331, -812.044)	(-219.625, -885.295)
(0., 0.)	(-74.153, -386.394)	(-380.685, -808.715)	(-225.944, -885.477)
(0., 0.)	(-72.866, -386.259)	(-384.827, -805.196)	(-232.154, -885.487)
(0., 0.)	(-71.345, -386.124)	(-388.718, -801.424)	(-238.245, -885.322)
(0., 0.)	(-69.509, -386.037)	(-392.312, -797.357)	(-244.183, -885.064)
(0., 0.)	(-67.333, -386.032)	(-395.57, -792.971)	(-249.937, -884.692)
(0., 0.)	(-64.834, -386.094)	(-398.468, -788.289)	(-255.508, -884.129)
(0., 0.)	(-61.997, -386.22)	(-400.984, -783.327)	(-260.945, -883.289)
(0., 0.)	(-58.748, -386.464)	(-403.086, -778.06)	(-266.164, -882.11)
(0., 0.)	(-54.973, -386.864)	(-404.702, -772.441)	(-271.054, -880.677)
(0., 0.)	(-50.613, -387.417)	(-405.746, -766.455)	(-275.613, -879.109)
(0., 0.)	(-45.705, -388.086)	(-406.173, -760.14)	(-279.895, -877.391)
(0., 0.)	(-40.352, -388.815)	(-405.949, -753.537)	(-283.913, -875.467)
(0., 0.)	(-34.649, -389.544)	(-404.997, -746.622)	(-287.562, -873.253)
(0., 0.)	(-28.645, -390.246)	(-403.211, -739.361)	(-290.704, -870.705)
(0., 0.)	(-22.35, -390.902)	(-400.515, -731.802)	(-293.264, -867.877)
(0., 0.)	(-15.748, -391.464)	(-396.906, -724.047)	(-295.218, -864.854)
(0., 0.)	(-8.861, -391.822)	(-392.424, -716.214)	(-296.601, -861.693)
(0., 0.)	(-1.758, -391.921)	(-387.188, -708.451)	(-297.581, -858.457)
(0., 0.)	(5.509, -391.895)	(-381.373, -700.947)	(-298.348, -855.2)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(12.886, -391.852)	(-375.095, -693.823)	(-298.833, -851.994)
(0., 0.)	(20.275, -391.7)	(-368.432, -687.096)	(-298.918, -848.936)
(0., 0.)	(27.657, -391.301)	(-361.481, -680.837)	(-298.674, -846.092)
(0., 0.)	(35.088, -390.604)	(-354.337, -675.154)	(-298.309, -843.502)
(0., 0.)	(42.62, -389.663)	(-347.057, -670.064)	(-297.956, -841.216)
(0., 0.)	(50.223, -388.535)	(-339.722, -665.54)	(-297.517, -839.101)
(0., 0.)	(57.781, -387.191)	(-332.518, -661.671)	(-296.356, -836.899)
(0., 0.)	(65.193, -385.629)	(-325.678, -658.673)	(-293.375, -834.694)
(0., 0.)	(72.382, -383.94)	(-319.275, -656.833)	(-287.656, -832.919)
(0., 0.)	(79.278, -382.249)	(-313.131, -656.349)	(-278.831, -831.898)
(0., 0.)	(85.859, -380.618)	(-306.969, -657.277)	(-267.051, -831.689)
(0., 0.)	(92.15, -379.011)	(-300.527, -659.538)	(-252.857, -832.161)
(0., 0.)	(98.182, -377.356)	(-293.614, -662.946)	(-236.837, -833.065)
(0., 0.)	(103.988, -375.674)	(-286.11, -667.29)	(-219.444, -834.072)
(0., 0.)	(109.579, -374.052)	(-277.986, -672.444)	(-201.096, -834.982)
(0., 0.)	(114.937, -372.543)	(-269.329, -678.391)	(-182.239, -835.827)
(0., 0.)	(120.057, -371.144)	(-260.23, -685.164)	(-163.347, -836.792)
(0., 0.)	(124.96, -369.863)	(-250.686, -692.79)	(-144.752, -838.172)
(0., 0.)	(129.651, -368.733)	(-240.616, -701.246)	(-126.52, -840.182)
(0., 0.)	(134.107, -367.758)	(-229.896, -710.401)	(-108.502, -842.835)
(0., 0.)	(138.296, -366.942)	(-218.404, -720.048)	(-90.411, -845.969)
(0., 0.)	(142.159, -366.286)	(-206.064, -729.993)	(-72.004, -849.383)
(0., 0.)	(145.599, -365.726)	(-192.893, -740.113)	(-53.14, -852.757)
(0., 0.)	(148.535, -365.2)	(-178.996, -750.366)	(-33.775, -855.767)
(0., 0.)	(150.939, -364.678)	(-164.447, -760.713)	(-14.002, -858.312)
(0., 0.)	(152.865, -364.174)	(-149.24, -771.118)	(6.053, -860.57)
(0., 0.)	(154.409, -363.759)	(-133.384, -781.54)	(26.297, -862.833)
(0., 0.)	(155.591, -363.491)	(-116.918, -791.887)	(46.691, -865.222)
(0., 0.)	(156.329, -363.405)	(-99.869, -802.097)	(67.233, -867.711)
(0., 0.)	(156.571, -363.583)	(-82.272, -812.039)	(87.883, -870.114)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(156.275, -364.027)	(-64.234, -821.517)	(108.527, -872.099)
(0., 0.)	(155.454, -364.664)	(-45.908, -830.36)	(129.076, -873.497)
(0., 0.)	(154.253, -365.489)	(-27.417, -838.461)	(149.448, -874.397)
(0., 0.)	(152.88, -366.553)	(-8.858, -845.713)	(169.445, -874.901)
(0., 0.)	(151.425, -367.784)	(9.67, -852.078)	(188.963, -875.049)
(0., 0.)	(149.874, -369.097)	(28.08, -857.594)	(208.101, -874.914)
(0., 0.)	(148.167, -370.488)	(46.316, -862.302)	(226.885, -874.579)
(0., 0.)	(146.271, -371.991)	(64.292, -866.207)	(245.211, -874.196)
(0., 0.)	(144.256, -373.557)	(81.926, -869.33)	(263.027, -873.948)
(0., 0.)	(142.296, -374.939)	(99.188, -871.788)	(280.333, -873.86)
(0., 0.)	(140.603, -375.859)	(116.02, -873.656)	(297.11, -873.863)
(0., 0.)	(139.274, -376.241)	(132.207, -874.805)	(313.203, -873.777)
(0., 0.)	(138.262, -376.225)	(147.548, -875.143)	(328.396, -873.262)
(0., 0.)	(137.533, -375.951)	(161.934, -874.771)	(342.602, -871.795)
(0., 0.)	(137.116, -375.467)	(175.301, -873.94)	(355.777, -868.89)
(0., 0.)	(137.012, -374.742)	(187.664, -872.941)	(367.836, -864.205)
(0., 0.)	(137.166, -373.745)	(199.097, -871.973)	(378.661, -857.797)
(0., 0.)	(137.53, -372.529)	(209.655, -871.112)	(388.144, -850.221)
(0., 0.)	(138.048, -371.216)	(219.295, -870.308)	(396.28, -842.245)
(0., 0.)	(138.599, -370.)	(227.909, -869.492)	(403.149, -834.719)
(0., 0.)	(139., -369.016)	(235.411, -868.629)	(408.831, -828.322)
(0., 0.)	(139.098, -368.253)	(241.792, -867.843)	(413.408, -823.322)
(0., 0.)	(138.899, -367.661)	(247.07, -867.385)	(416.923, -819.614)
(0., 0.)	(138.544, -367.195)	(251.109, -867.315)	(419.251, -816.976)
(0., 0.)	(138.203, -366.792)	(253.657, -867.431)	(420.228, -815.211)
(0., 0.)	(137.999, -366.439)	(254.62, -867.671)	(419.867, -814.186)
(0., 0.)	(137.983, -366.204)	(254.053, -868.103)	(418.327, -813.885)
(0., 0.)	(138.109, -366.183)	(252.095, -868.783)	(415.744, -814.301)
(0., 0.)	(138.235, -366.414)	(248.884, -869.748)	(412.192, -815.362)
(0., 0.)	(138.19, -366.873)	(244.538, -871.062)	(407.729, -816.961)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(137.848, -367.539)	(239.105, -872.683)	(402.48, -819.006)
(0., 0.)	(137.14, -368.383)	(232.566, -874.366)	(396.62, -821.409)
(0., 0.)	(136.023, -369.412)	(225.068, -875.952)	(390.292, -824.093)
(0., 0.)	(134.465, -370.662)	(217.124, -877.569)	(383.689, -826.954)
(0., 0.)	(132.453, -372.127)	(209.392, -879.23)	(377.255, -829.686)
(0., 0.)	(130.011, -373.75)	(202.395, -880.674)	(371.487, -831.787)
(0., 0.)	(127.193, -375.459)	(196.207, -881.604)	(366.374, -833.109)
(0., 0.)	(124.079, -377.182)	(190.518, -881.84)	(361.551, -834.136)
(0., 0.)	(120.762, -378.791)	(184.938, -881.519)	(356.781, -835.565)
(0., 0.)	(117.369, -380.124)	(179.252, -881.049)	(351.929, -837.565)
(0., 0.)	(114.102, -381.12)	(173.412, -880.695)	(346.811, -839.742)
(0., 0.)	(111.159, -381.855)	(167.446, -880.429)	(341.349, -841.696)
(0., 0.)	(108.647, -382.457)	(161.43, -880.126)	(335.719, -843.424)
(0., 0.)	(106.515, -383.034)	(155.422, -879.799)	(330.122, -845.267)
(0., 0.)	(104.565, -383.678)	(149.432, -879.58)	(324.597, -847.423)
(0., 0.)	(102.57, -384.415)	(143.46, -879.589)	(319.088, -849.778)
(0., 0.)	(100.445, -385.223)	(137.558, -879.911)	(313.567, -852.169)
(0., 0.)	(98.26, -386.087)	(131.749, -880.533)	(308.058, -854.576)
(0., 0.)	(96.15, -386.979)	(125.984, -881.323)	(302.584, -857.032)
(0., 0.)	(94.207, -387.898)	(120.199, -882.16)	(297.139, -859.541)
(0., 0.)	(92.461, -388.874)	(114.387, -883.017)	(291.677, -862.02)
(0., 0.)	(90.876, -389.896)	(108.574, -883.929)	(286.155, -864.383)
(0., 0.)	(89.33, -390.905)	(102.756, -884.908)	(280.56, -866.581)
(0., 0.)	(87.683, -391.903)	(96.894, -885.9)	(274.885, -868.575)
(0., 0.)	(85.844, -392.908)	(90.969, -886.798)	(269.147, -870.354)
(0., 0.)	(83.761, -393.908)	(84.994, -887.54)	(263.392, -872.01)
(0., 0.)	(81.417, -394.863)	(79.002, -888.141)	(257.685, -873.647)
(0., 0.)	(78.852, -395.731)	(73.017, -888.638)	(251.964, -875.166)
(0., 0.)	(76.129, -396.491)	(67.063, -889.048)	(246.122, -876.403)
(0., 0.)	(73.317, -397.139)	(61.156, -889.392)	(240.225, -877.432)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(70.506, -397.709)	(55.296, -889.659)	(234.429, -878.42)
(0., 0.)	(67.77, -398.231)	(49.499, -889.843)	(228.802, -879.432)
(0., 0.)	(65.163, -398.733)	(43.803, -889.978)	(223.318, -880.438)
(0., 0.)	(62.707, -399.213)	(38.247, -890.114)	(217.93, -881.396)
(0., 0.)	(60.382, -399.684)	(32.843, -890.269)	(212.64, -882.305)
(0., 0.)	(58.136, -400.17)	(27.562, -890.415)	(207.443, -883.129)
(0., 0.)	(55.943, -400.689)	(22.337, -890.489)	(202.358, -883.843)
(0., 0.)	(53.826, -401.231)	(17.106, -890.427)	(197.348, -884.396)
(0., 0.)	(51.791, -401.74)	(11.9, -890.278)	(192.366, -884.777)
(0., 0.)	(49.812, -402.196)	(6.85, -890.229)	(187.445, -885.092)
(0., 0.)	(47.859, -402.579)	(1.999, -890.32)	(182.608, -885.431)
(0., 0.)	(45.953, -402.891)	(-2.715, -890.431)	(177.835, -885.787)
(0., 0.)	(44.095, -403.176)	(-7.372, -890.466)	(173.121, -886.076)
(0., 0.)	(42.244, -403.474)	(-11.993, -890.445)	(168.508, -886.286)
(0., 0.)	(40.34, -403.737)	(-16.559, -890.404)	(164.008, -886.471)
(0., 0.)	(38.383, -403.927)	(-21.048, -890.326)	(159.594, -886.658)
(0., 0.)	(36.452, -404.087)	(-25.431, -890.22)	(155.234, -886.797)
(0., 0.)	(34.599, -404.281)	(-29.679, -890.145)	(150.987, -886.915)
(0., 0.)	(32.813, -404.5)	(-33.787, -890.105)	(146.915, -887.044)
(0., 0.)	(31.065, -404.7)	(-37.774, -890.045)	(142.984, -887.176)
(0., 0.)	(29.334, -404.853)	(-41.665, -889.939)	(139.105, -887.275)
(0., 0.)	(27.638, -404.965)	(-45.478, -889.809)	(135.283, -887.374)
(0., 0.)	(26.015, -405.051)	(-49.23, -889.682)	(131.591, -887.541)
(0., 0.)	(24.48, -405.138)	(-52.919, -889.555)	(128.012, -887.706)
(0., 0.)	(23.029, -405.234)	(-56.548, -889.406)	(124.441, -887.781)
(0., 0.)	(21.641, -405.296)	(-60.134, -889.181)	(120.875, -887.804)
(0., 0.)	(20.296, -405.286)	(-63.708, -888.849)	(117.384, -887.848)
(0., 0.)	(19.017, -405.236)	(-67.291, -888.441)	(113.938, -887.86)
(0., 0.)	(17.832, -405.232)	(-70.876, -888.016)	(110.445, -887.792)
(0., 0.)	(16.686, -405.301)	(-74.461, -887.605)	(106.89, -887.713)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(15.529, -405.412)	(-78.071, -887.192)	(103.265, -887.609)
(0., 0.)	(14.358, -405.538)	(-81.743, -886.75)	(99.485, -887.284)
(0., 0.)	(13.169, -405.661)	(-85.495, -886.292)	(95.56, -886.77)
(0., 0.)	(11.921, -405.755)	(-89.299, -885.866)	(91.695, -886.446)
(0., 0.)	(10.582, -405.807)	(-93.123, -885.496)	(87.93, -886.362)
(0., 0.)	(9.163, -405.839)	(-96.995, -885.152)	(84.144, -886.282)
(0., 0.)	(7.677, -405.849)	(-100.929, -884.782)	(80.271, -886.122)
(0., 0.)	(6.108, -405.823)	(-104.893, -884.386)	(76.329, -885.943)
(0., 0.)	(4.44, -405.754)	(-108.845, -883.988)	(72.377, -885.755)
(0., 0.)	(2.693, -405.659)	(-112.769, -883.594)	(68.457, -885.525)
(0., 0.)	(0.925, -405.527)	(-116.69, -883.183)	(64.544, -885.277)
(0., 0.)	(-0.82, -405.366)	(-120.623, -882.742)	(60.585, -885.035)
(0., 0.)	(-2.531, -405.211)	(-124.545, -882.29)	(56.589, -884.805)
(0., 0.)	(-4.214, -405.091)	(-128.42, -881.858)	(52.642, -884.605)
(0., 0.)	(-5.856, -404.991)	(-132.246, -881.469)	(48.793, -884.447)
(0., 0.)	(-7.415, -404.856)	(-136.042, -881.086)	(44.992, -884.299)
(0., 0.)	(-8.87, -404.654)	(-139.813, -880.643)	(41.179, -884.106)
(0., 0.)	(-10.234, -404.411)	(-143.547, -880.128)	(37.388, -883.9)
(0., 0.)	(-11.542, -404.155)	(-147.253, -879.608)	(33.664, -883.724)
(0., 0.)	(-12.848, -403.899)	(-150.961, -879.156)	(29.97, -883.542)
(0., 0.)	(-14.199, -403.636)	(-154.694, -878.761)	(26.225, -883.29)
(0., 0.)	(-15.615, -403.346)	(-158.444, -878.376)	(22.423, -883.037)
(0., 0.)	(-17.091, -403.023)	(-162.201, -877.942)	(18.596, -882.831)
(0., 0.)	(-18.591, -402.713)	(-165.97, -877.446)	(14.75, -882.618)
(0., 0.)	(-20.083, -402.439)	(-169.755, -876.906)	(10.893, -882.377)
(0., 0.)	(-21.582, -402.188)	(-173.563, -876.333)	(7.044, -882.155)
(0., 0.)	(-23.129, -401.92)	(-177.39, -875.757)	(3.179, -881.917)
(0., 0.)	(-24.744, -401.623)	(-181.246, -875.212)	(-0.739, -881.592)
(0., 0.)	(-26.412, -401.305)	(-185.133, -874.708)	(-4.689, -881.221)
(0., 0.)	(-28.102, -400.966)	(-189.033, -874.201)	(-8.634, -880.934)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-29.805, -400.617)	(-192.944, -873.628)	(-12.599, -880.734)
(0., 0.)	(-31.518, -400.299)	(-196.878, -872.99)	(-16.631, -880.564)
(0., 0.)	(-33.24, -400.044)	(-200.841, -872.319)	(-20.718, -880.415)
(0., 0.)	(-34.985, -399.828)	(-204.828, -871.667)	(-24.849, -880.304)
(0., 0.)	(-36.76, -399.573)	(-208.861, -871.062)	(-29.05, -880.191)
(0., 0.)	(-38.556, -399.243)	(-212.967, -870.493)	(-33.306, -880.089)
(0., 0.)	(-40.357, -398.875)	(-217.143, -869.9)	(-37.568, -880.045)
(0., 0.)	(-42.15, -398.51)	(-221.357, -869.21)	(-41.851, -880.017)
(0., 0.)	(-43.9, -398.161)	(-225.603, -868.402)	(-46.221, -879.907)
(0., 0.)	(-45.583, -397.82)	(-229.925, -867.503)	(-50.728, -879.729)
(0., 0.)	(-47.205, -397.463)	(-234.33, -866.545)	(-55.369, -879.575)
(0., 0.)	(-48.791, -397.094)	(-238.8, -865.513)	(-60.103, -879.496)
(0., 0.)	(-50.335, -396.788)	(-243.306, -864.427)	(-64.891, -879.494)
(0., 0.)	(-51.83, -396.564)	(-247.843, -863.289)	(-69.711, -879.544)
(0., 0.)	(-53.317, -396.343)	(-252.429, -862.071)	(-74.577, -879.616)
(0., 0.)	(-54.866, -396.046)	(-257.066, -860.793)	(-79.54, -879.697)
(0., 0.)	(-56.496, -395.679)	(-261.754, -859.517)	(-84.645, -879.817)
(0., 0.)	(-58.17, -395.295)	(-266.526, -858.226)	(-89.887, -879.97)
(0., 0.)	(-59.851, -394.911)	(-271.423, -856.856)	(-95.251, -880.181)
(0., 0.)	(-61.536, -394.494)	(-276.427, -855.386)	(-100.75, -880.484)
(0., 0.)	(-63.203, -394.034)	(-281.498, -853.858)	(-106.378, -880.847)
(0., 0.)	(-64.813, -393.572)	(-286.64, -852.291)	(-112.142, -881.189)
(0., 0.)	(-66.35, -393.158)	(-291.887, -850.627)	(-118.066, -881.517)
(0., 0.)	(-67.792, -392.802)	(-297.242, -848.815)	(-124.164, -881.893)
(0., 0.)	(-69.098, -392.467)	(-302.672, -846.866)	(-130.445, -882.309)
(0., 0.)	(-70.264, -392.104)	(-308.144, -844.826)	(-136.875, -882.695)
(0., 0.)	(-71.323, -391.715)	(-313.663, -842.723)	(-143.403, -883.002)
(0., 0.)	(-72.289, -391.334)	(-319.26, -840.542)	(-150.008, -883.265)
(0., 0.)	(-73.137, -390.979)	(-324.926, -838.253)	(-156.714, -883.549)
(0., 0.)	(-73.833, -390.609)	(-330.595, -835.859)	(-163.534, -883.885)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-74.364, -390.187)	(-336.204, -833.378)	(-170.437, -884.26)
(0., 0.)	(-74.744, -389.759)	(-341.747, -830.815)	(-177.37, -884.645)
(0., 0.)	(-74.984, -389.407)	(-347.247, -828.182)	(-184.304, -885.027)
(0., 0.)	(-75.09, -389.152)	(-352.687, -825.495)	(-191.211, -885.436)
(0., 0.)	(-75.047, -388.945)	(-357.998, -822.716)	(-198.054, -885.866)
(0., 0.)	(-74.835, -388.774)	(-363.155, -819.828)	(-204.844, -886.283)
(0., 0.)	(-74.448, -388.673)	(-368.162, -816.859)	(-211.595, -886.669)
(0., 0.)	(-73.881, -388.6)	(-372.994, -813.808)	(-218.275, -886.972)
(0., 0.)	(-73.101, -388.486)	(-377.571, -810.557)	(-224.795, -887.139)
(0., 0.)	(-72.018, -388.324)	(-381.786, -807.001)	(-231.069, -887.165)
(0., 0.)	(-70.527, -388.188)	(-385.592, -803.132)	(-237.065, -887.091)
(0., 0.)	(-68.535, -388.157)	(-389.001, -798.939)	(-242.809, -886.819)
(0., 0.)	(-65.996, -388.251)	(-392.005, -794.406)	(-248.343, -886.244)
(0., 0.)	(-62.942, -388.439)	(-394.551, -789.564)	(-253.602, -885.422)
(0., 0.)	(-59.409, -388.706)	(-396.587, -784.425)	(-258.559, -884.425)
(0., 0.)	(-55.347, -389.095)	(-398.068, -778.966)	(-263.231, -883.187)
(0., 0.)	(-50.686, -389.655)	(-398.96, -773.161)	(-267.648, -881.729)
(0., 0.)	(-45.426, -390.344)	(-399.216, -767.028)	(-271.823, -880.112)
(0., 0.)	(-39.652, -391.082)	(-398.792, -760.57)	(-275.698, -878.284)
(0., 0.)	(-33.485, -391.822)	(-397.645, -753.761)	(-279.141, -876.188)
(0., 0.)	(-27.015, -392.525)	(-395.694, -746.607)	(-282.025, -873.816)
(0., 0.)	(-20.281, -393.132)	(-392.861, -739.151)	(-284.294, -871.147)
(0., 0.)	(-13.253, -393.586)	(-389.119, -731.471)	(-285.995, -868.173)
(0., 0.)	(-5.935, -393.846)	(-384.552, -723.733)	(-287.205, -864.994)
(0., 0.)	(1.588, -393.897)	(-379.337, -716.117)	(-288.04, -861.77)
(0., 0.)	(9.233, -393.783)	(-373.645, -708.765)	(-288.543, -858.622)
(0., 0.)	(16.963, -393.561)	(-367.514, -701.713)	(-288.65, -855.437)
(0., 0.)	(24.744, -393.201)	(-360.903, -694.961)	(-288.3, -852.187)
(0., 0.)	(32.502, -392.594)	(-353.886, -688.549)	(-287.47, -849.054)
(0., 0.)	(40.146, -391.673)	(-346.707, -682.61)	(-286.219, -846.204)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(47.581, -390.49)	(-339.676, -677.37)	(-284.496, -843.512)
(0., 0.)	(54.744, -389.152)	(-333.08, -673.079)	(-281.679, -840.731)
(0., 0.)	(61.631, -387.729)	(-327.063, -669.952)	(-276.798, -837.898)
(0., 0.)	(68.263, -386.251)	(-321.5, -668.115)	(-269.377, -835.341)
(0., 0.)	(74.669, -384.751)	(-316.062, -667.576)	(-259.644, -833.33)
(0., 0.)	(80.838, -383.251)	(-310.383, -668.25)	(-248.098, -831.945)
(0., 0.)	(86.705, -381.755)	(-304.243, -670.068)	(-235.26, -831.156)
(0., 0.)	(92.266, -380.294)	(-297.562, -673.026)	(-221.615, -831.086)
(0., 0.)	(97.557, -378.897)	(-290.303, -677.049)	(-207.559, -831.882)
(0., 0.)	(102.604, -377.572)	(-282.46, -682.004)	(-193.32, -833.546)
(0., 0.)	(107.41, -376.33)	(-274.058, -687.821)	(-178.931, -836.002)
(0., 0.)	(111.963, -375.194)	(-265.149, -694.454)	(-164.31, -839.174)
(0., 0.)	(116.221, -374.183)	(-255.757, -701.888)	(-149.227, -842.938)
(0., 0.)	(120.135, -373.335)	(-245.855, -710.13)	(-133.418, -847.047)
(0., 0.)	(123.695, -372.697)	(-235.411, -719.119)	(-116.804, -851.227)
(0., 0.)	(126.89, -372.267)	(-224.39, -728.721)	(-99.469, -855.309)
(0., 0.)	(129.711, -371.985)	(-212.745, -738.774)	(-81.578, -859.265)
(0., 0.)	(132.197, -371.791)	(-200.463, -749.186)	(-63.226, -863.078)
(0., 0.)	(134.379, -371.635)	(-187.575, -759.856)	(-44.497, -866.668)
(0., 0.)	(136.228, -371.492)	(-174.122, -770.631)	(-25.542, -869.978)
(0., 0.)	(137.707, -371.348)	(-160.13, -781.37)	(-6.519, -872.926)
(0., 0.)	(138.809, -371.233)	(-145.611, -791.92)	(12.465, -875.553)
(0., 0.)	(139.547, -371.226)	(-130.562, -802.101)	(31.384, -877.993)
(0., 0.)	(139.915, -371.402)	(-114.973, -811.76)	(50.262, -880.279)
(0., 0.)	(139.902, -371.783)	(-98.876, -820.822)	(69.2, -882.262)
(0., 0.)	(139.503, -372.348)	(-82.375, -829.311)	(88.251, -883.831)
(0., 0.)	(138.763, -373.103)	(-65.583, -837.286)	(107.268, -884.816)
(0., 0.)	(137.752, -374.078)	(-48.646, -844.777)	(126.063, -884.985)
(0., 0.)	(136.553, -375.229)	(-31.676, -851.761)	(144.664, -884.471)
(0., 0.)	(135.269, -376.467)	(-14.742, -858.141)	(163.065, -883.532)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(134.034, -377.684)	(2.092, -863.745)	(180.951, -882.104)
(0., 0.)	(132.983, -378.755)	(18.726, -868.499)	(198.168, -880.236)
(0., 0.)	(132.186, -379.592)	(35.059, -872.491)	(214.789, -878.199)
(0., 0.)	(131.607, -380.188)	(50.98, -875.844)	(230.819, -876.25)
(0., 0.)	(131.189, -380.569)	(66.398, -878.559)	(246.204, -874.446)
(0., 0.)	(130.861, -380.778)	(81.274, -880.583)	(260.93, -872.779)
(0., 0.)	(130.572, -380.887)	(95.653, -882.011)	(275.073, -871.316)
(0., 0.)	(130.335, -380.915)	(109.544, -882.972)	(288.679, -870.117)
(0., 0.)	(130.194, -380.817)	(122.783, -883.386)	(301.716, -868.982)
(0., 0.)	(130.14, -380.531)	(135.235, -883.261)	(314.07, -867.336)
(0., 0.)	(130.16, -380.046)	(146.892, -882.815)	(325.516, -864.486)
(0., 0.)	(130.301, -379.399)	(157.786, -882.241)	(335.824, -860.224)
(0., 0.)	(130.601, -378.628)	(167.918, -881.565)	(345.113, -855.168)
(0., 0.)	(131.068, -377.752)	(177.243, -880.758)	(353.529, -850.089)
(0., 0.)	(131.63, -376.805)	(185.681, -879.823)	(361.049, -845.367)
(0., 0.)	(132.132, -375.863)	(193.165, -878.835)	(367.655, -841.142)
(0., 0.)	(132.431, -374.999)	(199.699, -877.925)	(373.316, -837.36)
(0., 0.)	(132.47, -374.261)	(205.286, -877.19)	(377.966, -833.924)
(0., 0.)	(132.269, -373.662)	(209.881, -876.678)	(381.548, -830.911)
(0., 0.)	(131.896, -373.223)	(213.427, -876.422)	(384.058, -828.464)
(0., 0.)	(131.422, -372.931)	(215.883, -876.406)	(385.531, -826.656)
(0., 0.)	(130.904, -372.742)	(217.23, -876.619)	(386.009, -825.547)
(0., 0.)	(130.39, -372.663)	(217.438, -877.001)	(385.501, -825.181)
(0., 0.)	(129.906, -372.723)	(216.434, -877.406)	(384.007, -825.474)
(0., 0.)	(129.429, -372.915)	(214.16, -877.69)	(381.585, -826.269)
(0., 0.)	(128.896, -373.237)	(210.662, -877.858)	(378.305, -827.455)
(0., 0.)	(128.248, -373.703)	(206.158, -878.128)	(374.318, -829.005)
(0., 0.)	(127.428, -374.313)	(201.026, -878.78)	(369.861, -830.861)
(0., 0.)	(126.384, -375.076)	(195.578, -879.762)	(365.122, -832.856)
(0., 0.)	(125.046, -375.982)	(190.05, -880.707)	(360.374, -834.715)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(123.336, -377.012)	(184.656, -881.328)	(355.868, -836.299)
(0., 0.)	(121.2, -378.127)	(179.453, -881.613)	(351.502, -837.74)
(0., 0.)	(118.647, -379.248)	(174.355, -881.651)	(347.131, -839.342)
(0., 0.)	(115.795, -380.304)	(169.191, -881.523)	(342.704, -841.377)
(0., 0.)	(112.839, -381.281)	(163.846, -881.341)	(338.128, -843.804)
(0., 0.)	(109.936, -382.202)	(158.28, -881.165)	(333.266, -846.327)
(0., 0.)	(107.16, -383.073)	(152.51, -880.992)	(328.036, -848.681)
(0., 0.)	(104.525, -383.904)	(146.585, -880.837)	(322.499, -850.896)
(0., 0.)	(102.015, -384.742)	(140.588, -880.789)	(316.818, -853.125)
(0., 0.)	(99.603, -385.592)	(134.593, -880.918)	(311.16, -855.431)
(0., 0.)	(97.252, -386.45)	(128.604, -881.191)	(305.545, -857.793)
(0., 0.)	(94.968, -387.312)	(122.616, -881.562)	(299.925, -860.174)
(0., 0.)	(92.82, -388.172)	(116.682, -882.104)	(294.352, -862.621)
(0., 0.)	(90.878, -389.054)	(110.822, -882.883)	(288.859, -865.211)
(0., 0.)	(89.175, -389.98)	(104.992, -883.821)	(283.394, -867.808)
(0., 0.)	(87.673, -390.951)	(99.127, -884.766)	(277.764, -870.111)
(0., 0.)	(86.262, -391.97)	(93.213, -885.598)	(271.935, -871.994)
(0., 0.)	(84.783, -393.025)	(87.268, -886.303)	(266.102, -873.662)
(0., 0.)	(83.075, -394.043)	(81.306, -886.922)	(260.316, -875.247)
(0., 0.)	(81.059, -394.969)	(75.337, -887.482)	(254.548, -876.767)
(0., 0.)	(78.735, -395.803)	(69.383, -887.971)	(248.747, -878.189)
(0., 0.)	(76.164, -396.566)	(63.444, -888.33)	(242.92, -879.476)
(0., 0.)	(73.467, -397.277)	(57.501, -888.501)	(237.103, -880.615)
(0., 0.)	(70.765, -397.917)	(51.556, -888.532)	(231.312, -881.576)
(0., 0.)	(68.12, -398.45)	(45.648, -888.505)	(225.597, -882.39)
(0., 0.)	(65.56, -398.921)	(39.802, -888.433)	(219.965, -883.084)
(0., 0.)	(63.114, -399.395)	(34.128, -888.425)	(214.378, -883.624)
(0., 0.)	(60.787, -399.878)	(28.648, -888.498)	(208.867, -884.102)
(0., 0.)	(58.554, -400.357)	(23.277, -888.575)	(203.49, -884.654)
(0., 0.)	(56.401, -400.824)	(17.948, -888.626)	(198.214, -885.224)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(54.338, -401.277)	(12.676, -888.669)	(193.038, -885.698)
(0., 0.)	(52.354, -401.731)	(7.523, -888.726)	(188.005, -886.09)
(0., 0.)	(50.422, -402.175)	(2.518, -888.804)	(183.087, -886.466)
(0., 0.)	(48.504, -402.588)	(-2.366, -888.914)	(178.255, -886.855)
(0., 0.)	(46.593, -403.01)	(-7.175, -889.043)	(173.53, -887.279)
(0., 0.)	(44.693, -403.448)	(-11.929, -889.151)	(168.886, -887.646)
(0., 0.)	(42.786, -403.85)	(-16.629, -889.205)	(164.263, -887.886)
(0., 0.)	(40.858, -404.183)	(-21.26, -889.215)	(159.7, -888.086)
(0., 0.)	(38.898, -404.433)	(-25.796, -889.215)	(155.265, -888.354)
(0., 0.)	(36.943, -404.617)	(-30.238, -889.204)	(150.909, -888.619)
(0., 0.)	(35.08, -404.815)	(-34.614, -889.16)	(146.541, -888.752)
(0., 0.)	(33.329, -405.038)	(-38.929, -889.082)	(142.2, -888.82)
(0., 0.)	(31.621, -405.248)	(-43.176, -888.986)	(137.975, -888.945)
(0., 0.)	(29.874, -405.424)	(-47.36, -888.886)	(133.843, -889.086)
(0., 0.)	(28.081, -405.559)	(-51.503, -888.769)	(129.737, -889.141)
(0., 0.)	(26.281, -405.664)	(-55.612, -888.628)	(125.661, -889.119)
(0., 0.)	(24.505, -405.762)	(-59.672, -888.464)	(121.65, -889.109)
(0., 0.)	(22.764, -405.859)	(-63.67, -888.252)	(117.637, -889.049)
(0., 0.)	(21.061, -405.938)	(-67.62, -887.972)	(113.535, -888.812)
(0., 0.)	(19.424, -405.98)	(-71.546, -887.655)	(109.549, -888.651)
(0., 0.)	(17.884, -405.998)	(-75.453, -887.324)	(105.746, -888.684)
(0., 0.)	(16.425, -406.017)	(-79.34, -886.97)	(101.964, -888.735)
(0., 0.)	(15.007, -406.018)	(-83.213, -886.577)	(98.086, -888.586)
(0., 0.)	(13.595, -405.988)	(-87.087, -886.15)	(94.192, -888.271)
(0., 0.)	(12.166, -405.946)	(-90.971, -885.712)	(90.395, -887.997)
(0., 0.)	(10.726, -405.917)	(-94.864, -885.265)	(86.607, -887.833)
(0., 0.)	(9.273, -405.904)	(-98.762, -884.792)	(82.686, -887.651)
(0., 0.)	(7.772, -405.873)	(-102.673, -884.305)	(78.645, -887.381)
(0., 0.)	(6.187, -405.815)	(-106.617, -883.831)	(74.611, -887.119)
(0., 0.)	(4.52, -405.745)	(-110.619, -883.364)	(70.628, -886.948)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(2.797, -405.66)	(-114.67, -882.887)	(66.61, -886.752)
(0., 0.)	(1.026, -405.553)	(-118.751, -882.408)	(62.488, -886.428)
(0., 0.)	(-0.812, -405.425)	(-122.861, -881.944)	(58.326, -886.056)
(0., 0.)	(-2.725, -405.281)	(-127.015, -881.483)	(54.191, -885.729)
(0., 0.)	(-4.697, -405.123)	(-131.214, -881.)	(50.038, -885.438)
(0., 0.)	(-6.735, -404.94)	(-135.431, -880.48)	(45.8, -885.138)
(0., 0.)	(-8.842, -404.724)	(-139.632, -879.925)	(41.507, -884.835)
(0., 0.)	(-10.994, -404.464)	(-143.813, -879.355)	(37.23, -884.513)
(0., 0.)	(-13.152, -404.16)	(-147.995, -878.811)	(32.996, -884.146)
(0., 0.)	(-15.299, -403.796)	(-152.196, -878.295)	(28.779, -883.747)
(0., 0.)	(-17.436, -403.392)	(-156.403, -877.784)	(24.588, -883.393)
(0., 0.)	(-19.546, -402.989)	(-160.582, -877.268)	(20.431, -883.066)
(0., 0.)	(-21.594, -402.596)	(-164.719, -876.75)	(16.281, -882.704)
(0., 0.)	(-23.565, -402.197)	(-168.816, -876.23)	(12.104, -882.3)
(0., 0.)	(-25.493, -401.789)	(-172.908, -875.691)	(7.919, -881.905)
(0., 0.)	(-27.416, -401.386)	(-177.021, -875.125)	(3.771, -881.575)
(0., 0.)	(-29.348, -401.015)	(-181.167, -874.553)	(-0.354, -881.266)
(0., 0.)	(-31.269, -400.68)	(-185.341, -873.992)	(-4.527, -880.862)
(0., 0.)	(-33.164, -400.377)	(-189.524, -873.437)	(-8.767, -880.386)
(0., 0.)	(-35.048, -400.095)	(-193.707, -872.866)	(-13.004, -879.991)
(0., 0.)	(-36.939, -399.831)	(-197.892, -872.286)	(-17.212, -879.719)
(0., 0.)	(-38.808, -399.564)	(-202.068, -871.678)	(-21.441, -879.476)
(0., 0.)	(-40.616, -399.273)	(-206.22, -871.029)	(-25.735, -879.174)
(0., 0.)	(-42.347, -398.971)	(-210.357, -870.365)	(-30.039, -878.841)
(0., 0.)	(-44., -398.694)	(-214.527, -869.74)	(-34.29, -878.552)
(0., 0.)	(-45.575, -398.459)	(-218.736, -869.158)	(-38.523, -878.339)
(0., 0.)	(-47.105, -398.245)	(-222.985, -868.531)	(-42.817, -878.213)
(0., 0.)	(-48.628, -397.999)	(-227.258, -867.816)	(-47.205, -878.172)
(0., 0.)	(-50.172, -397.696)	(-231.573, -867.023)	(-51.698, -878.157)
(0., 0.)	(-51.773, -397.373)	(-235.977, -866.166)	(-56.302, -878.118)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-53.448, -397.056)	(-240.457, -865.288)	(-60.977, -878.107)
(0., 0.)	(-55.173, -396.73)	(-244.982, -864.391)	(-65.706, -878.181)
(0., 0.)	(-56.905, -396.388)	(-249.588, -863.401)	(-70.535, -878.294)
(0., 0.)	(-58.6, -396.044)	(-254.299, -862.302)	(-75.489, -878.387)
(0., 0.)	(-60.236, -395.697)	(-259.079, -861.162)	(-80.541, -878.461)
(0., 0.)	(-61.823, -395.362)	(-263.893, -860.038)	(-85.666, -878.526)
(0., 0.)	(-63.359, -395.044)	(-268.764, -858.898)	(-90.882, -878.603)
(0., 0.)	(-64.848, -394.745)	(-273.714, -857.671)	(-96.208, -878.739)
(0., 0.)	(-66.313, -394.443)	(-278.73, -856.338)	(-101.63, -878.96)
(0., 0.)	(-67.777, -394.108)	(-283.797, -854.938)	(-107.126, -879.266)
(0., 0.)	(-69.272, -393.723)	(-288.91, -853.491)	(-112.713, -879.607)
(0., 0.)	(-70.812, -393.278)	(-294.08, -851.976)	(-118.418, -879.929)
(0., 0.)	(-72.369, -392.774)	(-299.319, -850.368)	(-124.231, -880.178)
(0., 0.)	(-73.921, -392.227)	(-304.63, -848.666)	(-130.185, -880.389)
(0., 0.)	(-75.445, -391.661)	(-309.999, -846.875)	(-136.313, -880.684)
(0., 0.)	(-76.9, -391.101)	(-315.405, -845.003)	(-142.568, -881.058)
(0., 0.)	(-78.239, -390.568)	(-320.829, -843.046)	(-148.879, -881.411)
(0., 0.)	(-79.42, -390.076)	(-326.275, -841.018)	(-155.263, -881.719)
(0., 0.)	(-80.402, -389.613)	(-331.717, -838.903)	(-161.741, -882.01)
(0., 0.)	(-81.191, -389.169)	(-337.118, -836.67)	(-168.246, -882.284)
(0., 0.)	(-81.806, -388.739)	(-342.488, -834.315)	(-174.753, -882.561)
(0., 0.)	(-82.252, -388.311)	(-347.854, -831.871)	(-181.339, -882.906)
(0., 0.)	(-82.524, -387.874)	(-353.21, -829.367)	(-188.023, -883.29)
(0., 0.)	(-82.621, -387.435)	(-358.516, -826.785)	(-194.714, -883.654)
(0., 0.)	(-82.528, -387.02)	(-363.725, -824.117)	(-201.379, -884.025)
(0., 0.)	(-82.227, -386.671)	(-368.798, -821.409)	(-208.049, -884.453)
(0., 0.)	(-81.709, -386.392)	(-373.724, -818.64)	(-214.701, -884.934)
(0., 0.)	(-80.966, -386.166)	(-378.51, -815.733)	(-221.295, -885.41)
(0., 0.)	(-79.996, -385.996)	(-383.104, -812.675)	(-227.82, -885.809)
(0., 0.)	(-78.791, -385.895)	(-387.436, -809.48)	(-234.262, -886.116)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-77.328, -385.824)	(-391.485, -806.088)	(-240.576, -886.314)
(0., 0.)	(-75.591, -385.745)	(-395.271, -802.451)	(-246.708, -886.397)
(0., 0.)	(-73.547, -385.682)	(-398.801, -798.547)	(-252.64, -886.362)
(0., 0.)	(-71.142, -385.694)	(-402.022, -794.359)	(-258.409, -886.131)
(0., 0.)	(-68.354, -385.822)	(-404.894, -789.87)	(-263.988, -885.681)
(0., 0.)	(-65.189, -386.041)	(-407.406, -785.078)	(-269.334, -885.044)
(0., 0.)	(-61.647, -386.325)	(-409.522, -779.998)	(-274.47, -884.086)
(0., 0.)	(-57.696, -386.712)	(-411.194, -774.624)	(-279.343, -882.756)
(0., 0.)	(-53.281, -387.271)	(-412.36, -768.914)	(-283.88, -881.212)
(0., 0.)	(-48.389, -388.002)	(-412.973, -762.851)	(-288.085, -879.51)
(0., 0.)	(-43.081, -388.845)	(-412.987, -756.508)	(-291.929, -877.592)
(0., 0.)	(-37.462, -389.701)	(-412.367, -749.991)	(-295.343, -875.471)
(0., 0.)	(-31.633, -390.488)	(-411.079, -743.307)	(-298.33, -873.195)
(0., 0.)	(-25.664, -391.162)	(-409.06, -736.394)	(-300.847, -870.702)
(0., 0.)	(-19.574, -391.667)	(-406.244, -729.259)	(-302.836, -867.929)
(0., 0.)	(-13.33, -391.969)	(-402.621, -722.004)	(-304.274, -864.967)
(0., 0.)	(-6.863, -392.088)	(-398.25, -714.736)	(-305.26, -861.971)
(0., 0.)	(-0.154, -392.057)	(-393.191, -707.582)	(-305.933, -859.094)
(0., 0.)	(6.717, -391.885)	(-387.532, -700.658)	(-306.31, -856.268)
(0., 0.)	(13.673, -391.622)	(-381.424, -694.029)	(-306.315, -853.398)
(0., 0.)	(20.687, -391.327)	(-375.017, -687.776)	(-305.968, -850.575)
(0., 0.)	(27.743, -390.984)	(-368.401, -681.988)	(-305.308, -847.953)
(0., 0.)	(34.831, -390.477)	(-361.56, -676.691)	(-304.357, -845.678)
(0., 0.)	(41.983, -389.708)	(-354.451, -671.83)	(-303.215, -843.708)
(0., 0.)	(49.264, -388.721)	(-347.157, -667.398)	(-301.913, -841.693)
(0., 0.)	(56.615, -387.627)	(-339.926, -663.502)	(-299.969, -839.374)
(0., 0.)	(63.808, -386.465)	(-333.048, -660.332)	(-296.472, -836.928)
(0., 0.)	(70.694, -385.212)	(-326.6, -658.102)	(-290.701, -834.769)
(0., 0.)	(77.297, -383.821)	(-320.43, -657.007)	(-282.486, -833.196)
(0., 0.)	(83.692, -382.272)	(-314.312, -657.123)	(-272.022, -832.316)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(89.871, -380.599)	(-308.05, -658.397)	(-259.643, -832.025)
(0., 0.)	(95.802, -378.892)	(-301.485, -660.757)	(-245.756, -832.135)
(0., 0.)	(101.502, -377.202)	(-294.555, -664.16)	(-230.696, -832.619)
(0., 0.)	(106.968, -375.538)	(-287.22, -668.524)	(-214.634, -833.415)
(0., 0.)	(112.164, -373.921)	(-279.431, -673.781)	(-197.704, -834.373)
(0., 0.)	(117.092, -372.424)	(-271.13, -679.928)	(-180.144, -835.45)
(0., 0.)	(121.803, -371.087)	(-262.197, -686.949)	(-162.289, -836.831)
(0., 0.)	(126.32, -369.861)	(-252.513, -694.741)	(-144.466, -838.822)
(0., 0.)	(130.622, -368.716)	(-242.034, -703.131)	(-126.883, -841.568)
(0., 0.)	(134.652, -367.633)	(-230.795, -711.967)	(-109.457, -844.953)
(0., 0.)	(138.358, -366.616)	(-218.894, -721.192)	(-91.907, -848.741)
(0., 0.)	(141.718, -365.711)	(-206.42, -730.803)	(-74.002, -852.682)
(0., 0.)	(144.723, -364.948)	(-193.453, -740.811)	(-55.634, -856.49)
(0., 0.)	(147.348, -364.312)	(-180.006, -751.097)	(-36.844, -859.988)
(0., 0.)	(149.542, -363.748)	(-166.011, -761.448)	(-17.824, -863.175)
(0., 0.)	(151.27, -363.217)	(-151.46, -771.728)	(1.226, -866.213)
(0., 0.)	(152.541, -362.756)	(-136.455, -781.878)	(20.22, -869.245)
(0., 0.)	(153.402, -362.479)	(-121.101, -791.837)	(39.197, -872.164)
(0., 0.)	(153.894, -362.465)	(-105.446, -801.512)	(58.143, -874.711)
(0., 0.)	(154.044, -362.699)	(-89.535, -810.79)	(76.956, -876.68)
(0., 0.)	(153.912, -363.163)	(-73.403, -819.565)	(95.603, -878.046)
(0., 0.)	(153.568, -363.844)	(-57.103, -827.715)	(114.055, -878.891)
(0., 0.)	(153.073, -364.675)	(-40.714, -835.117)	(132.229, -879.307)
(0., 0.)	(152.465, -365.566)	(-24.3, -841.757)	(150.081, -879.364)
(0., 0.)	(151.753, -366.458)	(-7.919, -847.713)	(167.534, -879.077)
(0., 0.)	(150.923, -367.352)	(8.302, -853.06)	(184.512, -878.509)
(0., 0.)	(149.975, -368.261)	(24.242, -857.82)	(201.067, -877.778)
(0., 0.)	(148.958, -369.164)	(39.814, -862.003)	(217.257, -876.877)
(0., 0.)	(147.93, -370.042)	(54.96, -865.613)	(232.897, -875.528)
(0., 0.)	(146.907, -370.928)	(69.616, -868.669)	(247.806, -873.636)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(145.873, -371.826)	(83.729, -871.149)	(261.978, -871.329)
(0., 0.)	(144.85, -372.636)	(97.238, -873.103)	(275.407, -868.828)
(0., 0.)	(143.911, -373.216)	(110.037, -874.593)	(288.047, -866.29)
(0., 0.)	(143.123, -373.528)	(122.007, -875.618)	(299.821, -863.642)
(0., 0.)	(142.514, -373.675)	(133.131, -876.258)	(310.632, -860.666)
(0., 0.)	(142.046, -373.744)	(143.512, -876.717)	(320.42, -857.354)
(0., 0.)	(141.658, -373.731)	(153.213, -877.108)	(329.248, -853.881)
(0., 0.)	(141.315, -373.604)	(162.12, -877.317)	(337.235, -850.496)
(0., 0.)	(141.025, -373.373)	(170.144, -877.253)	(344.429, -847.442)
(0., 0.)	(140.75, -373.054)	(177.284, -876.972)	(350.838, -844.768)
(0., 0.)	(140.437, -372.685)	(183.585, -876.606)	(356.428, -842.418)
(0., 0.)	(140.05, -372.313)	(189.059, -876.233)	(361.214, -840.41)
(0., 0.)	(139.578, -371.954)	(193.682, -875.902)	(365.159, -838.555)
(0., 0.)	(139.012, -371.615)	(197.433, -875.645)	(368.274, -836.754)
(0., 0.)	(138.339, -371.344)	(200.301, -875.452)	(370.689, -835.229)
(0., 0.)	(137.563, -371.192)	(202.292, -875.296)	(372.363, -834.016)
(0., 0.)	(136.692, -371.164)	(203.389, -875.157)	(373.101, -832.911)
(0., 0.)	(135.735, -371.266)	(203.552, -875.006)	(372.973, -832.072)
(0., 0.)	(134.664, -371.493)	(202.756, -874.862)	(372.136, -831.792)
(0., 0.)	(133.45, -371.813)	(200.951, -874.753)	(370.551, -832.077)
(0., 0.)	(132.104, -372.216)	(198.083, -874.676)	(368.15, -832.864)
(0., 0.)	(130.662, -372.724)	(194.19, -874.738)	(364.932, -834.129)
(0., 0.)	(129.13, -373.374)	(189.452, -875.167)	(360.983, -835.851)
(0., 0.)	(127.47, -374.21)	(184.197, -876.028)	(356.53, -837.865)
(0., 0.)	(125.624, -375.22)	(178.801, -877.034)	(351.96, -839.809)
(0., 0.)	(123.525, -376.34)	(173.509, -877.791)	(347.508, -841.466)
(0., 0.)	(121.119, -377.525)	(168.355, -878.133)	(343.041, -842.972)
(0., 0.)	(118.416, -378.765)	(163.264, -878.068)	(338.414, -844.536)
(0., 0.)	(115.531, -380.014)	(158.123, -877.696)	(333.643, -846.356)
(0., 0.)	(112.623, -381.165)	(152.849, -877.202)	(328.797, -848.562)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(109.823, -382.148)	(147.388, -876.743)	(323.819, -850.929)
(0., 0.)	(107.184, -383.001)	(141.767, -876.378)	(318.627, -853.236)
(0., 0.)	(104.721, -383.824)	(136.089, -876.154)	(313.265, -855.441)
(0., 0.)	(102.438, -384.691)	(130.441, -876.155)	(307.832, -857.537)
(0., 0.)	(100.324, -385.615)	(124.82, -876.419)	(302.385, -859.547)
(0., 0.)	(98.346, -386.592)	(119.145, -876.872)	(296.929, -861.499)
(0., 0.)	(96.454, -387.623)	(113.348, -877.403)	(291.452, -863.381)
(0., 0.)	(94.584, -388.691)	(107.513, -878.061)	(285.93, -865.213)
(0., 0.)	(92.673, -389.748)	(101.811, -879.03)	(280.356, -867.063)
(0., 0.)	(90.678, -390.77)	(96.223, -880.251)	(274.786, -868.949)
(0., 0.)	(88.567, -391.783)	(90.582, -881.484)	(269.167, -870.743)
(0., 0.)	(86.304, -392.802)	(84.805, -882.575)	(263.471, -872.384)
(0., 0.)	(83.832, -393.793)	(78.923, -883.501)	(257.734, -873.87)
(0., 0.)	(81.116, -394.687)	(72.98, -884.276)	(251.951, -875.144)
(0., 0.)	(78.204, -395.473)	(67.02, -884.917)	(246.107, -876.239)
(0., 0.)	(75.205, -396.188)	(61.095, -885.43)	(240.279, -877.294)
(0., 0.)	(72.203, -396.83)	(55.245, -885.814)	(234.55, -878.374)
(0., 0.)	(69.267, -397.358)	(49.487, -886.09)	(228.944, -879.398)
(0., 0.)	(66.491, -397.798)	(43.828, -886.282)	(223.445, -880.305)
(0., 0.)	(63.987, -398.245)	(38.272, -886.393)	(218.095, -881.158)
(0., 0.)	(61.76, -398.769)	(32.83, -886.446)	(212.844, -881.915)
(0., 0.)	(59.709, -399.336)	(27.493, -886.483)	(207.605, -882.486)
(0., 0.)	(57.735, -399.909)	(22.24, -886.539)	(202.391, -882.943)
(0., 0.)	(55.786, -400.477)	(17.054, -886.612)	(197.282, -883.411)
(0., 0.)	(53.855, -401.035)	(11.926, -886.682)	(192.251, -883.854)
(0., 0.)	(51.926, -401.563)	(6.847, -886.719)	(187.238, -884.158)
(0., 0.)	(49.991, -402.041)	(1.813, -886.727)	(182.222, -884.35)
(0., 0.)	(48.066, -402.456)	(-3.175, -886.732)	(177.216, -884.558)
(0., 0.)	(46.132, -402.823)	(-8.111, -886.756)	(172.262, -884.768)
(0., 0.)	(44.185, -403.156)	(-12.974, -886.824)	(167.358, -884.884)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(42.233, -403.463)	(-17.744, -886.942)	(162.615, -885.098)
(0., 0.)	(40.276, -403.736)	(-22.411, -887.061)	(158.048, -885.446)
(0., 0.)	(38.326, -403.966)	(-26.96, -887.109)	(153.614, -885.747)
(0., 0.)	(36.411, -404.18)	(-31.354, -887.07)	(149.31, -885.94)
(0., 0.)	(34.555, -404.393)	(-35.555, -886.987)	(145.138, -886.056)
(0., 0.)	(32.778, -404.6)	(-39.569, -886.9)	(141.09, -886.103)
(0., 0.)	(31.076, -404.776)	(-43.438, -886.808)	(137.204, -886.165)
(0., 0.)	(29.417, -404.903)	(-47.187, -886.704)	(133.495, -886.316)
(0., 0.)	(27.789, -405.006)	(-50.83, -886.571)	(129.935, -886.461)
(0., 0.)	(26.209, -405.113)	(-54.387, -886.413)	(126.446, -886.501)
(0., 0.)	(24.69, -405.203)	(-57.874, -886.247)	(122.957, -886.439)
(0., 0.)	(23.225, -405.247)	(-61.312, -886.077)	(119.475, -886.325)
(0., 0.)	(21.79, -405.26)	(-64.742, -885.865)	(116.055, -886.238)
(0., 0.)	(20.366, -405.287)	(-68.196, -885.584)	(112.673, -886.233)
(0., 0.)	(18.944, -405.34)	(-71.685, -885.258)	(109.201, -886.232)
(0., 0.)	(17.496, -405.404)	(-75.212, -884.926)	(105.599, -886.11)
(0., 0.)	(16.016, -405.465)	(-78.775, -884.611)	(101.978, -885.897)
(0., 0.)	(14.513, -405.5)	(-82.386, -884.319)	(98.401, -885.727)
(0., 0.)	(12.995, -405.478)	(-86.056, -884.025)	(94.824, -885.629)
(0., 0.)	(11.469, -405.418)	(-89.767, -883.696)	(91.157, -885.485)
(0., 0.)	(9.912, -405.37)	(-93.509, -883.346)	(87.373, -885.254)
(0., 0.)	(8.312, -405.363)	(-97.304, -882.993)	(83.518, -884.983)
(0., 0.)	(6.638, -405.392)	(-101.176, -882.645)	(79.658, -884.753)
(0., 0.)	(4.854, -405.417)	(-105.115, -882.294)	(75.795, -884.586)
(0., 0.)	(2.963, -405.383)	(-109.101, -881.945)	(71.855, -884.403)
(0., 0.)	(0.983, -405.294)	(-113.119, -881.611)	(67.807, -884.147)
(0., 0.)	(-1.062, -405.195)	(-117.174, -881.284)	(63.702, -883.872)
(0., 0.)	(-3.154, -405.124)	(-121.292, -880.941)	(59.59, -883.622)
(0., 0.)	(-5.281, -405.067)	(-125.486, -880.561)	(55.444, -883.339)
(0., 0.)	(-7.416, -404.999)	(-129.735, -880.132)	(51.232, -883.048)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-9.545, -404.888)	(-134.013, -879.666)	(46.943, -882.801)
(0., 0.)	(-11.649, -404.727)	(-138.31, -879.19)	(42.589, -882.561)
(0., 0.)	(-13.711, -404.528)	(-142.652, -878.714)	(38.199, -882.283)
(0., 0.)	(-15.714, -404.312)	(-147.062, -878.219)	(33.805, -881.997)
(0., 0.)	(-17.66, -404.112)	(-151.529, -877.711)	(29.369, -881.71)
(0., 0.)	(-19.556, -403.94)	(-156.022, -877.209)	(24.848, -881.395)
(0., 0.)	(-21.412, -403.769)	(-160.533, -876.721)	(20.271, -881.097)
(0., 0.)	(-23.245, -403.575)	(-165.089, -876.232)	(15.667, -880.843)
(0., 0.)	(-25.057, -403.371)	(-169.721, -875.729)	(10.989, -880.557)
(0., 0.)	(-26.836, -403.185)	(-174.436, -875.224)	(6.228, -880.226)
(0., 0.)	(-28.58, -403.01)	(-179.197, -874.719)	(1.464, -879.882)
(0., 0.)	(-30.287, -402.808)	(-183.935, -874.202)	(-3.26, -879.527)
(0., 0.)	(-31.929, -402.558)	(-188.624, -873.65)	(-7.93, -879.209)
(0., 0.)	(-33.47, -402.297)	(-193.267, -873.066)	(-12.563, -878.931)
(0., 0.)	(-34.932, -402.083)	(-197.87, -872.458)	(-17.211, -878.63)
(0., 0.)	(-36.349, -401.931)	(-202.436, -871.859)	(-21.905, -878.314)
(0., 0.)	(-37.747, -401.787)	(-206.997, -871.3)	(-26.59, -878.069)
(0., 0.)	(-39.153, -401.611)	(-211.569, -870.808)	(-31.214, -877.928)
(0., 0.)	(-40.601, -401.418)	(-216.154, -870.353)	(-35.802, -877.813)
(0., 0.)	(-42.111, -401.224)	(-220.746, -869.884)	(-40.41, -877.646)
(0., 0.)	(-43.677, -400.995)	(-225.349, -869.347)	(-45.078, -877.441)
(0., 0.)	(-45.282, -400.706)	(-229.971, -868.721)	(-49.818, -877.26)
(0., 0.)	(-46.912, -400.36)	(-234.616, -868.01)	(-54.591, -877.128)
(0., 0.)	(-48.588, -399.971)	(-239.301, -867.184)	(-59.391, -877.012)
(0., 0.)	(-50.342, -399.542)	(-244.046, -866.248)	(-64.273, -876.848)
(0., 0.)	(-52.172, -399.053)	(-248.876, -865.218)	(-69.286, -876.646)
(0., 0.)	(-54.049, -398.475)	(-253.794, -864.138)	(-74.43, -876.523)
(0., 0.)	(-55.955, -397.807)	(-258.777, -863.032)	(-79.675, -876.539)
(0., 0.)	(-57.89, -397.087)	(-263.83, -861.849)	(-85.001, -876.663)
(0., 0.)	(-59.855, -396.387)	(-268.964, -860.554)	(-90.405, -876.848)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-61.822, -395.756)	(-274.163, -859.188)	(-95.93, -877.025)
(0., 0.)	(-63.744, -395.179)	(-279.429, -857.794)	(-101.627, -877.186)
(0., 0.)	(-65.58, -394.622)	(-284.776, -856.337)	(-107.503, -877.393)
(0., 0.)	(-67.312, -394.07)	(-290.214, -854.76)	(-113.528, -877.69)
(0., 0.)	(-68.928, -393.547)	(-295.762, -853.059)	(-119.679, -878.076)
(0., 0.)	(-70.421, -393.082)	(-301.416, -851.246)	(-125.962, -878.514)
(0., 0.)	(-71.759, -392.655)	(-307.154, -849.312)	(-132.396, -878.951)
(0., 0.)	(-72.913, -392.223)	(-312.948, -847.249)	(-139.02, -879.336)
(0., 0.)	(-73.895, -391.786)	(-318.783, -845.086)	(-145.797, -879.737)
(0., 0.)	(-74.747, -391.362)	(-324.678, -842.842)	(-152.571, -880.362)
(0., 0.)	(-75.49, -390.922)	(-330.651, -840.489)	(-159.294, -881.253)
(0., 0.)	(-76.114, -390.433)	(-336.694, -838.006)	(-166.297, -881.887)
(0., 0.)	(-76.613, -389.912)	(-342.77, -835.381)	(-173.797, -881.926)
(0., 0.)	(-76.969, -389.395)	(-348.811, -832.589)	(-181.391, -881.912)
(0., 0.)	(-77.138, -388.917)	(-354.75, -829.642)	(-188.83, -882.147)
(0., 0.)	(-77.07, -388.513)	(-360.531, -826.569)	(-196.181, -882.465)
(0., 0.)	(-76.713, -388.23)	(-366.11, -823.367)	(-203.537, -882.659)
(0., 0.)	(-76.021, -388.095)	(-371.465, -820.027)	(-210.815, -882.82)
(0., 0.)	(-74.964, -388.082)	(-376.537, -816.54)	(-217.812, -883.196)
(0., 0.)	(-73.517, -388.147)	(-381.255, -812.894)	(-224.554, -883.574)
(0., 0.)	(-71.661, -388.272)	(-385.593, -809.059)	(-231.125, -883.698)
(0., 0.)	(-69.373, -388.438)	(-389.534, -804.972)	(-237.47, -883.648)
(0., 0.)	(-66.615, -388.639)	(-393.031, -800.545)	(-243.497, -883.465)
(0., 0.)	(-63.379, -388.893)	(-396.055, -795.693)	(-249.186, -882.991)
(0., 0.)	(-59.702, -389.233)	(-398.589, -790.416)	(-254.558, -882.186)
(0., 0.)	(-55.578, -389.684)	(-400.602, -784.789)	(-259.575, -881.129)
(0., 0.)	(-50.951, -390.284)	(-402.058, -778.827)	(-264.196, -879.797)
(0., 0.)	(-45.817, -390.998)	(-402.941, -772.512)	(-268.47, -878.161)
(0., 0.)	(-40.273, -391.711)	(-403.221, -765.866)	(-272.441, -876.282)
(0., 0.)	(-34.468, -392.333)	(-402.858, -758.943)	(-276.036, -874.208)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-28.48, -392.847)	(-401.833, -751.783)	(-279.173, -871.932)
(0., 0.)	(-22.297, -393.256)	(-400.062, -744.408)	(-281.793, -869.369)
(0., 0.)	(-15.893, -393.525)	(-397.467, -736.855)	(-283.815, -866.558)
(0., 0.)	(-9.241, -393.643)	(-394.069, -729.225)	(-285.272, -863.692)
(0., 0.)	(-2.335, -393.647)	(-389.913, -721.616)	(-286.31, -860.846)
(0., 0.)	(4.782, -393.593)	(-385.07, -714.138)	(-286.989, -857.916)
(0., 0.)	(12.023, -393.494)	(-379.647, -706.944)	(-287.299, -854.982)
(0., 0.)	(19.297, -393.266)	(-373.804, -700.173)	(-287.241, -852.241)
(0., 0.)	(26.548, -392.837)	(-367.735, -693.889)	(-286.816, -849.778)
(0., 0.)	(33.72, -392.222)	(-361.636, -688.115)	(-286.001, -847.528)
(0., 0.)	(40.726, -391.456)	(-355.7, -682.962)	(-284.606, -845.279)
(0., 0.)	(47.459, -390.544)	(-350.146, -678.64)	(-282.036, -842.794)
(0., 0.)	(53.887, -389.479)	(-345.071, -675.327)	(-277.732, -840.017)
(0., 0.)	(60.097, -388.288)	(-340.328, -673.089)	(-271.553, -837.209)
(0., 0.)	(66.224, -387.059)	(-335.592, -671.868)	(-263.752, -834.709)
(0., 0.)	(72.29, -385.856)	(-330.498, -671.586)	(-254.666, -832.735)
(0., 0.)	(78.164, -384.627)	(-324.802, -672.174)	(-244.59, -831.392)
(0., 0.)	(83.759, -383.35)	(-318.483, -673.615)	(-233.754, -830.733)
(0., 0.)	(89.109, -382.047)	(-311.61, -675.952)	(-222.302, -830.77)
(0., 0.)	(94.259, -380.764)	(-304.197, -679.165)	(-210.359, -831.524)
(0., 0.)	(99.213, -379.534)	(-296.225, -683.196)	(-198.01, -833.048)
(0., 0.)	(103.951, -378.378)	(-287.713, -688.025)	(-185.215, -835.338)
(0., 0.)	(108.481, -377.319)	(-278.721, -693.656)	(-171.799, -838.241)
(0., 0.)	(112.802, -376.385)	(-269.322, -700.098)	(-157.623, -841.459)
(0., 0.)	(116.875, -375.556)	(-259.551, -707.348)	(-142.658, -844.671)
(0., 0.)	(120.647, -374.776)	(-249.399, -715.38)	(-126.867, -847.834)
(0., 0.)	(124.099, -374.035)	(-238.799, -724.096)	(-110.379, -851.009)
(0., 0.)	(127.227, -373.325)	(-227.644, -733.277)	(-93.462, -854.225)
(0., 0.)	(130.031, -372.645)	(-215.838, -742.72)	(-76.282, -857.561)
(0., 0.)	(132.506, -371.979)	(-203.364, -752.365)	(-58.911, -861.066)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(134.635, -371.332)	(-190.26, -762.174)	(-41.388, -864.705)
(0., 0.)	(136.436, -370.741)	(-176.589, -772.035)	(-23.649, -868.234)
(0., 0.)	(137.941, -370.236)	(-162.42, -781.87)	(-5.587, -871.336)
(0., 0.)	(139.143, -369.865)	(-147.785, -791.617)	(12.797, -873.918)
(0., 0.)	(140.01, -369.709)	(-132.651, -801.161)	(31.416, -876.092)
(0., 0.)	(140.528, -369.807)	(-117.015, -810.375)	(50.177, -877.964)
(0., 0.)	(140.734, -370.124)	(-100.944, -819.156)	(68.994, -879.452)
(0., 0.)	(140.681, -370.578)	(-84.534, -827.448)	(87.77, -880.426)
(0., 0.)	(140.447, -371.144)	(-67.915, -835.202)	(106.407, -880.867)
(0., 0.)	(140.124, -371.818)	(-51.187, -842.374)	(124.842, -880.814)
(0., 0.)	(139.753, -372.538)	(-34.428, -848.897)	(142.96, -880.302)
(0., 0.)	(139.34, -373.238)	(-17.718, -854.671)	(160.671, -879.364)
(0., 0.)	(138.906, -373.874)	(-1.138, -859.677)	(177.913, -878.099)
(0., 0.)	(138.468, -374.485)	(15.235, -863.987)	(194.635, -876.641)
(0., 0.)	(137.988, -375.146)	(31.341, -867.664)	(210.948, -875.379)
(0., 0.)	(137.38, -375.891)	(47.118, -870.748)	(226.995, -874.616)
(0., 0.)	(136.633, -376.638)	(62.526, -873.289)	(242.595, -873.991)
(0., 0.)	(135.875, -377.263)	(77.503, -875.374)	(257.58, -873.15)
(0., 0.)	(135.256, -377.657)	(92.002, -877.026)	(271.961, -871.997)
(0., 0.)	(134.81, -377.795)	(105.971, -878.265)	(285.743, -870.374)
(0., 0.)	(134.496, -377.761)	(119.347, -879.115)	(298.85, -868.139)
(0., 0.)	(134.249, -377.658)	(132.093, -879.605)	(311.25, -865.387)
(0., 0.)	(134.068, -377.456)	(144.225, -879.785)	(322.957, -862.308)
(0., 0.)	(133.985, -377.047)	(155.73, -879.672)	(333.986, -858.956)
(0., 0.)	(133.999, -376.425)	(166.506, -879.238)	(344.24, -855.23)
(0., 0.)	(134.052, -375.628)	(176.477, -878.52)	(353.637, -851.136)
(0., 0.)	(134.079, -374.693)	(185.63, -877.604)	(362.19, -846.878)
(0., 0.)	(134.061, -373.664)	(193.962, -876.568)	(369.859, -842.506)
(0., 0.)	(133.976, -372.608)	(201.436, -875.475)	(376.51, -837.987)
(0., 0.)	(133.819, -371.606)	(208.01, -874.385)	(382.191, -833.595)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(133.591, -370.743)	(213.616, -873.387)	(386.936, -829.622)
(0., 0.)	(133.276, -370.058)	(218.196, -872.617)	(390.667, -826.182)
(0., 0.)	(132.876, -369.558)	(221.704, -872.162)	(393.291, -823.359)
(0., 0.)	(132.418, -369.236)	(224.1, -872.018)	(394.812, -821.326)
(0., 0.)	(131.95, -369.065)	(225.333, -872.118)	(395.305, -820.204)
(0., 0.)	(131.507, -369.028)	(225.307, -872.338)	(394.816, -819.955)
(0., 0.)	(131.088, -369.145)	(223.941, -872.52)	(393.303, -820.435)
(0., 0.)	(130.656, -369.419)	(221.253, -872.594)	(390.739, -821.464)
(0., 0.)	(130.171, -369.826)	(217.373, -872.719)	(387.185, -822.974)
(0., 0.)	(129.595, -370.35)	(212.593, -873.166)	(382.859, -824.857)
(0., 0.)	(128.877, -371.001)	(207.295, -874.02)	(378.104, -826.901)
(0., 0.)	(127.945, -371.827)	(201.798, -874.997)	(373.206, -828.869)
(0., 0.)	(126.693, -372.846)	(196.312, -875.739)	(368.351, -830.591)
(0., 0.)	(125.016, -374.001)	(190.933, -876.121)	(363.599, -832.101)
(0., 0.)	(122.863, -375.207)	(185.592, -876.164)	(358.888, -833.69)
(0., 0.)	(120.29, -376.391)	(180.15, -875.932)	(354.157, -835.641)
(0., 0.)	(117.466, -377.484)	(174.532, -875.566)	(349.284, -838.028)
(0., 0.)	(114.608, -378.445)	(168.741, -875.225)	(344.142, -840.57)
(0., 0.)	(111.877, -379.295)	(162.819, -874.939)	(338.65, -842.866)
(0., 0.)	(109.344, -380.053)	(156.848, -874.665)	(332.934, -844.933)
(0., 0.)	(106.996, -380.743)	(150.923, -874.427)	(327.326, -847.164)
(0., 0.)	(104.771, -381.443)	(145.071, -874.354)	(321.859, -849.578)
(0., 0.)	(102.616, -382.211)	(139.264, -874.563)	(316.372, -851.895)
(0., 0.)	(100.538, -383.065)	(133.474, -875.024)	(310.801, -854.016)
(0., 0.)	(98.611, -384.034)	(127.704, -875.636)	(305.237, -856.022)
(0., 0.)	(96.911, -385.109)	(121.958, -876.288)	(299.759, -858.014)
(0., 0.)	(95.461, -386.238)	(116.221, -876.914)	(294.328, -860.044)
(0., 0.)	(94.216, -387.404)	(110.526, -877.624)	(288.917, -862.099)
(0., 0.)	(93.044, -388.618)	(104.95, -878.604)	(283.494, -864.064)
(0., 0.)	(91.768, -389.832)	(99.438, -879.772)	(278.029, -865.892)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(90.219, -390.984)	(93.855, -880.888)	(272.472, -867.525)
(0., 0.)	(88.264, -392.039)	(88.132, -881.816)	(266.786, -868.927)
(0., 0.)	(85.863, -393.001)	(82.284, -882.569)	(261.035, -870.183)
(0., 0.)	(83.047, -393.88)	(76.366, -883.215)	(255.251, -871.401)
(0., 0.)	(79.906, -394.657)	(70.429, -883.799)	(249.4, -872.539)
(0., 0.)	(76.584, -395.312)	(64.505, -884.337)	(243.485, -873.556)
(0., 0.)	(73.286, -395.878)	(58.61, -884.828)	(237.619, -874.54)
(0., 0.)	(70.224, -396.455)	(52.76, -885.271)	(231.878, -875.596)
(0., 0.)	(67.484, -397.049)	(46.98, -885.675)	(226.231, -876.673)
(0., 0.)	(65.035, -397.653)	(41.289, -886.048)	(220.659, -877.679)
(0., 0.)	(62.798, -398.286)	(35.701, -886.414)	(215.208, -878.665)
(0., 0.)	(60.689, -398.927)	(30.222, -886.79)	(209.871, -879.635)
(0., 0.)	(58.627, -399.541)	(24.841, -887.139)	(204.64, -880.494)
(0., 0.)	(56.553, -400.132)	(19.563, -887.423)	(199.517, -881.103)
(0., 0.)	(54.432, -400.697)	(14.395, -887.633)	(194.448, -881.435)
(0., 0.)	(52.258, -401.205)	(9.316, -887.776)	(189.428, -881.707)
(0., 0.)	(50.034, -401.643)	(4.288, -887.879)	(184.475, -882.107)
(0., 0.)	(47.808, -402.02)	(-0.677, -887.975)	(179.57, -882.506)
(0., 0.)	(45.649, -402.346)	(-5.565, -888.039)	(174.715, -882.745)
(0., 0.)	(43.609, -402.643)	(-10.365, -888.039)	(169.949, -882.882)
(0., 0.)	(41.679, -402.912)	(-15.061, -888.017)	(165.232, -882.926)
(0., 0.)	(39.841, -403.145)	(-19.647, -888.036)	(160.566, -882.868)
(0., 0.)	(38.089, -403.361)	(-24.136, -888.082)	(156.097, -882.976)
(0., 0.)	(36.415, -403.568)	(-28.521, -888.121)	(151.821, -883.232)
(0., 0.)	(34.794, -403.765)	(-32.779, -888.134)	(147.625, -883.401)
(0., 0.)	(33.209, -403.944)	(-36.929, -888.104)	(143.47, -883.481)
(0., 0.)	(31.625, -404.087)	(-40.993, -888.044)	(139.388, -883.607)
(0., 0.)	(30.014, -404.211)	(-45.007, -887.976)	(135.385, -883.798)
(0., 0.)	(28.396, -404.341)	(-48.999, -887.93)	(131.416, -883.914)
(0., 0.)	(26.801, -404.446)	(-52.978, -887.907)	(127.48, -883.954)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(25.248, -404.531)	(-56.943, -887.872)	(123.611, -884.04)
(0., 0.)	(23.745, -404.628)	(-60.881, -887.782)	(119.78, -884.161)
(0., 0.)	(22.298, -404.73)	(-64.787, -887.61)	(115.919, -884.196)
(0., 0.)	(20.887, -404.824)	(-68.676, -887.342)	(112.06, -884.183)
(0., 0.)	(19.496, -404.904)	(-72.581, -886.992)	(108.236, -884.169)
(0., 0.)	(18.095, -404.952)	(-76.543, -886.591)	(104.371, -884.142)
(0., 0.)	(16.647, -404.985)	(-80.574, -886.16)	(100.446, -884.12)
(0., 0.)	(15.142, -405.022)	(-84.663, -885.717)	(96.467, -884.052)
(0., 0.)	(13.615, -405.063)	(-88.799, -885.266)	(92.422, -883.913)
(0., 0.)	(12.095, -405.085)	(-92.986, -884.796)	(88.31, -883.748)
(0., 0.)	(10.568, -405.091)	(-97.215, -884.312)	(84.109, -883.493)
(0., 0.)	(8.973, -405.112)	(-101.468, -883.839)	(79.871, -883.193)
(0., 0.)	(7.271, -405.137)	(-105.745, -883.37)	(75.647, -882.986)
(0., 0.)	(5.484, -405.141)	(-110.035, -882.889)	(71.403, -882.82)
(0., 0.)	(3.66, -405.107)	(-114.313, -882.398)	(67.128, -882.625)
(0., 0.)	(1.823, -405.03)	(-118.578, -881.92)	(62.859, -882.426)
(0., 0.)	(-0.047, -404.925)	(-122.863, -881.453)	(58.603, -882.21)
(0., 0.)	(-1.972, -404.812)	(-127.177, -880.972)	(54.344, -881.917)
(0., 0.)	(-3.944, -404.723)	(-131.507, -880.463)	(50.053, -881.568)
(0., 0.)	(-5.928, -404.645)	(-135.85, -879.915)	(45.701, -881.233)
(0., 0.)	(-7.913, -404.533)	(-140.227, -879.346)	(41.288, -880.947)
(0., 0.)	(-9.904, -404.367)	(-144.656, -878.766)	(36.843, -880.684)
(0., 0.)	(-11.911, -404.17)	(-149.125, -878.189)	(32.379, -880.406)
(0., 0.)	(-13.926, -403.955)	(-153.603, -877.619)	(27.876, -880.074)
(0., 0.)	(-15.915, -403.724)	(-158.072, -877.058)	(23.369, -879.73)
(0., 0.)	(-17.837, -403.495)	(-162.538, -876.504)	(18.905, -879.443)
(0., 0.)	(-19.68, -403.29)	(-167.023, -875.917)	(14.436, -879.168)
(0., 0.)	(-21.46, -403.102)	(-171.538, -875.26)	(9.878, -878.823)
(0., 0.)	(-23.204, -402.899)	(-176.086, -874.551)	(5.246, -878.439)
(0., 0.)	(-24.93, -402.667)	(-180.657, -873.851)	(0.638, -878.102)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-26.638, -402.415)	(-185.247, -873.211)	(-3.92, -877.82)
(0., 0.)	(-28.335, -402.165)	(-189.868, -872.643)	(-8.518, -877.529)
(0., 0.)	(-30.056, -401.926)	(-194.536, -872.108)	(-13.234, -877.219)
(0., 0.)	(-31.836, -401.696)	(-199.256, -871.553)	(-18.054, -876.958)
(0., 0.)	(-33.669, -401.446)	(-204.013, -870.956)	(-22.919, -876.75)
(0., 0.)	(-35.522, -401.144)	(-208.798, -870.339)	(-27.79, -876.537)
(0., 0.)	(-37.355, -400.793)	(-213.628, -869.698)	(-32.666, -876.302)
(0., 0.)	(-39.163, -400.424)	(-218.5, -869.045)	(-37.585, -876.087)
(0., 0.)	(-40.961, -400.06)	(-223.395, -868.396)	(-42.578, -875.903)
(0., 0.)	(-42.742, -399.693)	(-228.307, -867.719)	(-47.645, -875.7)
(0., 0.)	(-44.5, -399.327)	(-233.233, -866.98)	(-52.744, -875.457)
(0., 0.)	(-46.244, -398.963)	(-238.181, -866.125)	(-57.817, -875.196)
(0., 0.)	(-47.995, -398.573)	(-243.15, -865.155)	(-62.888, -874.952)
(0., 0.)	(-49.777, -398.125)	(-248.12, -864.14)	(-68.02, -874.745)
(0., 0.)	(-51.583, -397.619)	(-253.098, -863.086)	(-73.198, -874.608)
(0., 0.)	(-53.364, -397.091)	(-258.087, -861.942)	(-78.384, -874.516)
(0., 0.)	(-55.076, -396.589)	(-263.051, -860.696)	(-83.592, -874.408)
(0., 0.)	(-56.72, -396.13)	(-267.975, -859.388)	(-88.859, -874.308)
(0., 0.)	(-58.332, -395.685)	(-272.887, -858.03)	(-94.173, -874.294)
(0., 0.)	(-59.924, -395.23)	(-277.809, -856.624)	(-99.503, -874.381)
(0., 0.)	(-61.492, -394.76)	(-282.74, -855.144)	(-104.857, -874.54)
(0., 0.)	(-63.002, -394.271)	(-287.671, -853.556)	(-110.259, -874.756)
(0., 0.)	(-64.445, -393.755)	(-292.604, -851.862)	(-115.767, -875.011)
(0., 0.)	(-65.853, -393.238)	(-297.563, -850.085)	(-121.426, -875.317)
(0., 0.)	(-67.244, -392.752)	(-302.555, -848.229)	(-127.205, -875.71)
(0., 0.)	(-68.602, -392.288)	(-307.58, -846.318)	(-133.064, -876.19)
(0., 0.)	(-69.913, -391.805)	(-312.651, -844.363)	(-139.019, -876.728)
(0., 0.)	(-71.183, -391.297)	(-317.798, -842.377)	(-145.132, -877.299)
(0., 0.)	(-72.4, -390.778)	(-323.033, -840.344)	(-151.414, -877.888)
(0., 0.)	(-73.527, -390.24)	(-328.336, -838.222)	(-157.776, -878.519)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-74.545, -389.691)	(-333.7, -835.993)	(-164.185, -879.157)
(0., 0.)	(-75.449, -389.159)	(-339.117, -833.668)	(-170.73, -879.715)
(0., 0.)	(-76.217, -388.642)	(-344.539, -831.244)	(-177.372, -880.292)
(0., 0.)	(-76.825, -388.124)	(-349.897, -828.712)	(-183.902, -881.14)
(0., 0.)	(-77.257, -387.629)	(-355.143, -826.095)	(-190.331, -882.076)
(0., 0.)	(-77.494, -387.204)	(-360.269, -823.424)	(-196.992, -882.48)
(0., 0.)	(-77.503, -386.887)	(-365.252, -820.671)	(-203.813, -882.437)
(0., 0.)	(-77.247, -386.682)	(-370.056, -817.788)	(-210.442, -882.498)
(0., 0.)	(-76.707, -386.565)	(-374.649, -814.809)	(-216.818, -882.728)
(0., 0.)	(-75.88, -386.509)	(-378.969, -811.726)	(-223.025, -882.943)
(0., 0.)	(-74.749, -386.485)	(-382.987, -808.476)	(-229.082, -883.028)
(0., 0.)	(-73.29, -386.471)	(-386.706, -805.02)	(-234.959, -882.933)
(0., 0.)	(-71.484, -386.459)	(-390.109, -801.295)	(-240.486, -882.796)
(0., 0.)	(-69.31, -386.485)	(-393.166, -797.294)	(-245.727, -882.507)
(0., 0.)	(-66.767, -386.604)	(-395.864, -793.063)	(-250.816, -881.972)
(0., 0.)	(-63.881, -386.837)	(-398.232, -788.598)	(-255.742, -881.205)
(0., 0.)	(-60.703, -387.129)	(-400.286, -783.891)	(-260.467, -880.221)
(0., 0.)	(-57.26, -387.436)	(-401.991, -778.994)	(-264.942, -879.093)
(0., 0.)	(-53.531, -387.792)	(-403.305, -773.928)	(-269.151, -877.835)
(0., 0.)	(-49.451, -388.244)	(-404.186, -768.68)	(-273.129, -876.418)
(0., 0.)	(-44.991, -388.799)	(-404.611, -763.289)	(-276.878, -874.894)
(0., 0.)	(-40.202, -389.413)	(-404.579, -757.773)	(-280.341, -873.334)
(0., 0.)	(-35.177, -390.026)	(-404.033, -752.055)	(-283.441, -871.718)
(0., 0.)	(-29.983, -390.592)	(-402.917, -746.112)	(-286.122, -869.914)
(0., 0.)	(-24.618, -391.091)	(-401.208, -740.003)	(-288.319, -867.851)
(0., 0.)	(-19.053, -391.488)	(-398.892, -733.758)	(-290.026, -865.594)
(0., 0.)	(-13.289, -391.764)	(-395.977, -727.396)	(-291.307, -863.194)
(0., 0.)	(-7.39, -391.912)	(-392.541, -720.982)	(-292.235, -860.667)
(0., 0.)	(-1.413, -391.967)	(-388.737, -714.644)	(-292.825, -858.049)
(0., 0.)	(4.619, -391.996)	(-384.721, -708.452)	(-293.029, -855.382)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(10.702, -392.017)	(-380.577, -702.387)	(-292.754, -852.558)
(0., 0.)	(16.84, -391.95)	(-376.335, -696.465)	(-291.962, -849.557)
(0., 0.)	(23.004, -391.7)	(-372.088, -690.923)	(-290.548, -846.603)
(0., 0.)	(29.107, -391.251)	(-368.084, -686.147)	(-288.226, -843.728)
(0., 0.)	(35.002, -390.66)	(-364.574, -682.4)	(-284.628, -840.599)
(0., 0.)	(40.565, -389.938)	(-361.426, -679.708)	(-279.54, -837.065)
(0., 0.)	(45.818, -389.1)	(-358.148, -677.951)	(-273.112, -833.589)
(0., 0.)	(50.904, -388.273)	(-354.224, -676.955)	(-265.784, -830.752)
(0., 0.)	(55.924, -387.561)	(-349.409, -676.637)	(-257.96, -828.794)
(0., 0.)	(60.863, -386.88)	(-343.749, -677.048)	(-249.778, -827.766)
(0., 0.)	(65.7, -386.107)	(-337.414, -678.215)	(-241.213, -827.609)
(0., 0.)	(70.476, -385.22)	(-330.547, -680.142)	(-232.223, -828.241)
(0., 0.)	(75.228, -384.297)	(-323.256, -682.833)	(-222.681, -829.533)
(0., 0.)	(79.912, -383.4)	(-315.614, -686.284)	(-212.394, -831.312)
(0., 0.)	(84.445, -382.536)	(-307.691, -690.482)	(-201.199, -833.42)
(0., 0.)	(88.777, -381.713)	(-299.518, -695.428)	(-189.141, -835.711)
(0., 0.)	(92.873, -380.962)	(-291.07, -701.108)	(-176.431, -838.034)
(0., 0.)	(96.71, -380.289)	(-282.295, -707.455)	(-163.271, -840.419)
(0., 0.)	(100.304, -379.671)	(-273.114, -714.368)	(-149.741, -843.053)
(0., 0.)	(103.681, -379.048)	(-263.434, -721.74)	(-135.839, -846.134)
(0., 0.)	(106.862, -378.4)	(-253.193, -729.51)	(-121.599, -849.649)
(0., 0.)	(109.875, -377.759)	(-242.413, -737.594)	(-107.021, -853.466)
(0., 0.)	(112.754, -377.149)	(-231.192, -745.888)	(-92.043, -857.347)
(0., 0.)	(115.503, -376.555)	(-219.619, -754.374)	(-76.588, -861.037)
(0., 0.)	(118.113, -375.99)	(-207.683, -763.075)	(-60.645, -864.325)
(0., 0.)	(120.571, -375.487)	(-195.305, -771.869)	(-44.299, -867.172)
(0., 0.)	(122.847, -375.024)	(-182.41, -780.511)	(-27.612, -869.683)
(0., 0.)	(124.915, -374.594)	(-168.966, -788.829)	(-10.652, -871.895)
(0., 0.)	(126.787, -374.258)	(-155.036, -796.818)	(6.475, -873.836)
(0., 0.)	(128.432, -374.054)	(-140.731, -804.626)	(23.736, -875.542)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(129.814, -373.946)	(-126.134, -812.347)	(41.055, -877.113)
(0., 0.)	(130.92, -373.872)	(-111.273, -819.886)	(58.344, -878.586)
(0., 0.)	(131.787, -373.83)	(-96.135, -827.125)	(75.618, -879.927)
(0., 0.)	(132.444, -373.848)	(-80.739, -834.019)	(92.878, -881.06)
(0., 0.)	(132.885, -373.954)	(-65.155, -840.577)	(110.07, -882.012)
(0., 0.)	(133.085, -374.15)	(-49.503, -846.763)	(127.102, -882.806)
(0., 0.)	(133.038, -374.461)	(-33.888, -852.485)	(143.903, -883.392)
(0., 0.)	(132.753, -374.931)	(-18.349, -857.648)	(160.407, -883.648)
(0., 0.)	(132.264, -375.566)	(-2.934, -862.202)	(176.572, -883.421)
(0., 0.)	(131.614, -376.333)	(12.242, -866.144)	(192.345, -882.716)
(0., 0.)	(130.825, -377.16)	(27.063, -869.495)	(207.689, -881.691)
(0., 0.)	(129.985, -377.934)	(41.465, -872.284)	(222.469, -880.363)
(0., 0.)	(129.264, -378.511)	(55.414, -874.531)	(236.563, -878.75)
(0., 0.)	(128.764, -378.799)	(68.855, -876.244)	(249.966, -876.997)
(0., 0.)	(128.436, -378.821)	(81.727, -877.49)	(262.694, -875.182)
(0., 0.)	(128.155, -378.72)	(93.965, -878.377)	(274.72, -873.26)
(0., 0.)	(127.827, -378.636)	(105.56, -878.962)	(286.063, -871.279)
(0., 0.)	(127.424, -378.603)	(116.518, -879.272)	(296.659, -869.288)
(0., 0.)	(126.944, -378.539)	(126.776, -879.318)	(306.446, -867.334)
(0., 0.)	(126.391, -378.357)	(136.278, -879.218)	(315.467, -865.335)
(0., 0.)	(125.782, -378.042)	(145.069, -879.21)	(323.739, -862.983)
(0., 0.)	(125.141, -377.629)	(153.214, -879.442)	(331.159, -859.941)
(0., 0.)	(124.476, -377.133)	(160.666, -879.803)	(337.631, -856.166)
(0., 0.)	(123.747, -376.549)	(167.351, -880.077)	(343.184, -852.025)
(0., 0.)	(122.939, -375.926)	(173.225, -880.122)	(347.91, -847.959)
(0., 0.)	(122.065, -375.349)	(178.234, -879.93)	(351.863, -844.254)
(0., 0.)	(121.121, -374.89)	(182.316, -879.606)	(355.083, -841.212)
(0., 0.)	(120.1, -374.596)	(185.439, -879.294)	(357.503, -838.834)
(0., 0.)	(118.992, -374.476)	(187.586, -879.172)	(359.02, -836.942)
(0., 0.)	(117.816, -374.516)	(188.733, -879.354)	(359.551, -835.486)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(116.594, -374.677)	(188.797, -879.745)	(359.068, -834.511)
(0., 0.)	(115.382, -374.94)	(187.65, -880.147)	(357.686, -834.176)
(0., 0.)	(114.253, -375.313)	(185.19, -880.422)	(355.375, -834.536)
(0., 0.)	(113.24, -375.791)	(181.463, -880.641)	(352.055, -835.593)
(0., 0.)	(112.293, -376.362)	(176.732, -881.092)	(347.87, -837.227)
(0., 0.)	(111.308, -377.05)	(171.401, -881.985)	(343.174, -839.148)
(0., 0.)	(110.156, -377.906)	(165.829, -883.13)	(338.316, -841.097)
(0., 0.)	(108.714, -378.926)	(160.275, -884.105)	(333.621, -843.029)
(0., 0.)	(106.899, -380.04)	(154.88, -884.684)	(329.163, -844.923)
(0., 0.)	(104.732, -381.2)	(149.638, -884.876)	(324.764, -846.768)
(0., 0.)	(102.298, -382.378)	(144.403, -884.766)	(320.287, -848.738)
(0., 0.)	(99.698, -383.503)	(138.99, -884.511)	(315.587, -850.895)
(0., 0.)	(97.055, -384.509)	(133.265, -884.229)	(310.479, -853.038)
(0., 0.)	(94.508, -385.405)	(127.239, -883.943)	(304.93, -855.005)
(0., 0.)	(92.122, -386.213)	(120.987, -883.622)	(299.066, -856.895)
(0., 0.)	(89.88, -386.953)	(114.549, -883.234)	(292.994, -858.913)
(0., 0.)	(87.704, -387.694)	(107.931, -882.844)	(286.765, -861.044)
(0., 0.)	(85.501, -388.471)	(101.283, -882.717)	(280.412, -863.076)
(0., 0.)	(83.258, -389.286)	(94.687, -882.955)	(273.967, -864.973)
(0., 0.)	(81.082, -390.175)	(88.104, -883.409)	(267.538, -866.899)
(0., 0.)	(79.06, -391.183)	(81.506, -883.975)	(261.147, -868.895)
(0., 0.)	(77.147, -392.31)	(74.903, -884.649)	(254.735, -870.861)
(0., 0.)	(75.259, -393.491)	(68.3, -885.426)	(248.303, -872.762)
(0., 0.)	(73.317, -394.616)	(61.669, -886.248)	(241.837, -874.515)
(0., 0.)	(71.228, -395.647)	(54.979, -887.046)	(235.314, -876.139)
(0., 0.)	(68.895, -396.571)	(48.224, -887.758)	(228.711, -877.615)
(0., 0.)	(66.267, -397.401)	(41.436, -888.349)	(222.049, -878.899)
(0., 0.)	(63.372, -398.141)	(34.672, -888.814)	(215.425, -880.052)
(0., 0.)	(60.269, -398.746)	(27.988, -889.181)	(208.891, -881.119)
(0., 0.)	(57.099, -399.231)	(21.42, -889.484)	(202.428, -882.072)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(54.077, -399.685)	(14.971, -889.727)	(196.076, -882.91)
(0., 0.)	(51.311, -400.172)	(8.63, -889.924)	(189.913, -883.686)
(0., 0.)	(48.788, -400.699)	(2.419, -890.085)	(183.912, -884.362)
(0., 0.)	(46.463, -401.229)	(-3.636, -890.2)	(178.002, -884.866)
(0., 0.)	(44.28, -401.745)	(-9.536, -890.264)	(172.212, -885.248)
(0., 0.)	(42.139, -402.249)	(-15.316, -890.276)	(166.59, -885.614)
(0., 0.)	(39.949, -402.728)	(-20.999, -890.228)	(161.033, -885.922)
(0., 0.)	(37.682, -403.179)	(-26.578, -890.116)	(155.512, -886.093)
(0., 0.)	(35.388, -403.624)	(-32.037, -889.917)	(150.144, -886.195)
(0., 0.)	(33.127, -404.06)	(-37.37, -889.663)	(144.953, -886.306)
(0., 0.)	(30.919, -404.421)	(-42.567, -889.417)	(139.832, -886.332)
(0., 0.)	(28.797, -404.674)	(-47.62, -889.199)	(134.724, -886.177)
(0., 0.)	(26.799, -404.865)	(-52.518, -888.973)	(129.744, -885.99)
(0., 0.)	(24.943, -405.07)	(-57.239, -888.721)	(125.082, -886.033)
(0., 0.)	(23.212, -405.281)	(-61.78, -888.47)	(120.644, -886.209)
(0., 0.)	(21.596, -405.438)	(-66.174, -888.239)	(116.252, -886.309)
(0., 0.)	(20.062, -405.512)	(-70.462, -888.009)	(111.92, -886.307)
(0., 0.)	(18.546, -405.546)	(-74.662, -887.752)	(107.736, -886.233)
(0., 0.)	(17.014, -405.591)	(-78.756, -887.451)	(103.752, -886.149)
(0., 0.)	(15.478, -405.659)	(-82.733, -887.093)	(99.91, -886.117)
(0., 0.)	(13.979, -405.736)	(-86.58, -886.679)	(96.095, -886.075)
(0., 0.)	(12.553, -405.796)	(-90.311, -886.248)	(92.279, -885.944)
(0., 0.)	(11.204, -405.825)	(-93.964, -885.829)	(88.536, -885.796)
(0., 0.)	(9.915, -405.825)	(-97.58, -885.407)	(84.907, -885.707)
(0., 0.)	(8.693, -405.808)	(-101.184, -884.98)	(81.356, -885.606)
(0., 0.)	(7.545, -405.798)	(-104.773, -884.534)	(77.806, -885.334)
(0., 0.)	(6.435, -405.8)	(-108.332, -884.031)	(74.25, -884.925)
(0., 0.)	(5.305, -405.771)	(-111.857, -883.467)	(70.718, -884.562)
(0., 0.)	(4.13, -405.696)	(-115.365, -882.876)	(67.198, -884.313)
(0., 0.)	(2.925, -405.604)	(-118.892, -882.304)	(63.645, -884.058)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(1.688, -405.512)	(-122.455, -881.78)	(60.056, -883.751)
(0., 0.)	(0.41, -405.416)	(-126.049, -881.289)	(56.446, -883.439)
(0., 0.)	(-0.913, -405.309)	(-129.665, -880.795)	(52.797, -883.114)
(0., 0.)	(-2.306, -405.189)	(-133.304, -880.278)	(49.116, -882.768)
(0., 0.)	(-3.782, -405.056)	(-136.97, -879.74)	(45.461, -882.464)
(0., 0.)	(-5.33, -404.883)	(-140.676, -879.206)	(41.808, -882.177)
(0., 0.)	(-6.941, -404.639)	(-144.416, -878.69)	(38.085, -881.802)
(0., 0.)	(-8.638, -404.333)	(-148.185, -878.175)	(34.288, -881.35)
(0., 0.)	(-10.442, -403.998)	(-151.987, -877.653)	(30.488, -880.966)
(0., 0.)	(-12.356, -403.653)	(-155.829, -877.125)	(26.682, -880.683)
(0., 0.)	(-14.364, -403.292)	(-159.71, -876.583)	(22.79, -880.394)
(0., 0.)	(-16.444, -402.888)	(-163.634, -876.015)	(18.791, -880.038)
(0., 0.)	(-18.562, -402.431)	(-167.6, -875.426)	(14.75, -879.645)
(0., 0.)	(-20.698, -401.923)	(-171.607, -874.84)	(10.713, -879.244)
(0., 0.)	(-22.846, -401.377)	(-175.636, -874.273)	(6.693, -878.851)
(0., 0.)	(-24.984, -400.822)	(-179.676, -873.701)	(2.68, -878.453)
(0., 0.)	(-27.092, -400.29)	(-183.718, -873.104)	(-1.367, -878.026)
(0., 0.)	(-29.183, -399.78)	(-187.766, -872.471)	(-5.491, -877.569)
(0., 0.)	(-31.265, -399.281)	(-191.834, -871.823)	(-9.655, -877.134)
(0., 0.)	(-33.31, -398.805)	(-195.947, -871.2)	(-13.79, -876.781)
(0., 0.)	(-35.3, -398.369)	(-200.11, -870.627)	(-17.921, -876.473)
(0., 0.)	(-37.217, -397.974)	(-204.289, -870.082)	(-22.105, -876.117)
(0., 0.)	(-39.041, -397.613)	(-208.461, -869.509)	(-26.34, -875.717)
(0., 0.)	(-40.787, -397.281)	(-212.633, -868.889)	(-30.582, -875.368)
(0., 0.)	(-42.49, -396.983)	(-216.838, -868.238)	(-34.831, -875.123)
(0., 0.)	(-44.168, -396.709)	(-221.086, -867.629)	(-39.116, -874.981)
(0., 0.)	(-45.822, -396.444)	(-225.376, -867.107)	(-43.453, -874.906)
(0., 0.)	(-47.444, -396.161)	(-229.69, -866.639)	(-47.817, -874.851)
(0., 0.)	(-49.008, -395.87)	(-234.006, -866.128)	(-52.163, -874.853)
(0., 0.)	(-50.498, -395.629)	(-238.327, -865.513)	(-56.563, -874.936)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-51.911, -395.464)	(-242.675, -864.818)	(-61.11, -875.061)
(0., 0.)	(-53.274, -395.344)	(-247.097, -864.05)	(-65.762, -875.199)
(0., 0.)	(-54.617, -395.211)	(-251.611, -863.196)	(-70.445, -875.369)
(0., 0.)	(-55.96, -395.022)	(-256.189, -862.277)	(-75.161, -875.564)
(0., 0.)	(-57.32, -394.783)	(-260.81, -861.318)	(-79.972, -875.733)
(0., 0.)	(-58.722, -394.495)	(-265.485, -860.314)	(-84.922, -875.891)
(0., 0.)	(-60.185, -394.155)	(-270.23, -859.243)	(-89.972, -876.107)
(0., 0.)	(-61.679, -393.769)	(-275.04, -858.12)	(-95.083, -876.391)
(0., 0.)	(-63.166, -393.356)	(-279.894, -856.947)	(-100.264, -876.712)
(0., 0.)	(-64.624, -392.946)	(-284.778, -855.69)	(-105.544, -877.021)
(0., 0.)	(-66.036, -392.572)	(-289.711, -854.32)	(-110.97, -877.327)
(0., 0.)	(-67.409, -392.24)	(-294.734, -852.829)	(-116.579, -877.654)
(0., 0.)	(-68.771, -391.911)	(-299.87, -851.223)	(-122.351, -877.955)
(0., 0.)	(-70.14, -391.535)	(-305.103, -849.526)	(-128.227, -878.209)
(0., 0.)	(-71.5, -391.092)	(-310.414, -847.74)	(-134.221, -878.442)
(0., 0.)	(-72.809, -390.587)	(-315.795, -845.866)	(-140.368, -878.701)
(0., 0.)	(-74.031, -390.053)	(-321.256, -843.892)	(-146.663, -879.009)
(0., 0.)	(-75.157, -389.526)	(-326.777, -841.772)	(-153.076, -879.318)
(0., 0.)	(-76.159, -389.025)	(-332.329, -839.485)	(-159.593, -879.63)
(0., 0.)	(-76.993, -388.56)	(-337.892, -837.089)	(-166.206, -879.938)
(0., 0.)	(-77.634, -388.118)	(-343.435, -834.628)	(-172.858, -880.205)
(0., 0.)	(-78.087, -387.673)	(-348.926, -832.065)	(-179.548, -880.419)
(0., 0.)	(-78.374, -387.226)	(-354.348, -829.381)	(-186.311, -880.658)
(0., 0.)	(-78.498, -386.786)	(-359.703, -826.603)	(-193.122, -880.949)
(0., 0.)	(-78.414, -386.366)	(-364.969, -823.741)	(-199.917, -881.218)
(0., 0.)	(-78.064, -385.989)	(-370.06, -820.776)	(-206.665, -881.447)
(0., 0.)	(-77.417, -385.682)	(-374.897, -817.691)	(-213.358, -881.684)
(0., 0.)	(-76.458, -385.475)	(-379.447, -814.453)	(-219.953, -881.964)
(0., 0.)	(-75.15, -385.363)	(-383.712, -811.037)	(-226.4, -882.227)
(0., 0.)	(-73.468, -385.321)	(-387.664, -807.448)	(-232.646, -882.414)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-71.384, -385.331)	(-391.253, -803.655)	(-238.648, -882.519)
(0., 0.)	(-68.878, -385.389)	(-394.462, -799.592)	(-244.381, -882.544)
(0., 0.)	(-65.944, -385.518)	(-397.314, -795.227)	(-249.871, -882.401)
(0., 0.)	(-62.584, -385.731)	(-399.8, -790.548)	(-255.134, -882.011)
(0., 0.)	(-58.791, -386.043)	(-401.879, -785.522)	(-260.159, -881.339)
(0., 0.)	(-54.544, -386.509)	(-403.499, -780.11)	(-264.946, -880.394)
(0., 0.)	(-49.848, -387.158)	(-404.619, -774.338)	(-269.41, -879.132)
(0., 0.)	(-44.744, -387.92)	(-405.227, -768.227)	(-273.47, -877.566)
(0., 0.)	(-39.299, -388.711)	(-405.3, -761.793)	(-277.163, -875.794)
(0., 0.)	(-33.556, -389.469)	(-404.787, -755.037)	(-280.536, -873.786)
(0., 0.)	(-27.529, -390.159)	(-403.639, -747.988)	(-283.552, -871.537)
(0., 0.)	(-21.238, -390.734)	(-401.8, -740.714)	(-286.147, -869.094)
(0., 0.)	(-14.725, -391.132)	(-399.257, -733.282)	(-288.246, -866.414)
(0., 0.)	(-8.012, -391.32)	(-395.996, -725.735)	(-289.846, -863.535)
(0., 0.)	(-1.118, -391.296)	(-391.982, -718.127)	(-290.981, -860.611)
(0., 0.)	(5.921, -391.116)	(-387.22, -710.528)	(-291.783, -857.665)
(0., 0.)	(13.028, -390.879)	(-381.812, -703.115)	(-292.385, -854.735)
(0., 0.)	(20.126, -390.629)	(-375.945, -696.107)	(-292.727, -851.903)
(0., 0.)	(27.175, -390.338)	(-369.812, -689.623)	(-292.63, -849.25)
(0., 0.)	(34.161, -389.916)	(-363.5, -683.617)	(-292.052, -846.857)
(0., 0.)	(41.121, -389.296)	(-356.998, -678.051)	(-291.105, -844.704)
(0., 0.)	(48.086, -388.495)	(-350.369, -673.075)	(-289.699, -842.647)
(0., 0.)	(55.011, -387.554)	(-343.922, -668.924)	(-287.16, -840.492)
(0., 0.)	(61.787, -386.473)	(-338.006, -665.802)	(-282.541, -838.136)
(0., 0.)	(68.363, -385.217)	(-332.68, -663.82)	(-275.452, -835.669)
(0., 0.)	(74.794, -383.778)	(-327.612, -663.008)	(-266.208, -833.378)
(0., 0.)	(81.155, -382.223)	(-322.286, -663.283)	(-255.368, -831.507)
(0., 0.)	(87.427, -380.643)	(-316.308, -664.5)	(-243.402, -830.209)
(0., 0.)	(93.497, -379.053)	(-309.569, -666.561)	(-230.552, -829.546)
(0., 0.)	(99.286, -377.461)	(-302.16, -669.463)	(-216.998, -829.475)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(104.779, -375.883)	(-294.165, -673.204)	(-202.917, -829.927)
(0., 0.)	(110.015, -374.346)	(-285.594, -677.75)	(-188.399, -830.873)
(0., 0.)	(115.041, -372.873)	(-276.458, -683.072)	(-173.483, -832.405)
(0., 0.)	(119.853, -371.489)	(-266.797, -689.185)	(-158.173, -834.467)
(0., 0.)	(124.401, -370.213)	(-256.645, -696.075)	(-142.414, -836.947)
(0., 0.)	(128.659, -369.071)	(-246.022, -703.675)	(-126.121, -839.77)
(0., 0.)	(132.624, -368.062)	(-234.945, -711.934)	(-109.31, -842.808)
(0., 0.)	(136.271, -367.138)	(-223.377, -720.807)	(-92.073, -845.899)
(0., 0.)	(139.568, -366.255)	(-211.212, -730.135)	(-74.448, -849.036)
(0., 0.)	(142.511, -365.432)	(-198.407, -739.763)	(-56.44, -852.203)
(0., 0.)	(145.106, -364.711)	(-185.029, -749.616)	(-38.073, -855.292)
(0., 0.)	(147.335, -364.093)	(-171.124, -759.614)	(-19.435, -858.19)
(0., 0.)	(149.18, -363.538)	(-156.684, -769.636)	(-0.671, -860.905)
(0., 0.)	(150.675, -363.033)	(-141.698, -779.527)	(18.088, -863.48)
(0., 0.)	(151.862, -362.632)	(-126.189, -789.172)	(36.859, -865.989)
(0., 0.)	(152.749, -362.419)	(-110.233, -798.54)	(55.715, -868.404)
(0., 0.)	(153.319, -362.451)	(-93.912, -807.6)	(74.668, -870.54)
(0., 0.)	(153.567, -362.731)	(-77.308, -816.315)	(93.634, -872.197)
(0., 0.)	(153.521, -363.236)	(-60.511, -824.624)	(112.442, -873.317)
(0., 0.)	(153.236, -363.932)	(-43.593, -832.443)	(131.029, -874.038)
(0., 0.)	(152.769, -364.757)	(-26.597, -839.677)	(149.386, -874.43)
(0., 0.)	(152.147, -365.664)	(-9.559, -846.231)	(167.493, -874.505)
(0., 0.)	(151.346, -366.612)	(7.455, -852.029)	(185.287, -874.275)
(0., 0.)	(150.325, -367.619)	(24.32, -857.09)	(202.688, -873.725)
(0., 0.)	(149.07, -368.728)	(40.915, -861.49)	(219.717, -872.955)
(0., 0.)	(147.619, -369.952)	(57.19, -865.3)	(236.393, -871.962)
(0., 0.)	(146.021, -371.254)	(73.073, -868.563)	(252.522, -870.398)
(0., 0.)	(144.343, -372.546)	(88.468, -871.304)	(267.901, -868.191)
(0., 0.)	(142.719, -373.655)	(103.267, -873.567)	(282.451, -865.53)
(0., 0.)	(141.276, -374.434)	(117.371, -875.368)	(296.165, -862.594)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(140.055, -374.878)	(130.735, -876.654)	(309.028, -859.463)
(0., 0.)	(139.037, -375.074)	(143.339, -877.377)	(321.021, -856.192)
(0., 0.)	(138.195, -375.093)	(155.152, -877.609)	(332.118, -852.81)
(0., 0.)	(137.518, -374.944)	(166.117, -877.474)	(342.268, -849.227)
(0., 0.)	(136.98, -374.583)	(176.157, -877.03)	(351.438, -845.449)
(0., 0.)	(136.545, -373.988)	(185.265, -876.377)	(359.64, -841.633)
(0., 0.)	(136.161, -373.181)	(193.445, -875.645)	(366.84, -837.836)
(0., 0.)	(135.733, -372.226)	(200.66, -874.904)	(373.055, -834.142)
(0., 0.)	(135.188, -371.244)	(206.855, -874.163)	(378.355, -830.752)
(0., 0.)	(134.524, -370.399)	(211.973, -873.433)	(382.658, -827.668)
(0., 0.)	(133.766, -369.793)	(215.997, -872.799)	(385.764, -824.796)
(0., 0.)	(132.922, -369.431)	(218.907, -872.337)	(387.731, -822.352)
(0., 0.)	(132.001, -369.3)	(220.655, -872.06)	(388.746, -820.589)
(0., 0.)	(131.024, -369.349)	(221.163, -871.912)	(388.827, -819.54)
(0., 0.)	(130.051, -369.514)	(220.354, -871.802)	(387.888, -819.181)
(0., 0.)	(129.134, -369.758)	(218.201, -871.722)	(385.88, -819.512)
(0., 0.)	(128.28, -370.068)	(214.759, -871.785)	(382.851, -820.539)
(0., 0.)	(127.449, -370.487)	(210.231, -872.19)	(378.999, -822.123)
(0., 0.)	(126.554, -371.06)	(204.987, -873.086)	(374.561, -824.084)
(0., 0.)	(125.484, -371.796)	(199.393, -874.289)	(369.782, -826.225)
(0., 0.)	(124.144, -372.701)	(193.759, -875.388)	(365.023, -828.217)
(0., 0.)	(122.448, -373.775)	(188.333, -876.105)	(360.511, -829.806)
(0., 0.)	(120.319, -374.953)	(183.115, -876.331)	(356.099, -831.187)
(0., 0.)	(117.785, -376.125)	(177.943, -876.103)	(351.658, -832.769)
(0., 0.)	(115.018, -377.206)	(172.649, -875.653)	(347.091, -834.731)
(0., 0.)	(112.244, -378.152)	(167.177, -875.249)	(342.18, -836.861)
(0., 0.)	(109.604, -378.97)	(161.548, -874.95)	(336.859, -838.892)
(0., 0.)	(107.164, -379.691)	(155.833, -874.678)	(331.435, -840.91)
(0., 0.)	(104.954, -380.352)	(150.106, -874.447)	(326.094, -843.084)
(0., 0.)	(102.955, -380.989)	(144.376, -874.328)	(320.817, -845.421)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(101.104, -381.656)	(138.638, -874.37)	(315.523, -847.826)
(0., 0.)	(99.347, -382.437)	(132.923, -874.589)	(310.155, -850.178)
(0., 0.)	(97.705, -383.398)	(127.246, -874.971)	(304.751, -852.406)
(0., 0.)	(96.224, -384.537)	(121.582, -875.481)	(299.391, -854.563)
(0., 0.)	(94.926, -385.796)	(115.934, -876.137)	(294.11, -856.708)
(0., 0.)	(93.782, -387.119)	(110.379, -877.054)	(288.83, -858.844)
(0., 0.)	(92.707, -388.458)	(104.921, -878.206)	(283.486, -860.984)
(0., 0.)	(91.556, -389.739)	(99.472, -879.416)	(278.079, -863.03)
(0., 0.)	(90.131, -390.87)	(93.941, -880.533)	(272.59, -864.833)
(0., 0.)	(88.248, -391.847)	(88.299, -881.52)	(267.019, -866.371)
(0., 0.)	(85.811, -392.732)	(82.557, -882.384)	(261.386, -867.757)
(0., 0.)	(82.893, -393.571)	(76.746, -883.156)	(255.673, -869.018)
(0., 0.)	(79.694, -394.393)	(70.911, -883.886)	(249.857, -870.14)
(0., 0.)	(76.397, -395.197)	(65.096, -884.597)	(244.009, -871.187)
(0., 0.)	(73.132, -395.956)	(59.329, -885.28)	(238.234, -872.255)
(0., 0.)	(70.019, -396.652)	(53.631, -885.929)	(232.598, -873.402)
(0., 0.)	(67.159, -397.276)	(48.034, -886.544)	(227.129, -874.604)
(0., 0.)	(64.601, -397.813)	(42.568, -887.136)	(221.805, -875.818)
(0., 0.)	(62.319, -398.279)	(37.249, -887.726)	(216.641, -877.025)
(0., 0.)	(60.229, -398.734)	(32.053, -888.286)	(211.612, -878.146)
(0., 0.)	(58.255, -399.213)	(26.948, -888.751)	(206.678, -879.161)
(0., 0.)	(56.33, -399.708)	(21.902, -889.111)	(201.785, -880.027)
(0., 0.)	(54.402, -400.243)	(16.91, -889.4)	(196.927, -880.727)
(0., 0.)	(52.415, -400.813)	(11.975, -889.645)	(192.102, -881.256)
(0., 0.)	(50.338, -401.369)	(7.092, -889.845)	(187.283, -881.609)
(0., 0.)	(48.2, -401.872)	(2.241, -889.973)	(182.505, -881.934)
(0., 0.)	(46.071, -402.302)	(-2.583, -890.015)	(177.818, -882.391)
(0., 0.)	(44.034, -402.658)	(-7.354, -889.997)	(173.149, -882.824)
(0., 0.)	(42.133, -402.955)	(-12.04, -889.966)	(168.394, -882.949)
(0., 0.)	(40.389, -403.206)	(-16.624, -889.953)	(163.68, -882.904)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(38.793, -403.436)	(-21.088, -889.961)	(159.284, -883.106)
(0., 0.)	(37.284, -403.659)	(-25.432, -889.991)	(155.156, -883.508)
(0., 0.)	(35.793, -403.866)	(-29.666, -890.024)	(151.098, -883.837)
(0., 0.)	(34.306, -404.072)	(-33.809, -890.042)	(147.03, -884.014)
(0., 0.)	(32.828, -404.268)	(-37.876, -890.033)	(142.975, -884.14)
(0., 0.)	(31.335, -404.429)	(-41.894, -889.955)	(138.975, -884.294)
(0., 0.)	(29.803, -404.557)	(-45.875, -889.76)	(135.075, -884.496)
(0., 0.)	(28.246, -404.68)	(-49.813, -889.466)	(131.232, -884.655)
(0., 0.)	(26.713, -404.805)	(-53.727, -889.104)	(127.342, -884.633)
(0., 0.)	(25.225, -404.901)	(-57.651, -888.665)	(123.427, -884.47)
(0., 0.)	(23.731, -404.948)	(-61.587, -888.135)	(119.555, -884.315)
(0., 0.)	(22.186, -404.983)	(-65.515, -887.53)	(115.69, -884.162)
(0., 0.)	(20.609, -405.056)	(-69.434, -886.896)	(111.797, -883.926)
(0., 0.)	(19.054, -405.162)	(-73.373, -886.28)	(107.912, -883.656)
(0., 0.)	(17.549, -405.251)	(-77.358, -885.702)	(104.013, -883.447)
(0., 0.)	(16.076, -405.303)	(-81.383, -885.15)	(100.022, -883.262)
(0., 0.)	(14.591, -405.339)	(-85.431, -884.623)	(95.981, -883.096)
(0., 0.)	(13.048, -405.368)	(-89.512, -884.126)	(91.947, -882.982)
(0., 0.)	(11.411, -405.399)	(-93.669, -883.67)	(87.844, -882.862)
(0., 0.)	(9.668, -405.446)	(-97.945, -883.244)	(83.612, -882.694)
(0., 0.)	(7.827, -405.495)	(-102.349, -882.831)	(79.268, -882.506)
(0., 0.)	(5.886, -405.53)	(-106.861, -882.416)	(74.808, -882.306)
(0., 0.)	(3.825, -405.536)	(-111.445, -881.984)	(70.222, -882.076)
(0., 0.)	(1.643, -405.52)	(-116.076, -881.545)	(65.56, -881.847)
(0., 0.)	(-0.604, -405.491)	(-120.743, -881.113)	(60.866, -881.613)
(0., 0.)	(-2.857, -405.457)	(-125.451, -880.686)	(56.134, -881.331)
(0., 0.)	(-5.089, -405.41)	(-130.208, -880.237)	(51.355, -880.993)
(0., 0.)	(-7.291, -405.342)	(-135., -879.748)	(46.587, -880.668)
(0., 0.)	(-9.45, -405.237)	(-139.799, -879.242)	(41.835, -880.389)
(0., 0.)	(-11.548, -405.089)	(-144.595, -878.717)	(37.044, -880.075)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-13.59, -404.927)	(-149.385, -878.142)	(32.197, -879.659)
(0., 0.)	(-15.58, -404.774)	(-154.147, -877.505)	(27.376, -879.224)
(0., 0.)	(-17.508, -404.642)	(-158.847, -876.83)	(22.655, -878.835)
(0., 0.)	(-19.364, -404.55)	(-163.475, -876.155)	(18.028, -878.466)
(0., 0.)	(-21.144, -404.478)	(-168.041, -875.486)	(13.451, -878.061)
(0., 0.)	(-22.846, -404.371)	(-172.557, -874.841)	(8.909, -877.652)
(0., 0.)	(-24.45, -404.208)	(-177.053, -874.23)	(4.393, -877.272)
(0., 0.)	(-25.939, -404.032)	(-181.514, -873.624)	(-0.099, -876.886)
(0., 0.)	(-27.302, -403.874)	(-185.885, -872.999)	(-4.537, -876.474)
(0., 0.)	(-28.549, -403.73)	(-190.176, -872.348)	(-8.862, -876.126)
(0., 0.)	(-29.713, -403.606)	(-194.436, -871.726)	(-13.104, -875.882)
(0., 0.)	(-30.836, -403.489)	(-198.713, -871.187)	(-17.361, -875.646)
(0., 0.)	(-31.962, -403.357)	(-203.018, -870.699)	(-21.686, -875.346)
(0., 0.)	(-33.118, -403.212)	(-207.332, -870.176)	(-26.048, -875.019)
(0., 0.)	(-34.319, -403.061)	(-211.665, -869.562)	(-30.431, -874.716)
(0., 0.)	(-35.583, -402.889)	(-216.045, -868.912)	(-34.875, -874.452)
(0., 0.)	(-36.912, -402.687)	(-220.484, -868.295)	(-39.406, -874.205)
(0., 0.)	(-38.288, -402.464)	(-224.974, -867.654)	(-43.992, -873.942)
(0., 0.)	(-39.694, -402.218)	(-229.505, -866.941)	(-48.606, -873.668)
(0., 0.)	(-41.103, -401.947)	(-234.077, -866.185)	(-53.244, -873.418)
(0., 0.)	(-42.478, -401.66)	(-238.707, -865.388)	(-57.933, -873.214)
(0., 0.)	(-43.796, -401.371)	(-243.371, -864.516)	(-62.699, -873.033)
(0., 0.)	(-45.065, -401.08)	(-248.029, -863.534)	(-67.537, -872.83)
(0., 0.)	(-46.331, -400.773)	(-252.681, -862.409)	(-72.396, -872.644)
(0., 0.)	(-47.652, -400.428)	(-257.339, -861.158)	(-77.281, -872.553)
(0., 0.)	(-49.055, -400.021)	(-261.995, -859.859)	(-82.254, -872.57)
(0., 0.)	(-50.543, -399.524)	(-266.666, -858.55)	(-87.324, -872.656)
(0., 0.)	(-52.103, -398.915)	(-271.39, -857.194)	(-92.447, -872.79)
(0., 0.)	(-53.747, -398.21)	(-276.18, -855.72)	(-97.66, -872.993)
(0., 0.)	(-55.472, -397.442)	(-281.036, -854.099)	(-103.057, -873.305)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-57.26, -396.643)	(-285.972, -852.365)	(-108.636, -873.726)
(0., 0.)	(-59.062, -395.829)	(-291.008, -850.566)	(-114.339, -874.193)
(0., 0.)	(-60.808, -395.018)	(-296.154, -848.702)	(-120.182, -874.687)
(0., 0.)	(-62.42, -394.236)	(-301.389, -846.756)	(-126.21, -875.236)
(0., 0.)	(-63.828, -393.506)	(-306.686, -844.726)	(-132.432, -875.81)
(0., 0.)	(-64.978, -392.867)	(-312.035, -842.607)	(-138.803, -876.381)
(0., 0.)	(-65.838, -392.33)	(-317.429, -840.373)	(-145.256, -876.98)
(0., 0.)	(-66.433, -391.868)	(-322.849, -838.012)	(-151.76, -877.666)
(0., 0.)	(-66.804, -391.448)	(-328.288, -835.514)	(-158.351, -878.44)
(0., 0.)	(-66.975, -391.054)	(-333.739, -832.885)	(-165.113, -879.186)
(0., 0.)	(-66.953, -390.7)	(-339.175, -830.154)	(-172.087, -879.739)
(0., 0.)	(-66.743, -390.409)	(-344.56, -827.343)	(-179.099, -880.223)
(0., 0.)	(-66.352, -390.211)	(-349.85, -824.442)	(-186.04, -880.758)
(0., 0.)	(-65.753, -390.105)	(-355.042, -821.413)	(-192.918, -881.324)
(0., 0.)	(-64.918, -390.054)	(-360.096, -818.196)	(-199.762, -881.852)
(0., 0.)	(-63.853, -390.031)	(-364.919, -814.75)	(-206.621, -882.227)
(0., 0.)	(-62.522, -390.025)	(-369.441, -811.028)	(-213.479, -882.351)
(0., 0.)	(-60.832, -390.04)	(-373.643, -806.961)	(-220.174, -882.249)
(0., 0.)	(-58.714, -390.096)	(-377.508, -802.51)	(-226.584, -881.924)
(0., 0.)	(-56.174, -390.205)	(-380.984, -797.687)	(-232.72, -881.335)
(0., 0.)	(-53.239, -390.364)	(-384.011, -792.473)	(-238.584, -880.469)
(0., 0.)	(-49.887, -390.598)	(-386.538, -786.856)	(-244.154, -879.315)
(0., 0.)	(-46.051, -390.954)	(-388.529, -780.873)	(-249.395, -877.815)
(0., 0.)	(-41.692, -391.422)	(-389.966, -774.562)	(-254.266, -875.985)
(0., 0.)	(-36.852, -391.95)	(-390.797, -767.92)	(-258.751, -873.91)
(0., 0.)	(-31.629, -392.49)	(-390.955, -760.979)	(-262.795, -871.64)
(0., 0.)	(-26.087, -392.988)	(-390.403, -753.786)	(-266.365, -869.172)
(0., 0.)	(-20.255, -393.39)	(-389.086, -746.348)	(-269.486, -866.535)
(0., 0.)	(-14.164, -393.65)	(-386.94, -738.714)	(-272.079, -863.677)
(0., 0.)	(-7.841, -393.755)	(-383.951, -730.969)	(-274.09, -860.62)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-1.279, -393.753)	(-380.177, -723.169)	(-275.553, -857.492)
(0., 0.)	(5.499, -393.685)	(-375.717, -715.418)	(-276.572, -854.411)
(0., 0.)	(12.421, -393.524)	(-370.698, -707.902)	(-277.257, -851.459)
(0., 0.)	(19.421, -393.198)	(-365.27, -700.798)	(-277.667, -848.594)
(0., 0.)	(26.48, -392.667)	(-359.594, -694.178)	(-277.835, -845.905)
(0., 0.)	(33.549, -391.936)	(-353.807, -688.1)	(-277.767, -843.595)
(0., 0.)	(40.501, -391.002)	(-348.011, -682.616)	(-277.412, -841.623)
(0., 0.)	(47.241, -389.907)	(-342.332, -677.805)	(-276.441, -839.627)
(0., 0.)	(53.797, -388.76)	(-336.937, -673.798)	(-274.15, -837.342)
(0., 0.)	(60.24, -387.618)	(-331.891, -670.743)	(-269.91, -834.798)
(0., 0.)	(66.554, -386.411)	(-327.047, -668.788)	(-263.445, -832.291)
(0., 0.)	(72.702, -385.099)	(-322.159, -667.975)	(-254.94, -830.121)
(0., 0.)	(78.668, -383.716)	(-316.953, -668.225)	(-244.915, -828.46)
(0., 0.)	(84.431, -382.295)	(-311.239, -669.414)	(-233.845, -827.444)
(0., 0.)	(89.974, -380.897)	(-304.987, -671.475)	(-222.013, -827.076)
(0., 0.)	(95.251, -379.572)	(-298.276, -674.424)	(-209.558, -827.327)
(0., 0.)	(100.227, -378.333)	(-291.186, -678.304)	(-196.576, -828.105)
(0., 0.)	(104.894, -377.175)	(-283.746, -683.123)	(-183.152, -829.395)
(0., 0.)	(109.271, -376.127)	(-275.908, -688.853)	(-169.377, -831.256)
(0., 0.)	(113.397, -375.236)	(-267.589, -695.398)	(-155.288, -833.676)
(0., 0.)	(117.286, -374.479)	(-258.711, -702.622)	(-140.884, -836.618)
(0., 0.)	(120.899, -373.784)	(-249.225, -710.408)	(-126.087, -839.951)
(0., 0.)	(124.226, -373.083)	(-239.14, -718.711)	(-110.797, -843.431)
(0., 0.)	(127.308, -372.364)	(-228.551, -727.504)	(-95.026, -846.841)
(0., 0.)	(130.171, -371.651)	(-217.504, -736.698)	(-78.845, -850.094)
(0., 0.)	(132.762, -370.965)	(-205.917, -746.141)	(-62.319, -853.193)
(0., 0.)	(135.006, -370.332)	(-193.711, -755.685)	(-45.555, -856.159)
(0., 0.)	(136.874, -369.774)	(-180.904, -765.214)	(-28.591, -859.048)
(0., 0.)	(138.414, -369.321)	(-167.527, -774.656)	(-11.409, -861.844)
(0., 0.)	(139.693, -368.982)	(-153.578, -783.952)	(6.008, -864.513)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(140.733, -368.738)	(-139.067, -793.071)	(23.676, -867.017)
(0., 0.)	(141.513, -368.622)	(-124.073, -802.001)	(41.572, -869.368)
(0., 0.)	(141.982, -368.717)	(-108.688, -810.746)	(59.632, -871.557)
(0., 0.)	(142.129, -369.077)	(-92.947, -819.255)	(77.779, -873.512)
(0., 0.)	(142.008, -369.669)	(-76.882, -827.428)	(95.975, -875.049)
(0., 0.)	(141.671, -370.39)	(-60.573, -835.162)	(114.186, -876.102)
(0., 0.)	(141.174, -371.15)	(-44.133, -842.358)	(132.268, -876.687)
(0., 0.)	(140.544, -371.94)	(-27.675, -848.947)	(149.999, -876.749)
(0., 0.)	(139.777, -372.823)	(-11.29, -854.898)	(167.317, -876.342)
(0., 0.)	(138.857, -373.83)	(4.941, -860.154)	(184.26, -875.715)
(0., 0.)	(137.78, -374.932)	(20.934, -864.697)	(200.809, -875.041)
(0., 0.)	(136.578, -376.07)	(36.61, -868.555)	(216.747, -874.153)
(0., 0.)	(135.297, -377.147)	(51.876, -871.782)	(232.013, -873.085)
(0., 0.)	(134.024, -378.065)	(66.661, -874.402)	(246.692, -872.04)
(0., 0.)	(132.878, -378.739)	(80.925, -876.424)	(260.786, -870.982)
(0., 0.)	(131.938, -379.163)	(94.617, -877.885)	(274.232, -869.658)
(0., 0.)	(131.24, -379.37)	(107.669, -878.869)	(286.969, -867.799)
(0., 0.)	(130.784, -379.408)	(120.058, -879.49)	(298.922, -865.295)
(0., 0.)	(130.5, -379.288)	(131.849, -879.913)	(310.068, -862.195)
(0., 0.)	(130.313, -378.991)	(143.059, -880.243)	(320.398, -858.739)
(0., 0.)	(130.195, -378.507)	(153.585, -880.367)	(329.936, -855.185)
(0., 0.)	(130.142, -377.832)	(163.34, -880.175)	(338.705, -851.667)
(0., 0.)	(130.112, -376.975)	(172.303, -879.703)	(346.794, -848.376)
(0., 0.)	(129.997, -375.98)	(180.435, -879.017)	(354.24, -845.444)
(0., 0.)	(129.706, -374.946)	(187.705, -878.195)	(360.949, -842.752)
(0., 0.)	(129.249, -373.972)	(194.089, -877.344)	(366.736, -839.974)
(0., 0.)	(128.698, -373.107)	(199.559, -876.571)	(371.541, -837.011)
(0., 0.)	(128.079, -372.401)	(204.065, -875.929)	(375.362, -834.034)
(0., 0.)	(127.358, -371.917)	(207.547, -875.439)	(378.144, -831.32)
(0., 0.)	(126.538, -371.692)	(209.905, -875.12)	(379.833, -829.103)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(125.659, -371.681)	(211.011, -874.963)	(380.427, -827.537)
(0., 0.)	(124.792, -371.818)	(210.803, -874.909)	(379.946, -826.807)
(0., 0.)	(123.995, -372.072)	(209.246, -874.883)	(378.419, -826.964)
(0., 0.)	(123.274, -372.423)	(206.316, -874.853)	(375.903, -827.859)
(0., 0.)	(122.594, -372.838)	(202.193, -874.981)	(372.463, -829.318)
(0., 0.)	(121.858, -373.323)	(197.264, -875.517)	(368.267, -831.197)
(0., 0.)	(120.919, -373.957)	(191.914, -876.407)	(363.649, -833.25)
(0., 0.)	(119.619, -374.837)	(186.429, -877.265)	(358.996, -835.154)
(0., 0.)	(117.841, -375.966)	(181.011, -877.792)	(354.497, -836.76)
(0., 0.)	(115.529, -377.242)	(175.692, -877.981)	(349.969, -838.226)
(0., 0.)	(112.758, -378.561)	(170.365, -877.902)	(345.261, -839.78)
(0., 0.)	(109.737, -379.844)	(164.891, -877.637)	(340.377, -841.628)
(0., 0.)	(106.718, -381.016)	(159.158, -877.292)	(335.259, -843.782)
(0., 0.)	(103.879, -382.038)	(153.138, -876.975)	(329.796, -846.069)
(0., 0.)	(101.313, -382.924)	(146.937, -876.757)	(324.049, -848.466)
(0., 0.)	(99.041, -383.723)	(140.663, -876.653)	(318.245, -851.06)
(0., 0.)	(97.012, -384.48)	(134.325, -876.664)	(312.451, -853.766)
(0., 0.)	(95.129, -385.231)	(127.914, -876.86)	(306.478, -856.257)
(0., 0.)	(93.321, -386.046)	(121.493, -877.338)	(300.249, -858.391)
(0., 0.)	(91.62, -387.02)	(115.137, -878.116)	(293.988, -860.435)
(0., 0.)	(90.094, -388.221)	(108.862, -879.123)	(287.833, -862.542)
(0., 0.)	(88.749, -389.586)	(102.615, -880.261)	(281.745, -864.615)
(0., 0.)	(87.494, -390.995)	(96.33, -881.437)	(275.621, -866.55)
(0., 0.)	(86.155, -392.34)	(89.962, -882.559)	(269.401, -868.321)
(0., 0.)	(84.514, -393.543)	(83.5, -883.546)	(263.09, -869.95)
(0., 0.)	(82.401, -394.59)	(76.993, -884.412)	(256.757, -871.457)
(0., 0.)	(79.785, -395.514)	(70.562, -885.297)	(250.446, -872.796)
(0., 0.)	(76.771, -396.336)	(64.231, -886.188)	(244.141, -873.903)
(0., 0.)	(73.547, -397.051)	(57.982, -886.956)	(237.859, -874.842)
(0., 0.)	(70.325, -397.68)	(51.822, -887.55)	(231.691, -875.733)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(67.272, -398.242)	(45.786, -887.994)	(225.738, -876.658)
(0., 0.)	(64.465, -398.781)	(39.897, -888.342)	(219.971, -877.578)
(0., 0.)	(61.936, -399.328)	(34.162, -888.626)	(214.34, -878.424)
(0., 0.)	(59.661, -399.854)	(28.58, -888.85)	(208.878, -879.25)
(0., 0.)	(57.558, -400.322)	(23.155, -889.005)	(203.592, -880.099)
(0., 0.)	(55.538, -400.765)	(17.879, -889.121)	(198.441, -880.937)
(0., 0.)	(53.532, -401.226)	(12.749, -889.245)	(193.418, -881.724)
(0., 0.)	(51.47, -401.678)	(7.757, -889.38)	(188.528, -882.362)
(0., 0.)	(49.352, -402.111)	(2.871, -889.482)	(183.727, -882.859)
(0., 0.)	(47.276, -402.579)	(-1.934, -889.508)	(178.981, -883.277)
(0., 0.)	(45.278, -403.066)	(-6.646, -889.476)	(174.335, -883.66)
(0., 0.)	(43.344, -403.514)	(-11.233, -889.45)	(169.838, -884.039)
(0., 0.)	(41.44, -403.902)	(-15.69, -889.458)	(165.421, -884.358)
(0., 0.)	(39.582, -404.227)	(-20.031, -889.467)	(161.057, -884.613)
(0., 0.)	(37.81, -404.483)	(-24.243, -889.472)	(156.857, -884.928)
(0., 0.)	(36.156, -404.684)	(-28.311, -889.49)	(152.899, -885.288)
(0., 0.)	(34.619, -404.843)	(-32.222, -889.512)	(149.113, -885.54)
(0., 0.)	(33.178, -404.955)	(-35.963, -889.516)	(145.407, -885.623)
(0., 0.)	(31.797, -405.019)	(-39.551, -889.473)	(141.709, -885.557)
(0., 0.)	(30.449, -405.079)	(-43.038, -889.358)	(138.038, -885.453)
(0., 0.)	(29.122, -405.169)	(-46.462, -889.181)	(134.561, -885.546)
(0., 0.)	(27.799, -405.275)	(-49.846, -888.985)	(131.259, -885.774)
(0., 0.)	(26.455, -405.38)	(-53.21, -888.778)	(128.011, -885.949)
(0., 0.)	(25.075, -405.477)	(-56.571, -888.547)	(124.727, -885.989)
(0., 0.)	(23.671, -405.557)	(-59.962, -888.281)	(121.357, -885.898)
(0., 0.)	(22.26, -405.606)	(-63.415, -887.962)	(117.923, -885.77)
(0., 0.)	(20.837, -405.62)	(-66.936, -887.589)	(114.449, -885.693)
(0., 0.)	(19.393, -405.622)	(-70.512, -887.192)	(110.893, -885.623)
(0., 0.)	(17.923, -405.63)	(-74.14, -886.794)	(107.208, -885.479)
(0., 0.)	(16.435, -405.664)	(-77.822, -886.409)	(103.459, -885.287)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(14.951, -405.715)	(-81.564, -886.027)	(99.744, -885.116)
(0., 0.)	(13.493, -405.738)	(-85.358, -885.629)	(96.068, -884.986)
(0., 0.)	(12.025, -405.73)	(-89.197, -885.208)	(92.329, -884.854)
(0., 0.)	(10.49, -405.734)	(-93.073, -884.782)	(88.458, -884.693)
(0., 0.)	(8.874, -405.75)	(-96.988, -884.372)	(84.463, -884.511)
(0., 0.)	(7.226, -405.729)	(-100.961, -883.975)	(80.429, -884.321)
(0., 0.)	(5.577, -405.658)	(-104.996, -883.592)	(76.424, -884.179)
(0., 0.)	(3.874, -405.582)	(-109.084, -883.223)	(72.411, -884.104)
(0., 0.)	(2.069, -405.531)	(-113.226, -882.841)	(68.3, -884.004)
(0., 0.)	(0.177, -405.474)	(-117.441, -882.427)	(64.045, -883.822)
(0., 0.)	(-1.778, -405.367)	(-121.737, -881.968)	(59.687, -883.591)
(0., 0.)	(-3.803, -405.224)	(-126.128, -881.446)	(55.28, -883.355)
(0., 0.)	(-5.916, -405.088)	(-130.621, -880.882)	(50.829, -883.131)
(0., 0.)	(-8.11, -404.957)	(-135.224, -880.351)	(46.289, -882.925)
(0., 0.)	(-10.36, -404.797)	(-139.955, -879.893)	(41.594, -882.728)
(0., 0.)	(-12.655, -404.598)	(-144.803, -879.459)	(36.715, -882.477)
(0., 0.)	(-14.997, -404.36)	(-149.743, -878.973)	(31.713, -882.166)
(0., 0.)	(-17.368, -404.083)	(-154.774, -878.397)	(26.659, -881.85)
(0., 0.)	(-19.736, -403.763)	(-159.91, -877.757)	(21.512, -881.516)
(0., 0.)	(-22.08, -403.394)	(-165.156, -877.119)	(16.229, -881.136)
(0., 0.)	(-24.381, -402.973)	(-170.48, -876.516)	(10.878, -880.735)
(0., 0.)	(-26.613, -402.519)	(-175.841, -875.919)	(5.526, -880.334)
(0., 0.)	(-28.767, -402.06)	(-181.222, -875.272)	(0.163, -879.945)
(0., 0.)	(-30.872, -401.62)	(-186.638, -874.568)	(-5.266, -879.594)
(0., 0.)	(-32.966, -401.184)	(-192.1, -873.86)	(-10.79, -879.264)
(0., 0.)	(-35.073, -400.718)	(-197.614, -873.198)	(-16.39, -878.904)
(0., 0.)	(-37.186, -400.217)	(-203.174, -872.545)	(-22.002, -878.539)
(0., 0.)	(-39.293, -399.696)	(-208.755, -871.853)	(-27.595, -878.251)
(0., 0.)	(-41.404, -399.153)	(-214.333, -871.106)	(-33.226, -878.022)
(0., 0.)	(-43.549, -398.576)	(-219.924, -870.309)	(-38.927, -877.768)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-45.729, -397.982)	(-225.553, -869.481)	(-44.649, -877.42)
(0., 0.)	(-47.909, -397.427)	(-231.229, -868.605)	(-50.367, -877.002)
(0., 0.)	(-50.041, -396.943)	(-236.942, -867.619)	(-56.163, -876.615)
(0., 0.)	(-52.119, -396.514)	(-242.654, -866.485)	(-62.095, -876.299)
(0., 0.)	(-54.122, -396.115)	(-248.348, -865.227)	(-68.067, -875.985)
(0., 0.)	(-56.027, -395.735)	(-254.067, -863.87)	(-73.996, -875.67)
(0., 0.)	(-57.808, -395.36)	(-259.818, -862.423)	(-79.931, -875.442)
(0., 0.)	(-59.498, -395.014)	(-265.556, -860.928)	(-85.945, -875.346)
(0., 0.)	(-61.139, -394.696)	(-271.26, -859.411)	(-92.007, -875.339)
(0., 0.)	(-62.749, -394.346)	(-276.968, -857.814)	(-98.079, -875.366)
(0., 0.)	(-64.365, -393.907)	(-282.725, -856.071)	(-104.229, -875.434)
(0., 0.)	(-66.028, -393.376)	(-288.542, -854.182)	(-110.569, -875.587)
(0., 0.)	(-67.756, -392.778)	(-294.411, -852.19)	(-117.121, -875.858)
(0., 0.)	(-69.517, -392.134)	(-300.333, -850.131)	(-123.815, -876.235)
(0., 0.)	(-71.231, -391.444)	(-306.308, -848.011)	(-130.593, -876.67)
(0., 0.)	(-72.771, -390.737)	(-312.293, -845.808)	(-137.454, -877.133)
(0., 0.)	(-74.029, -390.079)	(-318.258, -843.518)	(-144.41, -877.651)
(0., 0.)	(-74.972, -389.512)	(-324.205, -841.138)	(-151.451, -878.232)
(0., 0.)	(-75.595, -389.036)	(-330.118, -838.621)	(-158.563, -878.817)
(0., 0.)	(-75.883, -388.639)	(-335.949, -835.908)	(-165.717, -879.398)
(0., 0.)	(-75.82, -388.323)	(-341.638, -833.022)	(-172.883, -880.025)
(0., 0.)	(-75.42, -388.096)	(-347.153, -830.054)	(-180.047, -880.711)
(0., 0.)	(-74.705, -387.991)	(-352.492, -827.042)	(-187.158, -881.425)
(0., 0.)	(-73.729, -387.986)	(-357.666, -823.93)	(-194.145, -882.107)
(0., 0.)	(-72.551, -388.032)	(-362.644, -820.651)	(-200.989, -882.71)
(0., 0.)	(-71.184, -388.12)	(-367.389, -817.201)	(-207.71, -883.215)
(0., 0.)	(-69.563, -388.257)	(-371.863, -813.529)	(-214.304, -883.578)
(0., 0.)	(-67.604, -388.423)	(-376.012, -809.54)	(-220.735, -883.693)
(0., 0.)	(-65.241, -388.589)	(-379.787, -805.201)	(-226.956, -883.467)
(0., 0.)	(-62.391, -388.788)	(-383.162, -800.493)	(-232.92, -882.9)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-58.984, -389.062)	(-386.098, -795.377)	(-238.576, -882.028)
(0., 0.)	(-54.999, -389.454)	(-388.549, -789.867)	(-243.942, -880.905)
(0., 0.)	(-50.436, -390.008)	(-390.5, -783.999)	(-249.096, -879.603)
(0., 0.)	(-45.296, -390.696)	(-391.92, -777.805)	(-253.987, -878.108)
(0., 0.)	(-39.598, -391.439)	(-392.74, -771.298)	(-258.481, -876.392)
(0., 0.)	(-33.415, -392.16)	(-392.885, -764.489)	(-262.506, -874.465)
(0., 0.)	(-26.841, -392.811)	(-392.237, -757.385)	(-266.042, -872.295)
(0., 0.)	(-19.939, -393.332)	(-390.684, -749.917)	(-269.038, -869.809)
(0., 0.)	(-12.74, -393.641)	(-388.17, -742.03)	(-271.327, -866.945)
(0., 0.)	(-5.254, -393.733)	(-384.643, -733.791)	(-272.772, -863.753)
(0., 0.)	(2.524, -393.665)	(-380.126, -725.384)	(-273.455, -860.397)
(0., 0.)	(10.594, -393.474)	(-374.757, -717.037)	(-273.567, -857.066)
(0., 0.)	(18.92, -393.116)	(-368.756, -708.973)	(-273.236, -853.796)
(0., 0.)	(27.392, -392.499)	(-362.355, -701.369)	(-272.541, -850.595)
(0., 0.)	(35.867, -391.611)	(-355.79, -694.322)	(-271.439, -847.49)
(0., 0.)	(44.161, -390.529)	(-349.306, -688.)	(-269.697, -844.481)
(0., 0.)	(52.108, -389.349)	(-343.14, -682.681)	(-266.768, -841.477)
(0., 0.)	(59.663, -388.104)	(-337.406, -678.575)	(-261.942, -838.313)
(0., 0.)	(66.914, -386.754)	(-331.94, -675.662)	(-254.864, -835.011)
(0., 0.)	(73.979, -385.255)	(-326.379, -673.825)	(-245.865, -831.822)
(0., 0.)	(80.914, -383.63)	(-320.366, -672.996)	(-235.609, -829.151)
(0., 0.)	(87.695, -381.951)	(-313.71, -673.131)	(-224.637, -827.3)
(0., 0.)	(94.261, -380.29)	(-306.419, -674.166)	(-213.255, -826.35)
(0., 0.)	(100.551, -378.668)	(-298.595, -676.03)	(-201.597, -826.23)
(0., 0.)	(106.523, -377.09)	(-290.331, -678.677)	(-189.637, -826.81)
(0., 0.)	(112.165, -375.571)	(-281.682, -682.094)	(-177.267, -827.984)
(0., 0.)	(117.467, -374.147)	(-272.679, -686.298)	(-164.357, -829.596)
(0., 0.)	(122.396, -372.841)	(-263.312, -691.31)	(-150.733, -831.523)
(0., 0.)	(126.958, -371.623)	(-253.561, -697.184)	(-136.269, -833.657)
(0., 0.)	(131.194, -370.46)	(-243.449, -703.944)	(-121.026, -835.862)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(135.096, -369.292)	(-233.005, -711.47)	(-105.237, -838.127)
(0., 0.)	(138.662, -368.061)	(-222.16, -719.599)	(-89.091, -840.627)
(0., 0.)	(141.883, -366.782)	(-210.783, -728.236)	(-72.715, -843.435)
(0., 0.)	(144.741, -365.543)	(-198.781, -737.266)	(-56.145, -846.475)
(0., 0.)	(147.229, -364.44)	(-186.128, -746.478)	(-39.322, -849.728)
(0., 0.)	(149.363, -363.533)	(-172.871, -755.753)	(-22.19, -853.01)
(0., 0.)	(151.166, -362.825)	(-159.069, -765.079)	(-4.725, -856.131)
(0., 0.)	(152.662, -362.269)	(-144.757, -774.437)	(13.045, -858.985)
(0., 0.)	(153.87, -361.813)	(-129.999, -783.776)	(31.066, -861.515)
(0., 0.)	(154.77, -361.452)	(-114.835, -793.056)	(49.272, -863.74)
(0., 0.)	(155.364, -361.237)	(-99.254, -802.164)	(67.634, -865.79)
(0., 0.)	(155.692, -361.261)	(-83.283, -810.961)	(86.064, -867.734)
(0., 0.)	(155.775, -361.609)	(-67.04, -819.359)	(104.414, -869.43)
(0., 0.)	(155.598, -362.259)	(-50.663, -827.329)	(122.576, -870.694)
(0., 0.)	(155.136, -363.11)	(-34.227, -834.825)	(140.491, -871.329)
(0., 0.)	(154.382, -364.08)	(-17.767, -841.747)	(158.213, -871.398)
(0., 0.)	(153.342, -365.145)	(-1.327, -848.006)	(175.85, -871.2)
(0., 0.)	(152.035, -366.337)	(15.033, -853.612)	(193.172, -870.718)
(0., 0.)	(150.471, -367.689)	(31.233, -858.614)	(209.952, -870.007)
(0., 0.)	(148.665, -369.211)	(47.204, -862.996)	(226.263, -869.258)
(0., 0.)	(146.655, -370.852)	(62.834, -866.78)	(242.141, -868.339)
(0., 0.)	(144.53, -372.488)	(77.974, -870.096)	(257.439, -867.)
(0., 0.)	(142.435, -373.933)	(92.529, -873.058)	(271.951, -865.07)
(0., 0.)	(140.529, -375.02)	(106.448, -875.656)	(285.511, -862.437)
(0., 0.)	(138.916, -375.717)	(119.634, -877.718)	(298.035, -859.202)
(0., 0.)	(137.598, -376.14)	(131.981, -879.141)	(309.511, -855.701)
(0., 0.)	(136.524, -376.396)	(143.414, -879.932)	(320.011, -852.189)
(0., 0.)	(135.672, -376.474)	(153.906, -880.21)	(329.516, -848.703)
(0., 0.)	(135.045, -376.322)	(163.449, -880.127)	(337.907, -845.246)
(0., 0.)	(134.619, -375.914)	(172.043, -879.804)	(345.306, -842.052)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(134.324, -375.273)	(179.711, -879.393)	(351.84, -839.357)
(0., 0.)	(134.056, -374.495)	(186.458, -879.027)	(357.507, -837.229)
(0., 0.)	(133.725, -373.711)	(192.256, -878.753)	(362.325, -835.597)
(0., 0.)	(133.273, -373.039)	(197.099, -878.588)	(366.291, -834.236)
(0., 0.)	(132.681, -372.524)	(200.978, -878.547)	(369.353, -832.881)
(0., 0.)	(131.948, -372.174)	(203.844, -878.604)	(371.437, -831.39)
(0., 0.)	(131.05, -372.01)	(205.634, -878.686)	(372.533, -829.909)
(0., 0.)	(129.957, -372.067)	(206.312, -878.772)	(372.692, -828.741)
(0., 0.)	(128.669, -372.34)	(205.803, -878.858)	(371.959, -828.171)
(0., 0.)	(127.232, -372.765)	(204.021, -878.934)	(370.344, -828.385)
(0., 0.)	(125.714, -373.267)	(200.994, -879.087)	(367.83, -829.336)
(0., 0.)	(124.147, -373.824)	(196.879, -879.484)	(364.471, -830.84)
(0., 0.)	(122.536, -374.452)	(191.931, -880.277)	(360.391, -832.693)
(0., 0.)	(120.854, -375.182)	(186.397, -881.385)	(355.74, -834.694)
(0., 0.)	(119.026, -376.053)	(180.542, -882.495)	(350.786, -836.684)
(0., 0.)	(116.954, -377.095)	(174.776, -883.381)	(345.944, -838.421)
(0., 0.)	(114.544, -378.29)	(169.374, -883.958)	(341.408, -839.734)
(0., 0.)	(111.754, -379.57)	(164.239, -884.109)	(336.932, -840.751)
(0., 0.)	(108.67, -380.842)	(159.104, -883.764)	(332.311, -841.79)
(0., 0.)	(105.461, -382.024)	(153.797, -883.111)	(327.499, -843.09)
(0., 0.)	(102.321, -383.048)	(148.313, -882.468)	(322.479, -844.574)
(0., 0.)	(99.417, -383.878)	(142.719, -882.01)	(317.265, -846.1)
(0., 0.)	(96.845, -384.559)	(137.074, -881.688)	(311.957, -847.72)
(0., 0.)	(94.596, -385.174)	(131.399, -881.423)	(306.668, -849.527)
(0., 0.)	(92.592, -385.795)	(125.719, -881.299)	(301.416, -851.491)
(0., 0.)	(90.745, -386.47)	(120.063, -881.449)	(296.181, -853.581)
(0., 0.)	(89.022, -387.221)	(114.445, -881.881)	(290.953, -855.731)
(0., 0.)	(87.476, -388.049)	(108.848, -882.469)	(285.642, -857.784)
(0., 0.)	(86.162, -388.967)	(103.276, -883.139)	(280.221, -859.658)
(0., 0.)	(85.066, -389.976)	(97.772, -883.933)	(274.846, -861.563)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(84.077, -391.039)	(92.334, -884.878)	(269.573, -863.611)
(0., 0.)	(83.019, -392.127)	(86.889, -885.883)	(264.322, -865.637)
(0., 0.)	(81.685, -393.193)	(81.36, -886.831)	(258.977, -867.415)
(0., 0.)	(79.92, -394.2)	(75.747, -887.676)	(253.521, -868.929)
(0., 0.)	(77.683, -395.1)	(70.078, -888.402)	(247.99, -870.213)
(0., 0.)	(75.032, -395.88)	(64.376, -888.977)	(242.402, -871.265)
(0., 0.)	(72.11, -396.573)	(58.678, -889.39)	(236.853, -872.188)
(0., 0.)	(69.096, -397.205)	(53.051, -889.718)	(231.406, -873.127)
(0., 0.)	(66.163, -397.799)	(47.577, -890.126)	(226.047, -874.148)
(0., 0.)	(63.432, -398.344)	(42.248, -890.643)	(220.748, -875.179)
(0., 0.)	(60.955, -398.84)	(36.981, -891.149)	(215.505, -876.211)
(0., 0.)	(58.722, -399.326)	(31.738, -891.581)	(210.366, -877.315)
(0., 0.)	(56.679, -399.818)	(26.53, -891.923)	(205.326, -878.474)
(0., 0.)	(54.783, -400.349)	(21.389, -892.17)	(200.378, -879.632)
(0., 0.)	(52.966, -400.909)	(16.346, -892.338)	(195.51, -880.705)
(0., 0.)	(51.15, -401.429)	(11.392, -892.439)	(190.713, -881.653)
(0., 0.)	(49.316, -401.906)	(6.488, -892.465)	(185.955, -882.484)
(0., 0.)	(47.45, -402.369)	(1.597, -892.406)	(181.22, -883.222)
(0., 0.)	(45.501, -402.78)	(-3.277, -892.267)	(176.489, -883.84)
(0., 0.)	(43.435, -403.09)	(-8.114, -892.067)	(171.748, -884.32)
(0., 0.)	(41.309, -403.371)	(-12.909, -891.856)	(167.045, -884.714)
(0., 0.)	(39.244, -403.729)	(-17.644, -891.699)	(162.356, -885.024)
(0., 0.)	(37.315, -404.138)	(-22.297, -891.604)	(157.708, -885.34)
(0., 0.)	(35.522, -404.5)	(-26.862, -891.542)	(153.212, -885.733)
(0., 0.)	(33.84, -404.781)	(-31.334, -891.493)	(148.856, -886.075)
(0., 0.)	(32.25, -405.014)	(-35.684, -891.445)	(144.57, -886.293)
(0., 0.)	(30.742, -405.22)	(-39.884, -891.37)	(140.419, -886.504)
(0., 0.)	(29.285, -405.393)	(-43.936, -891.229)	(136.467, -886.771)
(0., 0.)	(27.847, -405.533)	(-47.851, -891.007)	(132.617, -886.981)
(0., 0.)	(26.404, -405.667)	(-51.642, -890.729)	(128.741, -887.001)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(24.933, -405.798)	(-55.343, -890.429)	(124.894, -886.911)
(0., 0.)	(23.445, -405.909)	(-58.992, -890.123)	(121.237, -886.968)
(0., 0.)	(21.971, -405.981)	(-62.593, -889.811)	(117.728, -887.121)
(0., 0.)	(20.538, -406.012)	(-66.118, -889.48)	(114.274, -887.207)
(0., 0.)	(19.145, -406.033)	(-69.561, -889.08)	(110.868, -887.199)
(0., 0.)	(17.786, -406.066)	(-72.94, -888.59)	(107.508, -887.121)
(0., 0.)	(16.469, -406.089)	(-76.306, -888.048)	(104.142, -887.008)
(0., 0.)	(15.213, -406.071)	(-79.716, -887.504)	(100.716, -886.889)
(0., 0.)	(14.013, -406.028)	(-83.205, -886.96)	(97.221, -886.785)
(0., 0.)	(12.835, -406.009)	(-86.763, -886.395)	(93.705, -886.709)
(0., 0.)	(11.646, -406.027)	(-90.365, -885.837)	(90.177, -886.621)
(0., 0.)	(10.408, -406.052)	(-94.019, -885.319)	(86.562, -886.473)
(0., 0.)	(9.088, -406.055)	(-97.757, -884.819)	(82.799, -886.233)
(0., 0.)	(7.666, -406.014)	(-101.575, -884.325)	(78.944, -885.976)
(0., 0.)	(6.138, -405.933)	(-105.452, -883.847)	(75.07, -885.789)
(0., 0.)	(4.531, -405.851)	(-109.383, -883.385)	(71.156, -885.634)
(0., 0.)	(2.876, -405.776)	(-113.374, -882.923)	(67.16, -885.424)
(0., 0.)	(1.152, -405.685)	(-117.419, -882.455)	(63.107, -885.177)
(0., 0.)	(-0.673, -405.571)	(-121.514, -881.99)	(59.005, -884.933)
(0., 0.)	(-2.616, -405.424)	(-125.658, -881.543)	(54.831, -884.69)
(0., 0.)	(-4.669, -405.228)	(-129.849, -881.109)	(50.598, -884.439)
(0., 0.)	(-6.791, -404.991)	(-134.084, -880.639)	(46.328, -884.16)
(0., 0.)	(-8.932, -404.74)	(-138.354, -880.111)	(42.02, -883.834)
(0., 0.)	(-11.062, -404.486)	(-142.644, -879.563)	(37.707, -883.49)
(0., 0.)	(-13.17, -404.21)	(-146.966, -879.059)	(33.392, -883.156)
(0., 0.)	(-15.218, -403.904)	(-151.324, -878.63)	(29.013, -882.773)
(0., 0.)	(-17.196, -403.565)	(-155.723, -878.215)	(24.567, -882.349)
(0., 0.)	(-19.137, -403.19)	(-160.137, -877.734)	(20.14, -881.976)
(0., 0.)	(-21.077, -402.806)	(-164.526, -877.183)	(15.779, -881.694)
(0., 0.)	(-23.043, -402.423)	(-168.88, -876.596)	(11.419, -881.411)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-25.041, -402.021)	(-173.225, -876.024)	(7.005, -881.054)
(0., 0.)	(-27.058, -401.61)	(-177.61, -875.487)	(2.552, -880.647)
(0., 0.)	(-29.093, -401.207)	(-182.07, -874.962)	(-1.928, -880.249)
(0., 0.)	(-31.158, -400.81)	(-186.609, -874.401)	(-6.465, -879.893)
(0., 0.)	(-33.237, -400.406)	(-191.205, -873.784)	(-11.082, -879.598)
(0., 0.)	(-35.287, -399.995)	(-195.839, -873.118)	(-15.787, -879.339)
(0., 0.)	(-37.268, -399.59)	(-200.511, -872.41)	(-20.599, -879.029)
(0., 0.)	(-39.169, -399.178)	(-205.24, -871.699)	(-25.5, -878.648)
(0., 0.)	(-41.007, -398.713)	(-210.056, -871.)	(-30.417, -878.265)
(0., 0.)	(-42.793, -398.177)	(-214.943, -870.28)	(-35.316, -877.945)
(0., 0.)	(-44.501, -397.613)	(-219.868, -869.476)	(-40.249, -877.665)
(0., 0.)	(-46.109, -397.11)	(-224.812, -868.597)	(-45.294, -877.347)
(0., 0.)	(-47.627, -396.723)	(-229.802, -867.685)	(-50.458, -876.963)
(0., 0.)	(-49.108, -396.424)	(-234.879, -866.74)	(-55.702, -876.57)
(0., 0.)	(-50.62, -396.176)	(-240.025, -865.713)	(-60.982, -876.282)
(0., 0.)	(-52.207, -395.932)	(-245.224, -864.547)	(-66.316, -876.129)
(0., 0.)	(-53.87, -395.657)	(-250.462, -863.269)	(-71.762, -876.042)
(0., 0.)	(-55.586, -395.355)	(-255.746, -861.913)	(-77.36, -876.008)
(0., 0.)	(-57.314, -395.038)	(-261.088, -860.488)	(-83.097, -876.059)
(0., 0.)	(-59.011, -394.705)	(-266.5, -859.035)	(-88.911, -876.202)
(0., 0.)	(-60.659, -394.344)	(-271.968, -857.569)	(-94.748, -876.433)
(0., 0.)	(-62.264, -393.939)	(-277.484, -856.049)	(-100.662, -876.728)
(0., 0.)	(-63.858, -393.479)	(-283.07, -854.428)	(-106.754, -877.058)
(0., 0.)	(-65.473, -392.979)	(-288.74, -852.683)	(-113.047, -877.455)
(0., 0.)	(-67.127, -392.447)	(-294.483, -850.825)	(-119.487, -877.926)
(0., 0.)	(-68.771, -391.873)	(-300.287, -848.893)	(-126.024, -878.397)
(0., 0.)	(-70.322, -391.261)	(-306.139, -846.893)	(-132.647, -878.845)
(0., 0.)	(-71.714, -390.646)	(-312.02, -844.788)	(-139.36, -879.36)
(0., 0.)	(-72.924, -390.079)	(-317.896, -842.574)	(-146.191, -879.984)
(0., 0.)	(-73.962, -389.565)	(-323.739, -840.289)	(-153.162, -880.688)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-74.832, -389.097)	(-329.525, -837.922)	(-160.241, -881.419)
(0., 0.)	(-75.504, -388.676)	(-335.224, -835.426)	(-167.327, -882.123)
(0., 0.)	(-75.923, -388.298)	(-340.83, -832.792)	(-174.365, -882.776)
(0., 0.)	(-76.071, -387.98)	(-346.331, -830.041)	(-181.361, -883.37)
(0., 0.)	(-75.966, -387.76)	(-351.664, -827.182)	(-188.283, -883.923)
(0., 0.)	(-75.618, -387.642)	(-356.794, -824.226)	(-195.077, -884.412)
(0., 0.)	(-75.037, -387.614)	(-361.71, -821.182)	(-201.717, -884.822)
(0., 0.)	(-74.231, -387.67)	(-366.369, -818.041)	(-208.235, -885.212)
(0., 0.)	(-73.195, -387.75)	(-370.735, -814.753)	(-214.675, -885.575)
(0., 0.)	(-71.894, -387.802)	(-374.797, -811.27)	(-220.942, -885.797)
(0., 0.)	(-70.276, -387.819)	(-378.531, -807.536)	(-226.92, -885.748)
(0., 0.)	(-68.254, -387.794)	(-381.857, -803.491)	(-232.58, -885.399)
(0., 0.)	(-65.703, -387.766)	(-384.694, -799.06)	(-237.936, -884.799)
(0., 0.)	(-62.529, -387.835)	(-387.017, -794.165)	(-243.002, -883.923)
(0., 0.)	(-58.697, -388.121)	(-388.832, -788.774)	(-247.752, -882.69)
(0., 0.)	(-54.181, -388.663)	(-390.114, -782.911)	(-252.18, -881.078)
(0., 0.)	(-48.937, -389.43)	(-390.796, -776.617)	(-256.325, -879.104)
(0., 0.)	(-42.971, -390.327)	(-390.781, -769.872)	(-260.158, -876.839)
(0., 0.)	(-36.391, -391.244)	(-389.956, -762.632)	(-263.543, -874.295)
(0., 0.)	(-29.35, -392.071)	(-388.215, -754.882)	(-266.265, -871.396)
(0., 0.)	(-21.949, -392.75)	(-385.49, -746.649)	(-268.225, -868.088)
(0., 0.)	(-14.244, -393.273)	(-381.775, -738.021)	(-269.459, -864.382)
(0., 0.)	(-6.303, -393.634)	(-377.135, -729.147)	(-270.041, -860.387)
(0., 0.)	(1.812, -393.806)	(-371.711, -720.25)	(-270.027, -856.314)
(0., 0.)	(10.044, -393.729)	(-365.697, -711.56)	(-269.524, -852.428)
(0., 0.)	(18.322, -393.333)	(-359.376, -703.31)	(-268.713, -848.82)
(0., 0.)	(26.64, -392.655)	(-353.017, -695.774)	(-267.68, -845.493)
(0., 0.)	(34.973, -391.783)	(-346.818, -689.189)	(-266.172, -842.382)
(0., 0.)	(43.165, -390.758)	(-340.885, -683.633)	(-263.613, -839.237)
(0., 0.)	(51.048, -389.583)	(-335.174, -679.065)	(-259.377, -835.85)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(58.588, -388.237)	(-329.458, -675.45)	(-253.188, -832.338)
(0., 0.)	(65.902, -386.743)	(-323.443, -672.786)	(-245.238, -829.108)
(0., 0.)	(73.107, -385.173)	(-316.995, -671.034)	(-235.934, -826.495)
(0., 0.)	(80.206, -383.561)	(-310.15, -670.211)	(-225.778, -824.659)
(0., 0.)	(87.113, -381.873)	(-303.026, -670.41)	(-215.193, -823.571)
(0., 0.)	(93.734, -380.126)	(-295.734, -671.648)	(-204.311, -823.229)
(0., 0.)	(100.009, -378.397)	(-288.313, -673.871)	(-193.028, -823.659)
(0., 0.)	(105.92, -376.766)	(-280.702, -677.068)	(-181.224, -824.669)
(0., 0.)	(111.437, -375.257)	(-272.795, -681.219)	(-168.802, -825.964)
(0., 0.)	(116.49, -373.899)	(-264.502, -686.301)	(-155.669, -827.511)
(0., 0.)	(121.029, -372.693)	(-255.763, -692.246)	(-141.788, -829.419)
(0., 0.)	(125.075, -371.566)	(-246.544, -698.944)	(-127.277, -831.666)
(0., 0.)	(128.685, -370.466)	(-236.858, -706.359)	(-112.319, -834.192)
(0., 0.)	(131.922, -369.454)	(-226.755, -714.53)	(-96.983, -836.959)
(0., 0.)	(134.842, -368.591)	(-216.201, -723.421)	(-81.254, -839.97)
(0., 0.)	(137.467, -367.837)	(-205.072, -732.888)	(-65.156, -843.275)
(0., 0.)	(139.766, -367.125)	(-193.272, -742.751)	(-48.653, -846.776)
(0., 0.)	(141.704, -366.429)	(-180.76, -752.812)	(-31.724, -850.332)
(0., 0.)	(143.28, -365.797)	(-167.546, -762.917)	(-14.442, -853.854)
(0., 0.)	(144.516, -365.362)	(-153.695, -772.983)	(3.147, -857.301)
(0., 0.)	(145.422, -365.186)	(-139.266, -782.997)	(21.084, -860.566)
(0., 0.)	(146.011, -365.234)	(-124.302, -792.948)	(39.355, -863.519)
(0., 0.)	(146.286, -365.468)	(-108.844, -802.689)	(57.861, -866.105)
(0., 0.)	(146.246, -365.881)	(-92.93, -812.049)	(76.515, -868.314)
(0., 0.)	(145.875, -366.489)	(-76.631, -820.962)	(95.162, -870.165)
(0., 0.)	(145.186, -367.309)	(-60.013, -829.374)	(113.711, -871.678)
(0., 0.)	(144.222, -368.317)	(-43.139, -837.224)	(132.154, -872.808)
(0., 0.)	(143.033, -369.51)	(-26.079, -844.476)	(150.469, -873.547)
(0., 0.)	(141.639, -370.868)	(-8.923, -851.07)	(168.665, -873.978)
(0., 0.)	(140.057, -372.347)	(8.23, -856.947)	(186.697, -874.176)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(138.331, -373.892)	(25.284, -862.094)	(204.386, -873.997)
(0., 0.)	(136.525, -375.43)	(42.125, -866.535)	(221.597, -873.359)
(0., 0.)	(134.693, -376.836)	(58.639, -870.286)	(238.237, -872.353)
(0., 0.)	(132.916, -377.982)	(74.718, -873.37)	(254.204, -870.975)
(0., 0.)	(131.337, -378.819)	(90.23, -875.842)	(269.48, -869.15)
(0., 0.)	(130.074, -379.366)	(105.08, -877.758)	(284.003, -866.806)
(0., 0.)	(129.171, -379.658)	(119.261, -879.236)	(297.637, -863.816)
(0., 0.)	(128.604, -379.706)	(132.832, -880.397)	(310.344, -860.192)
(0., 0.)	(128.323, -379.448)	(145.738, -881.205)	(322.121, -856.129)
(0., 0.)	(128.294, -378.849)	(157.803, -881.571)	(332.918, -851.859)
(0., 0.)	(128.446, -377.958)	(168.945, -881.518)	(342.746, -847.545)
(0., 0.)	(128.683, -376.879)	(179.179, -881.172)	(351.681, -843.346)
(0., 0.)	(128.891, -375.713)	(188.473, -880.598)	(359.69, -839.212)
(0., 0.)	(128.981, -374.524)	(196.781, -879.815)	(366.655, -835.06)
(0., 0.)	(128.934, -373.386)	(204.053, -878.901)	(372.662, -831.082)
(0., 0.)	(128.791, -372.411)	(210.228, -877.968)	(377.788, -827.489)
(0., 0.)	(128.571, -371.681)	(215.239, -877.139)	(381.951, -824.438)
(0., 0.)	(128.257, -371.214)	(219.077, -876.599)	(385.046, -822.075)
(0., 0.)	(127.865, -370.964)	(221.721, -876.501)	(387.044, -820.433)
(0., 0.)	(127.471, -370.894)	(223.062, -876.796)	(387.948, -819.506)
(0., 0.)	(127.141, -370.961)	(222.944, -877.244)	(387.717, -819.389)
(0., 0.)	(126.882, -371.127)	(221.301, -877.627)	(386.373, -820.092)
(0., 0.)	(126.626, -371.394)	(218.243, -877.971)	(383.996, -821.421)
(0., 0.)	(126.249, -371.81)	(214.024, -878.537)	(380.71, -823.142)
(0., 0.)	(125.643, -372.431)	(208.994, -879.558)	(376.662, -825.159)
(0., 0.)	(124.747, -373.302)	(203.45, -880.917)	(372.083, -827.364)
(0., 0.)	(123.487, -374.418)	(197.706, -882.201)	(367.385, -829.548)
(0., 0.)	(121.787, -375.734)	(192.126, -883.145)	(362.919, -831.47)
(0., 0.)	(119.616, -377.162)	(186.818, -883.703)	(358.628, -833.119)
(0., 0.)	(117.037, -378.61)	(181.605, -883.904)	(354.234, -834.672)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(114.215, -379.957)	(176.237, -883.857)	(349.579, -836.286)
(0., 0.)	(111.358, -381.11)	(170.574, -883.714)	(344.6, -837.977)
(0., 0.)	(108.643, -382.091)	(164.585, -883.514)	(339.204, -839.668)
(0., 0.)	(106.169, -382.99)	(158.377, -883.259)	(333.443, -841.38)
(0., 0.)	(103.903, -383.839)	(152.132, -883.027)	(327.557, -843.28)
(0., 0.)	(101.71, -384.633)	(145.969, -882.939)	(321.799, -845.532)
(0., 0.)	(99.488, -385.369)	(139.853, -883.041)	(316.202, -848.069)
(0., 0.)	(97.213, -386.071)	(133.713, -883.279)	(310.638, -850.67)
(0., 0.)	(94.905, -386.814)	(127.58, -883.619)	(305.01, -853.19)
(0., 0.)	(92.627, -387.652)	(121.499, -884.038)	(299.351, -855.625)
(0., 0.)	(90.463, -388.595)	(115.446, -884.537)	(293.73, -858.077)
(0., 0.)	(88.476, -389.623)	(109.398, -885.15)	(288.146, -860.505)
(0., 0.)	(86.651, -390.693)	(103.401, -885.902)	(282.472, -862.692)
(0., 0.)	(84.915, -391.763)	(97.491, -886.749)	(276.662, -864.527)
(0., 0.)	(83.185, -392.803)	(91.652, -887.591)	(270.892, -866.23)
(0., 0.)	(81.383, -393.798)	(85.86, -888.338)	(265.237, -867.888)
(0., 0.)	(79.436, -394.712)	(80.083, -888.953)	(259.635, -869.435)
(0., 0.)	(77.337, -395.5)	(74.321, -889.468)	(254.09, -870.904)
(0., 0.)	(75.139, -396.184)	(68.614, -889.932)	(248.588, -872.302)
(0., 0.)	(72.895, -396.824)	(62.986, -890.353)	(243.143, -873.602)
(0., 0.)	(70.628, -397.448)	(57.427, -890.703)	(237.799, -874.814)
(0., 0.)	(68.366, -398.041)	(51.995, -891.061)	(232.517, -875.932)
(0., 0.)	(66.135, -398.593)	(46.69, -891.425)	(227.282, -877.002)
(0., 0.)	(63.9, -399.102)	(41.442, -891.69)	(222.1, -878.057)
(0., 0.)	(61.618, -399.585)	(36.206, -891.816)	(216.99, -879.095)
(0., 0.)	(59.289, -400.088)	(30.988, -891.859)	(211.931, -880.107)
(0., 0.)	(56.927, -400.65)	(25.82, -891.898)	(206.919, -881.102)
(0., 0.)	(54.566, -401.253)	(20.707, -891.974)	(201.955, -882.085)
(0., 0.)	(52.274, -401.852)	(15.667, -892.089)	(197.068, -883.119)
(0., 0.)	(50.072, -402.387)	(10.718, -892.19)	(192.237, -884.157)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(47.936, -402.795)	(5.862, -892.219)	(187.504, -885.074)
(0., 0.)	(45.893, -403.107)	(1.082, -892.142)	(182.857, -885.762)
(0., 0.)	(43.977, -403.427)	(-3.623, -891.972)	(178.272, -886.186)
(0., 0.)	(42.126, -403.791)	(-8.247, -891.758)	(173.771, -886.471)
(0., 0.)	(40.241, -404.146)	(-12.812, -891.544)	(169.313, -886.746)
(0., 0.)	(38.256, -404.456)	(-17.379, -891.345)	(164.787, -887.016)
(0., 0.)	(36.184, -404.744)	(-21.97, -891.162)	(160.19, -887.231)
(0., 0.)	(34.125, -405.003)	(-26.56, -890.996)	(155.649, -887.409)
(0., 0.)	(32.156, -405.206)	(-31.123, -890.829)	(151.21, -887.585)
(0., 0.)	(30.284, -405.329)	(-35.637, -890.647)	(146.777, -887.739)
(0., 0.)	(28.485, -405.434)	(-40.089, -890.473)	(142.285, -887.841)
(0., 0.)	(26.727, -405.574)	(-44.494, -890.307)	(137.792, -887.923)
(0., 0.)	(25.003, -405.717)	(-48.876, -890.118)	(133.388, -888.021)
(0., 0.)	(23.342, -405.81)	(-53.235, -889.878)	(129.083, -888.103)
(0., 0.)	(21.765, -405.844)	(-57.555, -889.563)	(124.811, -888.107)
(0., 0.)	(20.253, -405.86)	(-61.825, -889.155)	(120.481, -887.967)
(0., 0.)	(18.741, -405.89)	(-66.066, -888.657)	(116.086, -887.666)
(0., 0.)	(17.166, -405.925)	(-70.31, -888.101)	(111.809, -887.478)
(0., 0.)	(15.533, -405.944)	(-74.586, -887.521)	(107.645, -887.456)
(0., 0.)	(13.895, -405.952)	(-78.874, -886.952)	(103.465, -887.412)
(0., 0.)	(12.291, -405.968)	(-83.149, -886.409)	(99.247, -887.276)
(0., 0.)	(10.719, -406.001)	(-87.409, -885.862)	(95.028, -887.1)
(0., 0.)	(9.167, -406.04)	(-91.648, -885.297)	(90.804, -886.941)
(0., 0.)	(7.629, -406.067)	(-95.868, -884.747)	(86.545, -886.766)
(0., 0.)	(6.107, -406.076)	(-100.082, -884.234)	(82.268, -886.549)
(0., 0.)	(4.577, -406.079)	(-104.307, -883.732)	(78.037, -886.349)
(0., 0.)	(2.972, -406.07)	(-108.563, -883.225)	(73.848, -886.186)
(0., 0.)	(1.28, -406.036)	(-112.846, -882.731)	(69.621, -886.013)
(0., 0.)	(-0.432, -405.971)	(-117.137, -882.288)	(65.309, -885.804)
(0., 0.)	(-2.115, -405.878)	(-121.415, -881.902)	(60.953, -885.593)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-3.79, -405.765)	(-125.679, -881.523)	(56.624, -885.395)
(0., 0.)	(-5.51, -405.64)	(-129.942, -881.087)	(52.335, -885.188)
(0., 0.)	(-7.281, -405.499)	(-134.206, -880.592)	(48.073, -884.962)
(0., 0.)	(-9.075, -405.34)	(-138.478, -880.077)	(43.83, -884.741)
(0., 0.)	(-10.879, -405.154)	(-142.754, -879.574)	(39.563, -884.514)
(0., 0.)	(-12.713, -404.929)	(-147.026, -879.1)	(35.245, -884.271)
(0., 0.)	(-14.592, -404.653)	(-151.315, -878.62)	(30.894, -884.018)
(0., 0.)	(-16.526, -404.342)	(-155.626, -878.123)	(26.543, -883.786)
(0., 0.)	(-18.501, -404.008)	(-159.948, -877.619)	(22.21, -883.585)
(0., 0.)	(-20.484, -403.629)	(-164.283, -877.1)	(17.871, -883.368)
(0., 0.)	(-22.437, -403.192)	(-168.629, -876.579)	(13.477, -883.09)
(0., 0.)	(-24.357, -402.725)	(-172.984, -876.067)	(9.033, -882.774)
(0., 0.)	(-26.253, -402.267)	(-177.341, -875.578)	(4.618, -882.536)
(0., 0.)	(-28.124, -401.814)	(-181.68, -875.087)	(0.273, -882.387)
(0., 0.)	(-29.956, -401.34)	(-185.979, -874.547)	(-4.058, -882.198)
(0., 0.)	(-31.726, -400.846)	(-190.227, -873.95)	(-8.412, -881.897)
(0., 0.)	(-33.439, -400.361)	(-194.433, -873.316)	(-12.728, -881.57)
(0., 0.)	(-35.129, -399.927)	(-198.58, -872.679)	(-16.946, -881.337)
(0., 0.)	(-36.821, -399.564)	(-202.688, -872.032)	(-21.118, -881.196)
(0., 0.)	(-38.519, -399.264)	(-206.795, -871.371)	(-25.324, -881.105)
(0., 0.)	(-40.221, -399.002)	(-210.921, -870.703)	(-29.586, -881.066)
(0., 0.)	(-41.916, -398.758)	(-215.046, -870.024)	(-33.853, -881.099)
(0., 0.)	(-43.581, -398.516)	(-219.136, -869.327)	(-38.081, -881.206)
(0., 0.)	(-45.187, -398.277)	(-223.193, -868.582)	(-42.285, -881.342)
(0., 0.)	(-46.725, -398.079)	(-227.226, -867.793)	(-46.5, -881.449)
(0., 0.)	(-48.185, -397.923)	(-231.225, -866.973)	(-50.698, -881.571)
(0., 0.)	(-49.571, -397.773)	(-235.21, -866.133)	(-54.852, -881.779)
(0., 0.)	(-50.903, -397.616)	(-239.197, -865.305)	(-59.032, -882.032)
(0., 0.)	(-52.196, -397.469)	(-243.199, -864.488)	(-63.304, -882.286)
(0., 0.)	(-53.478, -397.326)	(-247.245, -863.618)	(-67.642, -882.533)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-54.802, -397.165)	(-251.335, -862.655)	(-71.992, -882.785)
(0., 0.)	(-56.173, -396.972)	(-255.447, -861.62)	(-76.349, -883.033)
(0., 0.)	(-57.559, -396.752)	(-259.587, -860.513)	(-80.786, -883.21)
(0., 0.)	(-58.939, -396.491)	(-263.801, -859.328)	(-85.376, -883.313)
(0., 0.)	(-60.323, -396.187)	(-268.092, -858.106)	(-90.119, -883.45)
(0., 0.)	(-61.724, -395.852)	(-272.437, -856.89)	(-94.939, -883.686)
(0., 0.)	(-63.16, -395.501)	(-276.855, -855.669)	(-99.792, -883.955)
(0., 0.)	(-64.661, -395.134)	(-281.375, -854.416)	(-104.709, -884.195)
(0., 0.)	(-66.251, -394.735)	(-285.993, -853.132)	(-109.763, -884.413)
(0., 0.)	(-67.907, -394.28)	(-290.686, -851.82)	(-114.989, -884.643)
(0., 0.)	(-69.58, -393.754)	(-295.457, -850.447)	(-120.359, -884.838)
(0., 0.)	(-71.249, -393.181)	(-300.343, -848.957)	(-125.859, -885.001)
(0., 0.)	(-72.924, -392.598)	(-305.36, -847.318)	(-131.506, -885.196)
(0., 0.)	(-74.598, -392.026)	(-310.494, -845.581)	(-137.325, -885.421)
(0., 0.)	(-76.227, -391.455)	(-315.717, -843.776)	(-143.295, -885.584)
(0., 0.)	(-77.732, -390.856)	(-320.997, -841.887)	(-149.396, -885.632)
(0., 0.)	(-79.068, -390.22)	(-326.325, -839.907)	(-155.645, -885.675)
(0., 0.)	(-80.228, -389.602)	(-331.702, -837.829)	(-162.029, -885.803)
(0., 0.)	(-81.223, -389.026)	(-337.101, -835.601)	(-168.48, -885.935)
(0., 0.)	(-82.078, -388.455)	(-342.502, -833.213)	(-174.972, -885.991)
(0., 0.)	(-82.81, -387.894)	(-347.905, -830.714)	(-181.526, -886.056)
(0., 0.)	(-83.416, -387.373)	(-353.297, -828.163)	(-188.172, -886.223)
(0., 0.)	(-83.886, -386.869)	(-358.647, -825.57)	(-194.903, -886.438)
(0., 0.)	(-84.207, -386.346)	(-363.906, -822.873)	(-201.638, -886.597)
(0., 0.)	(-84.343, -385.838)	(-369.057, -820.033)	(-208.324, -886.713)
(0., 0.)	(-84.247, -385.423)	(-374.072, -817.102)	(-214.989, -886.856)
(0., 0.)	(-83.897, -385.105)	(-378.884, -814.088)	(-221.642, -887.047)
(0., 0.)	(-83.274, -384.847)	(-383.458, -810.966)	(-228.234, -887.239)
(0., 0.)	(-82.349, -384.658)	(-387.783, -807.707)	(-234.699, -887.373)
(0., 0.)	(-81.111, -384.557)	(-391.832, -804.261)	(-240.961, -887.489)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-79.593, -384.514)	(-395.562, -800.598)	(-246.989, -887.532)
(0., 0.)	(-77.811, -384.48)	(-398.968, -796.695)	(-252.803, -887.418)
(0., 0.)	(-75.74, -384.437)	(-402.056, -792.559)	(-258.478, -887.12)
(0., 0.)	(-73.345, -384.416)	(-404.813, -788.194)	(-264.007, -886.657)
(0., 0.)	(-70.604, -384.444)	(-407.226, -783.563)	(-269.368, -886.014)
(0., 0.)	(-67.484, -384.574)	(-409.283, -778.635)	(-274.544, -885.201)
(0., 0.)	(-63.924, -384.882)	(-410.947, -773.411)	(-279.46, -884.17)
(0., 0.)	(-59.874, -385.391)	(-412.171, -767.933)	(-284.1, -882.885)
(0., 0.)	(-55.364, -386.055)	(-412.926, -762.256)	(-288.516, -881.42)
(0., 0.)	(-50.488, -386.796)	(-413.179, -756.391)	(-292.727, -879.812)
(0., 0.)	(-45.36, -387.555)	(-412.913, -750.307)	(-296.686, -878.046)
(0., 0.)	(-40.066, -388.286)	(-412.13, -744.056)	(-300.303, -876.131)
(0., 0.)	(-34.661, -388.953)	(-410.793, -737.7)	(-303.562, -874.038)
(0., 0.)	(-29.16, -389.537)	(-408.843, -731.221)	(-306.434, -871.714)
(0., 0.)	(-23.519, -390.036)	(-406.24, -724.585)	(-308.81, -869.216)
(0., 0.)	(-17.657, -390.451)	(-402.973, -717.861)	(-310.709, -866.628)
(0., 0.)	(-11.529, -390.788)	(-399.072, -711.212)	(-312.33, -863.988)
(0., 0.)	(-5.159, -391.036)	(-394.63, -704.764)	(-313.739, -861.402)
(0., 0.)	(1.385, -391.169)	(-389.803, -698.572)	(-314.805, -858.864)
(0., 0.)	(8.04, -391.177)	(-384.707, -692.699)	(-315.387, -856.37)
(0., 0.)	(14.786, -391.046)	(-379.34, -687.188)	(-315.477, -853.993)
(0., 0.)	(21.644, -390.747)	(-373.637, -682.036)	(-315.206, -851.911)
(0., 0.)	(28.62, -390.251)	(-367.615, -677.274)	(-314.601, -850.008)
(0., 0.)	(35.66, -389.565)	(-361.455, -672.998)	(-313.269, -847.87)
(0., 0.)	(42.648, -388.727)	(-355.419, -669.397)	(-310.338, -845.403)
(0., 0.)	(49.472, -387.764)	(-349.645, -666.707)	(-305.113, -842.915)
(0., 0.)	(56.107, -386.693)	(-344.078, -665.1)	(-297.486, -840.772)
(0., 0.)	(62.573, -385.511)	(-338.526, -664.545)	(-287.767, -839.097)
(0., 0.)	(68.865, -384.193)	(-332.753, -664.897)	(-276.365, -837.748)
(0., 0.)	(75.013, -382.793)	(-326.56, -666.018)	(-263.569, -836.503)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(81.107, -381.419)	(-319.863, -667.85)	(-249.668, -835.374)
(0., 0.)	(87.144, -380.097)	(-312.679, -670.416)	(-235.051, -834.482)
(0., 0.)	(92.967, -378.722)	(-305.079, -673.787)	(-219.967, -833.875)
(0., 0.)	(98.481, -377.279)	(-297.12, -678.022)	(-204.558, -833.681)
(0., 0.)	(103.699, -375.855)	(-288.758, -683.105)	(-189.044, -834.098)
(0., 0.)	(108.662, -374.514)	(-279.883, -689.008)	(-173.584, -835.225)
(0., 0.)	(113.377, -373.291)	(-270.412, -695.701)	(-158.075, -836.986)
(0., 0.)	(117.8, -372.222)	(-260.298, -703.125)	(-142.265, -839.295)
(0., 0.)	(121.872, -371.284)	(-249.52, -711.183)	(-125.9, -842.016)
(0., 0.)	(125.566, -370.429)	(-238.082, -719.828)	(-108.84, -844.887)
(0., 0.)	(128.905, -369.679)	(-225.999, -729.014)	(-91.086, -847.647)
(0., 0.)	(131.918, -369.061)	(-213.273, -738.644)	(-72.73, -850.246)
(0., 0.)	(134.646, -368.55)	(-199.943, -748.563)	(-54.014, -852.861)
(0., 0.)	(137.107, -368.084)	(-186.048, -758.666)	(-35.175, -855.589)
(0., 0.)	(139.308, -367.632)	(-171.598, -768.859)	(-16.307, -858.448)
(0., 0.)	(141.251, -367.198)	(-156.596, -778.996)	(2.582, -861.445)
(0., 0.)	(142.929, -366.85)	(-141.038, -788.933)	(21.541, -864.538)
(0., 0.)	(144.313, -366.644)	(-124.916, -798.566)	(40.676, -867.623)
(0., 0.)	(145.369, -366.607)	(-108.294, -807.841)	(60.018, -870.409)
(0., 0.)	(146.092, -366.768)	(-91.287, -816.718)	(79.516, -872.651)
(0., 0.)	(146.499, -367.116)	(-73.994, -825.14)	(99.021, -874.346)
(0., 0.)	(146.652, -367.624)	(-56.486, -833.027)	(118.369, -875.538)
(0., 0.)	(146.62, -368.262)	(-38.847, -840.271)	(137.479, -876.222)
(0., 0.)	(146.433, -368.992)	(-21.17, -846.8)	(156.321, -876.375)
(0., 0.)	(146.088, -369.779)	(-3.542, -852.587)	(174.866, -876.029)
(0., 0.)	(145.59, -370.614)	(13.951, -857.648)	(193.025, -875.227)
(0., 0.)	(144.964, -371.479)	(31.222, -862.022)	(210.657, -874.007)
(0., 0.)	(144.254, -372.348)	(48.204, -865.765)	(227.807, -872.664)
(0., 0.)	(143.531, -373.159)	(64.827, -868.935)	(244.581, -871.511)
(0., 0.)	(142.855, -373.837)	(80.975, -871.574)	(260.792, -870.302)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(142.243, -374.345)	(96.537, -873.664)	(276.285, -868.629)
(0., 0.)	(141.707, -374.65)	(111.432, -875.241)	(290.947, -866.187)
(0., 0.)	(141.3, -374.719)	(125.602, -876.363)	(304.677, -862.867)
(0., 0.)	(141.091, -374.592)	(138.997, -877.012)	(317.4, -858.652)
(0., 0.)	(141.087, -374.354)	(151.581, -877.199)	(329.091, -853.843)
(0., 0.)	(141.249, -374.048)	(163.328, -877.041)	(339.81, -849.01)
(0., 0.)	(141.51, -373.641)	(174.19, -876.621)	(349.557, -844.495)
(0., 0.)	(141.772, -373.042)	(184.137, -876.012)	(358.395, -840.416)
(0., 0.)	(141.957, -372.217)	(193.169, -875.306)	(366.451, -836.8)
(0., 0.)	(142.013, -371.269)	(201.296, -874.603)	(373.762, -833.725)
(0., 0.)	(141.91, -370.363)	(208.531, -873.992)	(380.286, -831.182)
(0., 0.)	(141.645, -369.578)	(214.851, -873.495)	(385.859, -828.829)
(0., 0.)	(141.228, -368.889)	(220.209, -873.065)	(390.507, -826.528)
(0., 0.)	(140.646, -368.256)	(224.575, -872.711)	(394.252, -824.234)
(0., 0.)	(139.884, -367.705)	(227.928, -872.452)	(396.992, -821.938)
(0., 0.)	(138.939, -367.311)	(230.213, -872.221)	(398.685, -819.788)
(0., 0.)	(137.83, -367.134)	(231.37, -872.058)	(399.384, -818.06)
(0., 0.)	(136.587, -367.206)	(231.361, -872.081)	(399.12, -817.042)
(0., 0.)	(135.224, -367.515)	(230.18, -872.337)	(397.917, -816.941)
(0., 0.)	(133.745, -368.005)	(227.814, -872.751)	(395.784, -817.791)
(0., 0.)	(132.167, -368.624)	(224.296, -873.242)	(392.773, -819.389)
(0., 0.)	(130.495, -369.357)	(219.754, -873.848)	(388.965, -821.332)
(0., 0.)	(128.728, -370.213)	(214.434, -874.751)	(384.408, -823.312)
(0., 0.)	(126.866, -371.195)	(208.569, -875.968)	(379.218, -825.328)
(0., 0.)	(124.88, -372.305)	(202.402, -877.209)	(373.831, -827.437)
(0., 0.)	(122.688, -373.554)	(196.343, -878.185)	(368.792, -829.509)
(0., 0.)	(120.21, -374.931)	(190.758, -878.837)	(364.299, -831.301)
(0., 0.)	(117.427, -376.391)	(185.651, -879.191)	(360.096, -832.777)
(0., 0.)	(114.385, -377.838)	(180.743, -879.262)	(355.907, -834.304)
(0., 0.)	(111.209, -379.127)	(175.758, -879.189)	(351.59, -836.271)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(108.094, -380.178)	(170.499, -879.155)	(346.989, -838.577)
(0., 0.)	(105.215, -381.033)	(164.912, -879.224)	(341.902, -840.749)
(0., 0.)	(102.638, -381.78)	(159.042, -879.313)	(336.325, -842.582)
(0., 0.)	(100.31, -382.477)	(152.973, -879.381)	(330.482, -844.356)
(0., 0.)	(98.103, -383.165)	(146.767, -879.512)	(324.58, -846.362)
(0., 0.)	(95.896, -383.908)	(140.455, -879.811)	(318.674, -848.632)
(0., 0.)	(93.687, -384.757)	(134.083, -880.331)	(312.732, -851.089)
(0., 0.)	(91.618, -385.732)	(127.72, -881.115)	(306.77, -853.772)
(0., 0.)	(89.818, -386.844)	(121.401, -882.143)	(300.834, -856.615)
(0., 0.)	(88.309, -388.085)	(115.114, -883.294)	(294.941, -859.426)
(0., 0.)	(87.075, -389.443)	(108.803, -884.434)	(288.947, -861.958)
(0., 0.)	(86.064, -390.875)	(102.412, -885.457)	(282.759, -864.172)
(0., 0.)	(85.126, -392.295)	(95.918, -886.297)	(276.542, -866.29)
(0., 0.)	(84.04, -393.594)	(89.4, -887.022)	(270.388, -868.394)
(0., 0.)	(82.568, -394.688)	(83.009, -887.827)	(264.243, -870.452)
(0., 0.)	(80.578, -395.591)	(76.757, -888.715)	(258.072, -872.367)
(0., 0.)	(78.118, -396.376)	(70.531, -889.521)	(251.932, -874.069)
(0., 0.)	(75.384, -397.092)	(64.278, -890.134)	(245.831, -875.531)
(0., 0.)	(72.593, -397.749)	(58.041, -890.557)	(239.776, -876.845)
(0., 0.)	(69.86, -398.35)	(51.879, -890.847)	(233.771, -878.098)
(0., 0.)	(67.171, -398.886)	(45.81, -891.066)	(227.828, -879.265)
(0., 0.)	(64.523, -399.368)	(39.822, -891.249)	(221.998, -880.367)
(0., 0.)	(62.024, -399.897)	(33.929, -891.395)	(216.306, -881.412)
(0., 0.)	(59.744, -400.52)	(28.159, -891.499)	(210.739, -882.406)
(0., 0.)	(57.635, -401.162)	(22.517, -891.571)	(205.303, -883.33)
(0., 0.)	(55.575, -401.738)	(16.988, -891.624)	(199.952, -884.097)
(0., 0.)	(53.463, -402.219)	(11.582, -891.662)	(194.697, -884.688)
(0., 0.)	(51.291, -402.612)	(6.301, -891.681)	(189.517, -885.124)
(0., 0.)	(49.093, -402.955)	(1.119, -891.674)	(184.377, -885.471)
(0., 0.)	(46.887, -403.27)	(-3.998, -891.639)	(179.336, -885.831)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(44.673, -403.57)	(-9.055, -891.561)	(174.41, -886.174)
(0., 0.)	(42.462, -403.875)	(-14.019, -891.423)	(169.52, -886.419)
(0., 0.)	(40.295, -404.182)	(-18.854, -891.251)	(164.685, -886.605)
(0., 0.)	(38.244, -404.465)	(-23.55, -891.085)	(160.039, -886.811)
(0., 0.)	(36.354, -404.69)	(-28.113, -890.947)	(155.605, -887.015)
(0., 0.)	(34.623, -404.863)	(-32.538, -890.839)	(151.284, -887.161)
(0., 0.)	(33.035, -405.036)	(-36.802, -890.758)	(147.055, -887.283)
(0., 0.)	(31.561, -405.211)	(-40.915, -890.667)	(142.971, -887.452)
(0., 0.)	(30.185, -405.361)	(-44.902, -890.496)	(139.023, -887.625)
(0., 0.)	(28.916, -405.477)	(-48.772, -890.213)	(135.162, -887.702)
(0., 0.)	(27.744, -405.568)	(-52.541, -889.871)	(131.389, -887.705)
(0., 0.)	(26.639, -405.655)	(-56.25, -889.551)	(127.739, -887.713)
(0., 0.)	(25.568, -405.751)	(-59.918, -889.256)	(124.157, -887.71)
(0., 0.)	(24.497, -405.842)	(-63.553, -888.9)	(120.482, -887.553)
(0., 0.)	(23.391, -405.927)	(-67.172, -888.43)	(116.715, -887.259)
(0., 0.)	(22.23, -406.022)	(-70.815, -887.89)	(113.066, -887.147)
(0., 0.)	(21.025, -406.142)	(-74.513, -887.349)	(109.495, -887.205)
(0., 0.)	(19.792, -406.265)	(-78.257, -886.819)	(105.848, -887.208)
(0., 0.)	(18.515, -406.342)	(-82.037, -886.26)	(102.113, -887.093)
(0., 0.)	(17.158, -406.345)	(-85.861, -885.666)	(98.31, -886.916)
(0., 0.)	(15.714, -406.315)	(-89.739, -885.101)	(94.449, -886.784)
(0., 0.)	(14.198, -406.297)	(-93.654, -884.626)	(90.551, -886.715)
(0., 0.)	(12.603, -406.275)	(-97.592, -884.229)	(86.623, -886.627)
(0., 0.)	(10.938, -406.213)	(-101.548, -883.847)	(82.67, -886.483)
(0., 0.)	(9.24, -406.116)	(-105.525, -883.445)	(78.698, -886.336)
(0., 0.)	(7.534, -406.011)	(-109.526, -883.04)	(74.709, -886.187)
(0., 0.)	(5.818, -405.878)	(-113.542, -882.643)	(70.71, -885.976)
(0., 0.)	(4.079, -405.715)	(-117.561, -882.267)	(66.718, -885.719)
(0., 0.)	(2.313, -405.538)	(-121.582, -881.902)	(62.726, -885.495)
(0., 0.)	(0.529, -405.36)	(-125.602, -881.538)	(58.691, -885.312)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-1.276, -405.177)	(-129.623, -881.151)	(54.591, -885.106)
(0., 0.)	(-3.109, -404.971)	(-133.643, -880.738)	(50.494, -884.877)
(0., 0.)	(-4.978, -404.727)	(-137.666, -880.308)	(46.46, -884.674)
(0., 0.)	(-6.893, -404.439)	(-141.707, -879.855)	(42.421, -884.441)
(0., 0.)	(-8.862, -404.117)	(-145.772, -879.388)	(38.298, -884.097)
(0., 0.)	(-10.878, -403.773)	(-149.862, -878.914)	(34.165, -883.738)
(0., 0.)	(-12.912, -403.419)	(-153.966, -878.429)	(30.096, -883.456)
(0., 0.)	(-14.942, -403.036)	(-158.083, -877.902)	(26.013, -883.164)
(0., 0.)	(-16.951, -402.607)	(-162.22, -877.328)	(21.84, -882.782)
(0., 0.)	(-18.915, -402.14)	(-166.371, -876.737)	(17.616, -882.371)
(0., 0.)	(-20.81, -401.662)	(-170.526, -876.174)	(13.405, -882.004)
(0., 0.)	(-22.608, -401.196)	(-174.679, -875.643)	(9.221, -881.693)
(0., 0.)	(-24.314, -400.751)	(-178.835, -875.116)	(5.045, -881.412)
(0., 0.)	(-25.967, -400.337)	(-183.009, -874.578)	(0.851, -881.121)
(0., 0.)	(-27.599, -399.954)	(-187.202, -874.019)	(-3.386, -880.807)
(0., 0.)	(-29.225, -399.597)	(-191.393, -873.449)	(-7.649, -880.542)
(0., 0.)	(-30.849, -399.255)	(-195.585, -872.873)	(-11.915, -880.374)
(0., 0.)	(-32.466, -398.92)	(-199.792, -872.297)	(-16.207, -880.258)
(0., 0.)	(-34.074, -398.587)	(-204.042, -871.713)	(-20.56, -880.162)
(0., 0.)	(-35.678, -398.265)	(-208.34, -871.119)	(-24.976, -880.091)
(0., 0.)	(-37.291, -397.967)	(-212.668, -870.485)	(-29.44, -880.024)
(0., 0.)	(-38.922, -397.704)	(-216.995, -869.751)	(-33.921, -879.951)
(0., 0.)	(-40.572, -397.475)	(-221.303, -868.896)	(-38.387, -879.948)
(0., 0.)	(-42.234, -397.262)	(-225.608, -867.949)	(-42.849, -880.037)
(0., 0.)	(-43.888, -397.045)	(-229.92, -866.982)	(-47.369, -880.155)
(0., 0.)	(-45.527, -396.819)	(-234.246, -866.032)	(-51.984, -880.252)
(0., 0.)	(-47.184, -396.598)	(-238.616, -865.065)	(-56.65, -880.358)
(0., 0.)	(-48.901, -396.37)	(-243.049, -864.041)	(-61.329, -880.495)
(0., 0.)	(-50.651, -396.097)	(-247.503, -862.98)	(-66.029, -880.667)
(0., 0.)	(-52.388, -395.781)	(-251.959, -861.911)	(-70.796, -880.88)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-54.07, -395.47)	(-256.437, -860.805)	(-75.643, -881.118)
(0., 0.)	(-55.672, -395.207)	(-260.964, -859.628)	(-80.567, -881.337)
(0., 0.)	(-57.194, -394.999)	(-265.554, -858.411)	(-85.555, -881.516)
(0., 0.)	(-58.669, -394.809)	(-270.206, -857.186)	(-90.607, -881.621)
(0., 0.)	(-60.141, -394.58)	(-274.933, -855.911)	(-95.769, -881.641)
(0., 0.)	(-61.637, -394.282)	(-279.747, -854.515)	(-101.091, -881.639)
(0., 0.)	(-63.159, -393.912)	(-284.629, -852.973)	(-106.552, -881.659)
(0., 0.)	(-64.686, -393.481)	(-289.582, -851.336)	(-112.088, -881.694)
(0., 0.)	(-66.186, -393.034)	(-294.622, -849.664)	(-117.703, -881.711)
(0., 0.)	(-67.625, -392.595)	(-299.735, -847.917)	(-123.451, -881.715)
(0., 0.)	(-69., -392.14)	(-304.899, -846.042)	(-129.358, -881.695)
(0., 0.)	(-70.331, -391.666)	(-310.119, -844.062)	(-135.387, -881.661)
(0., 0.)	(-71.635, -391.172)	(-315.396, -842.017)	(-141.505, -881.665)
(0., 0.)	(-72.901, -390.655)	(-320.706, -839.903)	(-147.724, -881.743)
(0., 0.)	(-74.09, -390.102)	(-326.034, -837.721)	(-154.021, -881.84)
(0., 0.)	(-75.162, -389.505)	(-331.363, -835.47)	(-160.364, -881.955)
(0., 0.)	(-76.067, -388.886)	(-336.674, -833.145)	(-166.758, -882.039)
(0., 0.)	(-76.799, -388.288)	(-341.941, -830.712)	(-173.22, -882.074)
(0., 0.)	(-77.386, -387.719)	(-347.136, -828.13)	(-179.722, -882.155)
(0., 0.)	(-77.831, -387.168)	(-352.25, -825.399)	(-186.204, -882.311)
(0., 0.)	(-78.099, -386.608)	(-357.255, -822.559)	(-192.641, -882.457)
(0., 0.)	(-78.14, -386.058)	(-362.13, -819.634)	(-199.064, -882.574)
(0., 0.)	(-77.927, -385.575)	(-366.856, -816.601)	(-205.487, -882.721)
(0., 0.)	(-77.456, -385.171)	(-371.417, -813.452)	(-211.87, -882.93)
(0., 0.)	(-76.725, -384.824)	(-375.803, -810.233)	(-218.18, -883.176)
(0., 0.)	(-75.716, -384.558)	(-379.993, -806.955)	(-224.417, -883.41)
(0., 0.)	(-74.444, -384.406)	(-383.967, -803.602)	(-230.576, -883.627)
(0., 0.)	(-72.962, -384.32)	(-387.691, -800.11)	(-236.668, -883.805)
(0., 0.)	(-71.292, -384.243)	(-391.145, -796.403)	(-242.66, -883.904)
(0., 0.)	(-69.405, -384.178)	(-394.316, -792.451)	(-248.512, -883.874)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-67.238, -384.173)	(-397.191, -788.26)	(-254.167, -883.707)
(0., 0.)	(-64.716, -384.27)	(-399.744, -783.842)	(-259.59, -883.401)
(0., 0.)	(-61.765, -384.497)	(-401.926, -779.202)	(-264.823, -882.948)
(0., 0.)	(-58.345, -384.885)	(-403.695, -774.336)	(-269.903, -882.269)
(0., 0.)	(-54.44, -385.42)	(-404.996, -769.207)	(-274.768, -881.335)
(0., 0.)	(-50.064, -386.026)	(-405.776, -763.757)	(-279.308, -880.234)
(0., 0.)	(-45.247, -386.662)	(-405.999, -757.972)	(-283.513, -878.98)
(0., 0.)	(-40.001, -387.332)	(-405.625, -751.906)	(-287.424, -877.496)
(0., 0.)	(-34.348, -388.034)	(-404.625, -745.621)	(-291.021, -875.777)
(0., 0.)	(-28.338, -388.736)	(-402.945, -739.116)	(-294.229, -873.802)
(0., 0.)	(-22.041, -389.375)	(-400.519, -732.37)	(-296.953, -871.575)
(0., 0.)	(-15.479, -389.876)	(-397.308, -725.422)	(-299.069, -869.177)
(0., 0.)	(-8.629, -390.192)	(-393.258, -718.356)	(-300.601, -866.627)
(0., 0.)	(-1.499, -390.309)	(-388.38, -711.302)	(-301.711, -863.952)
(0., 0.)	(5.841, -390.239)	(-382.83, -704.417)	(-302.507, -861.289)
(0., 0.)	(13.301, -390.011)	(-376.835, -697.828)	(-302.961, -858.675)
(0., 0.)	(20.819, -389.636)	(-370.57, -691.618)	(-303.026, -856.073)
(0., 0.)	(28.383, -389.088)	(-364.067, -685.81)	(-302.693, -853.558)
(0., 0.)	(35.989, -388.322)	(-357.275, -680.42)	(-301.987, -851.317)
(0., 0.)	(43.593, -387.35)	(-350.176, -675.478)	(-300.941, -849.366)
(0., 0.)	(51.072, -386.23)	(-342.907, -671.073)	(-299.4, -847.448)
(0., 0.)	(58.322, -385.003)	(-335.786, -667.355)	(-296.694, -845.263)
(0., 0.)	(65.393, -383.736)	(-329.07, -664.501)	(-291.965, -842.919)
(0., 0.)	(72.33, -382.456)	(-322.756, -662.699)	(-284.803, -840.897)
(0., 0.)	(79.054, -381.066)	(-316.712, -662.106)	(-275.227, -839.478)
(0., 0.)	(85.518, -379.511)	(-310.753, -662.785)	(-263.495, -838.707)
(0., 0.)	(91.735, -377.87)	(-304.66, -664.672)	(-249.945, -838.488)
(0., 0.)	(97.692, -376.223)	(-298.254, -667.624)	(-234.864, -838.502)
(0., 0.)	(103.351, -374.582)	(-291.421, -671.485)	(-218.556, -838.487)
(0., 0.)	(108.694, -372.94)	(-284.064, -676.154)	(-201.393, -838.461)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(113.708, -371.358)	(-276.087, -681.622)	(-183.807, -838.545)
(0., 0.)	(118.393, -369.923)	(-267.418, -687.832)	(-166.197, -838.938)
(0., 0.)	(122.784, -368.681)	(-258.069, -694.647)	(-148.87, -839.869)
(0., 0.)	(126.915, -367.606)	(-248.105, -701.978)	(-131.928, -841.42)
(0., 0.)	(130.802, -366.649)	(-237.546, -709.866)	(-115.106, -843.549)
(0., 0.)	(134.447, -365.803)	(-226.375, -718.342)	(-98.021, -846.148)
(0., 0.)	(137.805, -365.069)	(-214.557, -727.352)	(-80.472, -848.964)
(0., 0.)	(140.838, -364.459)	(-202.067, -736.812)	(-62.421, -851.739)
(0., 0.)	(143.527, -363.963)	(-188.886, -746.596)	(-43.909, -854.366)
(0., 0.)	(145.855, -363.527)	(-175.01, -756.558)	(-25.027, -856.961)
(0., 0.)	(147.829, -363.111)	(-160.475, -766.538)	(-5.952, -859.737)
(0., 0.)	(149.467, -362.751)	(-145.369, -776.438)	(13.165, -862.653)
(0., 0.)	(150.762, -362.5)	(-129.785, -786.234)	(32.305, -865.548)
(0., 0.)	(151.722, -362.399)	(-113.813, -795.886)	(51.541, -868.209)
(0., 0.)	(152.384, -362.51)	(-97.507, -805.305)	(70.89, -870.325)
(0., 0.)	(152.751, -362.815)	(-80.878, -814.349)	(90.255, -871.805)
(0., 0.)	(152.829, -363.251)	(-63.931, -822.845)	(109.518, -872.792)
(0., 0.)	(152.694, -363.799)	(-46.751, -830.69)	(128.581, -873.414)
(0., 0.)	(152.424, -364.469)	(-29.456, -837.876)	(147.364, -873.687)
(0., 0.)	(152.02, -365.24)	(-12.136, -844.422)	(165.799, -873.68)
(0., 0.)	(151.423, -366.092)	(5.134, -850.322)	(183.839, -873.476)
(0., 0.)	(150.589, -367.055)	(22.254, -855.576)	(201.504, -873.119)
(0., 0.)	(149.524, -368.188)	(39.113, -860.174)	(218.83, -872.561)
(0., 0.)	(148.265, -369.491)	(55.647, -864.055)	(235.714, -871.634)
(0., 0.)	(146.876, -370.852)	(71.794, -867.258)	(251.953, -870.287)
(0., 0.)	(145.486, -372.087)	(87.446, -869.917)	(267.46, -868.575)
(0., 0.)	(144.208, -373.051)	(102.485, -872.115)	(282.219, -866.44)
(0., 0.)	(143.096, -373.689)	(116.84, -873.884)	(296.226, -863.781)
(0., 0.)	(142.181, -374.025)	(130.482, -875.257)	(309.368, -860.462)
(0., 0.)	(141.485, -374.133)	(143.437, -876.258)	(321.545, -856.472)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(140.983, -374.079)	(155.67, -876.859)	(332.768, -851.96)
(0., 0.)	(140.641, -373.898)	(167.063, -876.969)	(343.056, -847.262)
(0., 0.)	(140.405, -373.557)	(177.553, -876.624)	(352.473, -842.708)
(0., 0.)	(140.212, -373.05)	(187.139, -875.999)	(361.057, -838.508)
(0., 0.)	(139.997, -372.402)	(195.794, -875.206)	(368.785, -834.678)
(0., 0.)	(139.686, -371.629)	(203.477, -874.297)	(375.558, -831.012)
(0., 0.)	(139.249, -370.773)	(210.181, -873.385)	(381.277, -827.379)
(0., 0.)	(138.734, -369.917)	(215.905, -872.612)	(386.025, -824.038)
(0., 0.)	(138.196, -369.16)	(220.626, -872.002)	(389.902, -821.249)
(0., 0.)	(137.629, -368.576)	(224.285, -871.475)	(392.931, -819.024)
(0., 0.)	(136.975, -368.194)	(226.843, -871.05)	(395.078, -817.433)
(0., 0.)	(136.216, -367.997)	(228.309, -870.858)	(396.26, -816.564)
(0., 0.)	(135.376, -367.967)	(228.693, -870.985)	(396.413, -816.303)
(0., 0.)	(134.489, -368.092)	(227.937, -871.375)	(395.509, -816.509)
(0., 0.)	(133.57, -368.372)	(225.936, -871.815)	(393.587, -817.162)
(0., 0.)	(132.584, -368.788)	(222.699, -872.171)	(390.734, -818.255)
(0., 0.)	(131.495, -369.316)	(218.412, -872.529)	(387.108, -819.742)
(0., 0.)	(130.278, -369.959)	(213.329, -873.148)	(382.857, -821.609)
(0., 0.)	(128.894, -370.737)	(207.618, -874.133)	(378.046, -823.808)
(0., 0.)	(127.276, -371.668)	(201.437, -875.244)	(372.752, -826.243)
(0., 0.)	(125.354, -372.757)	(195.191, -876.195)	(367.428, -828.653)
(0., 0.)	(123.094, -373.975)	(189.35, -876.886)	(362.548, -830.616)
(0., 0.)	(120.495, -375.275)	(184.012, -877.338)	(358.019, -832.028)
(0., 0.)	(117.586, -376.617)	(178.914, -877.479)	(353.502, -833.261)
(0., 0.)	(114.453, -377.93)	(173.756, -877.32)	(348.833, -834.738)
(0., 0.)	(111.231, -379.109)	(168.355, -877.025)	(343.977, -836.573)
(0., 0.)	(108.056, -380.108)	(162.668, -876.777)	(338.863, -838.632)
(0., 0.)	(105.033, -380.951)	(156.805, -876.667)	(333.465, -840.699)
(0., 0.)	(102.234, -381.699)	(150.866, -876.642)	(327.886, -842.766)
(0., 0.)	(99.675, -382.404)	(144.859, -876.634)	(322.235, -844.922)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(97.312, -383.101)	(138.749, -876.688)	(316.589, -847.229)
(0., 0.)	(95.097, -383.829)	(132.56, -876.917)	(310.952, -849.68)
(0., 0.)	(93.031, -384.666)	(126.401, -877.41)	(305.188, -852.039)
(0., 0.)	(91.158, -385.681)	(120.349, -878.16)	(299.244, -854.188)
(0., 0.)	(89.524, -386.871)	(114.364, -879.071)	(293.36, -856.434)
(0., 0.)	(88.147, -388.18)	(108.369, -880.051)	(287.663, -858.881)
(0., 0.)	(86.992, -389.558)	(102.349, -881.064)	(282.027, -861.318)
(0., 0.)	(85.963, -390.923)	(96.334, -882.101)	(276.333, -863.589)
(0., 0.)	(84.934, -392.21)	(90.343, -883.113)	(270.575, -865.646)
(0., 0.)	(83.736, -393.407)	(84.419, -884.107)	(264.771, -867.447)
(0., 0.)	(82.173, -394.518)	(78.532, -885.015)	(258.952, -869.005)
(0., 0.)	(80.125, -395.514)	(72.657, -885.752)	(253.187, -870.425)
(0., 0.)	(77.625, -396.348)	(66.83, -886.329)	(247.481, -871.758)
(0., 0.)	(74.852, -397.009)	(61.089, -886.798)	(241.837, -873.024)
(0., 0.)	(72.009, -397.537)	(55.455, -887.172)	(236.319, -874.273)
(0., 0.)	(69.268, -398.008)	(49.937, -887.438)	(230.981, -875.466)
(0., 0.)	(66.762, -398.528)	(44.539, -887.614)	(225.78, -876.552)
(0., 0.)	(64.485, -399.11)	(39.261, -887.747)	(220.664, -877.579)
(0., 0.)	(62.333, -399.675)	(34.105, -887.875)	(215.614, -878.61)
(0., 0.)	(60.197, -400.196)	(29.039, -888.004)	(210.663, -879.625)
(0., 0.)	(58.01, -400.692)	(24.013, -888.115)	(205.779, -880.515)
(0., 0.)	(55.746, -401.159)	(18.996, -888.192)	(200.916, -881.251)
(0., 0.)	(53.423, -401.62)	(13.989, -888.254)	(196.059, -881.875)
(0., 0.)	(51.063, -402.087)	(9.013, -888.353)	(191.204, -882.384)
(0., 0.)	(48.685, -402.532)	(4.073, -888.513)	(186.297, -882.777)
(0., 0.)	(46.286, -402.943)	(-0.85, -888.707)	(181.375, -883.156)
(0., 0.)	(43.873, -403.315)	(-5.751, -888.909)	(176.555, -883.583)
(0., 0.)	(41.492, -403.639)	(-10.582, -889.114)	(171.84, -883.97)
(0., 0.)	(39.208, -403.93)	(-15.278, -889.303)	(167.179, -884.259)
(0., 0.)	(37.076, -404.201)	(-19.801, -889.444)	(162.631, -884.509)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(35.126, -404.439)	(-24.16, -889.504)	(158.273, -884.789)
(0., 0.)	(33.349, -404.647)	(-28.363, -889.488)	(154.099, -885.054)
(0., 0.)	(31.699, -404.84)	(-32.415, -889.43)	(150.052, -885.237)
(0., 0.)	(30.164, -405.033)	(-36.334, -889.374)	(146.069, -885.29)
(0., 0.)	(28.727, -405.21)	(-40.14, -889.345)	(142.146, -885.244)
(0., 0.)	(27.35, -405.356)	(-43.882, -889.319)	(138.365, -885.277)
(0., 0.)	(25.994, -405.476)	(-47.629, -889.245)	(134.661, -885.424)
(0., 0.)	(24.63, -405.587)	(-51.417, -889.092)	(130.942, -885.575)
(0., 0.)	(23.256, -405.705)	(-55.229, -888.86)	(127.21, -885.657)
(0., 0.)	(21.882, -405.822)	(-59.04, -888.553)	(123.46, -885.671)
(0., 0.)	(20.496, -405.895)	(-62.862, -888.178)	(119.65, -885.617)
(0., 0.)	(19.089, -405.924)	(-66.728, -887.754)	(115.785, -885.503)
(0., 0.)	(17.66, -405.949)	(-70.668, -887.293)	(111.89, -885.372)
(0., 0.)	(16.189, -405.985)	(-74.675, -886.81)	(107.937, -885.23)
(0., 0.)	(14.658, -406.016)	(-78.734, -886.331)	(103.916, -885.092)
(0., 0.)	(13.088, -406.03)	(-82.846, -885.864)	(99.873, -884.993)
(0., 0.)	(11.517, -406.037)	(-87.02, -885.399)	(95.786, -884.885)
(0., 0.)	(9.953, -406.04)	(-91.248, -884.917)	(91.613, -884.703)
(0., 0.)	(8.384, -406.041)	(-95.512, -884.432)	(87.399, -884.543)
(0., 0.)	(6.8, -406.036)	(-99.802, -883.978)	(83.149, -884.46)
(0., 0.)	(5.192, -406.01)	(-104.133, -883.576)	(78.792, -884.347)
(0., 0.)	(3.557, -405.952)	(-108.523, -883.215)	(74.377, -884.179)
(0., 0.)	(1.905, -405.871)	(-112.97, -882.836)	(69.995, -884.038)
(0., 0.)	(0.241, -405.784)	(-117.445, -882.4)	(65.63, -883.914)
(0., 0.)	(-1.448, -405.693)	(-121.923, -881.913)	(61.179, -883.722)
(0., 0.)	(-3.173, -405.588)	(-126.426, -881.383)	(56.627, -883.482)
(0., 0.)	(-4.913, -405.46)	(-130.986, -880.819)	(52.025, -883.262)
(0., 0.)	(-6.63, -405.29)	(-135.602, -880.239)	(47.414, -883.039)
(0., 0.)	(-8.316, -405.063)	(-140.249, -879.667)	(42.793, -882.762)
(0., 0.)	(-9.994, -404.778)	(-144.903, -879.115)	(38.154, -882.446)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-11.675, -404.445)	(-149.553, -878.563)	(33.528, -882.153)
(0., 0.)	(-13.349, -404.068)	(-154.201, -877.985)	(28.895, -881.893)
(0., 0.)	(-15.01, -403.661)	(-158.834, -877.375)	(24.203, -881.601)
(0., 0.)	(-16.677, -403.242)	(-163.457, -876.728)	(19.481, -881.253)
(0., 0.)	(-18.377, -402.822)	(-168.067, -876.073)	(14.844, -880.942)
(0., 0.)	(-20.117, -402.38)	(-172.654, -875.464)	(10.306, -880.712)
(0., 0.)	(-21.895, -401.898)	(-177.228, -874.92)	(5.747, -880.47)
(0., 0.)	(-23.738, -401.379)	(-181.787, -874.393)	(1.078, -880.145)
(0., 0.)	(-25.676, -400.835)	(-186.327, -873.817)	(-3.613, -879.816)
(0., 0.)	(-27.711, -400.267)	(-190.858, -873.192)	(-8.211, -879.548)
(0., 0.)	(-29.827, -399.687)	(-195.393, -872.616)	(-12.71, -879.34)
(0., 0.)	(-32.018, -399.103)	(-199.949, -872.125)	(-17.217, -879.131)
(0., 0.)	(-34.292, -398.507)	(-204.51, -871.636)	(-21.821, -878.885)
(0., 0.)	(-36.648, -397.889)	(-209.061, -871.077)	(-26.493, -878.642)
(0., 0.)	(-39.037, -397.29)	(-213.633, -870.449)	(-31.175, -878.436)
(0., 0.)	(-41.41, -396.769)	(-218.271, -869.829)	(-35.884, -878.242)
(0., 0.)	(-43.757, -396.329)	(-222.988, -869.22)	(-40.664, -878.055)
(0., 0.)	(-46.098, -395.939)	(-227.769, -868.543)	(-45.522, -877.915)
(0., 0.)	(-48.438, -395.579)	(-232.587, -867.751)	(-50.439, -877.793)
(0., 0.)	(-50.755, -395.233)	(-237.437, -866.838)	(-55.411, -877.609)
(0., 0.)	(-53.03, -394.895)	(-242.313, -865.847)	(-60.445, -877.395)
(0., 0.)	(-55.253, -394.569)	(-247.214, -864.829)	(-65.56, -877.243)
(0., 0.)	(-57.417, -394.246)	(-252.176, -863.775)	(-70.774, -877.16)
(0., 0.)	(-59.502, -393.912)	(-257.205, -862.647)	(-76.055, -877.125)
(0., 0.)	(-61.485, -393.573)	(-262.253, -861.453)	(-81.338, -877.136)
(0., 0.)	(-63.35, -393.235)	(-267.285, -860.223)	(-86.62, -877.163)
(0., 0.)	(-65.114, -392.898)	(-272.326, -858.914)	(-91.965, -877.154)
(0., 0.)	(-66.8, -392.583)	(-277.406, -857.493)	(-97.409, -877.137)
(0., 0.)	(-68.451, -392.296)	(-282.527, -856.01)	(-102.957, -877.152)
(0., 0.)	(-70.118, -391.996)	(-287.674, -854.527)	(-108.57, -877.176)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-71.829, -391.631)	(-292.855, -853.013)	(-114.219, -877.174)
(0., 0.)	(-73.567, -391.202)	(-298.096, -851.386)	(-119.945, -877.2)
(0., 0.)	(-75.298, -390.703)	(-303.409, -849.623)	(-125.82, -877.308)
(0., 0.)	(-77.016, -390.13)	(-308.795, -847.763)	(-131.831, -877.456)
(0., 0.)	(-78.711, -389.535)	(-314.228, -845.815)	(-137.933, -877.549)
(0., 0.)	(-80.36, -388.978)	(-319.68, -843.765)	(-144.153, -877.582)
(0., 0.)	(-81.93, -388.468)	(-325.134, -841.616)	(-150.515, -877.659)
(0., 0.)	(-83.393, -387.974)	(-330.592, -839.395)	(-156.976, -877.841)
(0., 0.)	(-84.73, -387.468)	(-336.087, -837.138)	(-163.498, -878.08)
(0., 0.)	(-85.936, -386.94)	(-341.622, -834.797)	(-170.112, -878.294)
(0., 0.)	(-86.998, -386.409)	(-347.189, -832.324)	(-176.858, -878.443)
(0., 0.)	(-87.909, -385.9)	(-352.788, -829.747)	(-183.715, -878.63)
(0., 0.)	(-88.665, -385.416)	(-358.39, -827.098)	(-190.628, -878.923)
(0., 0.)	(-89.264, -384.943)	(-363.961, -824.388)	(-197.565, -879.173)
(0., 0.)	(-89.717, -384.447)	(-369.495, -821.607)	(-204.566, -879.352)
(0., 0.)	(-90.031, -383.922)	(-374.981, -818.73)	(-211.638, -879.592)
(0., 0.)	(-90.182, -383.439)	(-380.384, -815.735)	(-218.714, -879.887)
(0., 0.)	(-90.151, -383.058)	(-385.689, -812.65)	(-225.761, -880.126)
(0., 0.)	(-89.94, -382.762)	(-390.867, -809.513)	(-232.764, -880.312)
(0., 0.)	(-89.526, -382.493)	(-395.836, -806.278)	(-239.706, -880.486)
(0., 0.)	(-88.849, -382.238)	(-400.554, -802.907)	(-246.583, -880.617)
(0., 0.)	(-87.853, -382.017)	(-405.046, -799.39)	(-253.366, -880.704)
(0., 0.)	(-86.54, -381.882)	(-409.297, -795.715)	(-260.018, -880.747)
(0., 0.)	(-84.926, -381.839)	(-413.25, -791.819)	(-266.468, -880.693)
(0., 0.)	(-82.97, -381.885)	(-416.854, -787.656)	(-272.664, -880.44)
(0., 0.)	(-80.605, -382.044)	(-420.11, -783.24)	(-278.658, -879.953)
(0., 0.)	(-77.813, -382.307)	(-423.048, -778.605)	(-284.552, -879.262)
(0., 0.)	(-74.612, -382.647)	(-425.657, -773.734)	(-290.282, -878.417)
(0., 0.)	(-70.984, -383.096)	(-427.887, -768.583)	(-295.779, -877.423)
(0., 0.)	(-66.864, -383.719)	(-429.677, -763.136)	(-301.052, -876.217)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-62.204, -384.538)	(-430.96, -757.429)	(-306.084, -874.81)
(0., 0.)	(-57.047, -385.483)	(-431.68, -751.475)	(-310.801, -873.256)
(0., 0.)	(-51.491, -386.477)	(-431.752, -745.253)	(-315.115, -871.545)
(0., 0.)	(-45.613, -387.458)	(-431.065, -738.761)	(-318.973, -869.61)
(0., 0.)	(-39.43, -388.369)	(-429.533, -732.035)	(-322.23, -867.431)
(0., 0.)	(-32.927, -389.17)	(-427.087, -725.116)	(-324.749, -865.03)
(0., 0.)	(-26.096, -389.825)	(-423.672, -718.039)	(-326.555, -862.495)
(0., 0.)	(-18.967, -390.285)	(-419.282, -710.857)	(-327.821, -859.876)
(0., 0.)	(-11.552, -390.552)	(-413.99, -703.718)	(-328.695, -857.192)
(0., 0.)	(-3.859, -390.661)	(-407.937, -696.791)	(-329.107, -854.494)
(0., 0.)	(4.051, -390.632)	(-401.301, -690.196)	(-328.932, -851.815)
(0., 0.)	(12.099, -390.489)	(-394.219, -684.039)	(-328.163, -849.307)
(0., 0.)	(20.217, -390.272)	(-386.741, -678.395)	(-326.917, -847.184)
(0., 0.)	(28.341, -389.932)	(-378.87, -673.284)	(-325.425, -845.411)
(0., 0.)	(36.412, -389.31)	(-370.726, -668.734)	(-323.736, -843.65)
(0., 0.)	(44.391, -388.33)	(-362.612, -664.84)	(-321.384, -841.668)
(0., 0.)	(52.27, -387.13)	(-354.834, -661.778)	(-317.629, -839.645)
(0., 0.)	(59.991, -385.885)	(-347.462, -659.719)	(-311.997, -838.029)
(0., 0.)	(67.399, -384.616)	(-340.345, -658.748)	(-304.413, -837.074)
(0., 0.)	(74.437, -383.229)	(-333.284, -658.858)	(-294.942, -836.739)
(0., 0.)	(81.164, -381.659)	(-326.146, -660.005)	(-283.658, -836.951)
(0., 0.)	(87.638, -379.933)	(-318.896, -662.141)	(-270.668, -837.611)
(0., 0.)	(93.827, -378.106)	(-311.521, -665.207)	(-256.108, -838.528)
(0., 0.)	(99.7, -376.255)	(-303.945, -669.14)	(-240.139, -839.529)
(0., 0.)	(105.264, -374.47)	(-296.063, -673.861)	(-222.955, -840.46)
(0., 0.)	(110.532, -372.813)	(-287.811, -679.331)	(-204.836, -841.169)
(0., 0.)	(115.484, -371.263)	(-279.169, -685.515)	(-186.239, -841.651)
(0., 0.)	(120.119, -369.782)	(-270.051, -692.338)	(-167.651, -842.157)
(0., 0.)	(124.495, -368.365)	(-260.341, -699.723)	(-149.464, -843.038)
(0., 0.)	(128.671, -367.02)	(-249.987, -707.59)	(-131.808, -844.501)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(132.649, -365.777)	(-239.023, -715.845)	(-114.553, -846.565)
(0., 0.)	(136.386, -364.686)	(-227.466, -724.445)	(-97.409, -849.172)
(0., 0.)	(139.837, -363.752)	(-215.26, -733.309)	(-80.091, -852.082)
(0., 0.)	(142.944, -362.929)	(-202.408, -742.372)	(-62.403, -854.969)
(0., 0.)	(145.653, -362.17)	(-188.965, -751.596)	(-44.239, -857.621)
(0., 0.)	(147.949, -361.495)	(-174.975, -760.946)	(-25.645, -860.003)
(0., 0.)	(149.864, -360.969)	(-160.467, -770.381)	(-6.799, -862.228)
(0., 0.)	(151.443, -360.629)	(-145.519, -779.837)	(12.088, -864.45)
(0., 0.)	(152.709, -360.453)	(-130.226, -789.216)	(30.888, -866.759)
(0., 0.)	(153.651, -360.423)	(-114.652, -798.441)	(49.611, -869.177)
(0., 0.)	(154.235, -360.588)	(-98.79, -807.424)	(68.28, -871.557)
(0., 0.)	(154.455, -361.001)	(-82.607, -816.022)	(86.887, -873.713)
(0., 0.)	(154.337, -361.659)	(-66.116, -824.124)	(105.506, -875.56)
(0., 0.)	(153.931, -362.504)	(-49.419, -831.671)	(124.108, -877.064)
(0., 0.)	(153.301, -363.484)	(-32.646, -838.641)	(142.551, -878.255)
(0., 0.)	(152.498, -364.581)	(-15.916, -845.027)	(160.705, -879.09)
(0., 0.)	(151.556, -365.775)	(0.712, -850.796)	(178.451, -879.427)
(0., 0.)	(150.476, -367.026)	(17.177, -855.937)	(195.808, -879.221)
(0., 0.)	(149.274, -368.292)	(33.399, -860.452)	(212.806, -878.594)
(0., 0.)	(147.99, -369.546)	(49.32, -864.32)	(229.446, -877.68)
(0., 0.)	(146.649, -370.8)	(64.86, -867.599)	(245.494, -876.394)
(0., 0.)	(145.244, -372.044)	(79.924, -870.377)	(260.8, -874.839)
(0., 0.)	(143.796, -373.161)	(94.425, -872.655)	(275.374, -873.182)
(0., 0.)	(142.397, -373.99)	(108.301, -874.388)	(289.25, -871.348)
(0., 0.)	(141.141, -374.463)	(121.502, -875.52)	(302.367, -869.205)
(0., 0.)	(140.07, -374.639)	(133.963, -876.055)	(314.639, -866.562)
(0., 0.)	(139.168, -374.639)	(145.665, -876.16)	(325.967, -863.195)
(0., 0.)	(138.385, -374.554)	(156.665, -876.104)	(336.358, -859.131)
(0., 0.)	(137.733, -374.366)	(167.003, -876.071)	(345.888, -854.633)
(0., 0.)	(137.256, -374.011)	(176.594, -875.985)	(354.594, -849.995)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(136.917, -373.459)	(185.366, -875.7)	(362.499, -845.514)
(0., 0.)	(136.59, -372.714)	(193.313, -875.169)	(369.576, -841.36)
(0., 0.)	(136.167, -371.828)	(200.425, -874.46)	(375.682, -837.417)
(0., 0.)	(135.641, -370.9)	(206.647, -873.654)	(380.85, -833.623)
(0., 0.)	(135.07, -370.028)	(211.916, -872.844)	(385.141, -830.065)
(0., 0.)	(134.479, -369.307)	(216.209, -872.159)	(388.567, -826.887)
(0., 0.)	(133.835, -368.787)	(219.508, -871.714)	(391.053, -824.225)
(0., 0.)	(133.096, -368.458)	(221.766, -871.575)	(392.474, -822.222)
(0., 0.)	(132.259, -368.315)	(222.899, -871.745)	(392.789, -820.974)
(0., 0.)	(131.357, -368.364)	(222.818, -872.141)	(392.057, -820.505)
(0., 0.)	(130.439, -368.588)	(221.445, -872.579)	(390.284, -820.681)
(0., 0.)	(129.542, -368.969)	(218.8, -872.927)	(387.51, -821.302)
(0., 0.)	(128.66, -369.488)	(215.041, -873.231)	(383.893, -822.233)
(0., 0.)	(127.747, -370.115)	(210.41, -873.675)	(379.653, -823.439)
(0., 0.)	(126.731, -370.842)	(205.198, -874.434)	(375.001, -825.006)
(0., 0.)	(125.52, -371.691)	(199.739, -875.367)	(370.171, -826.893)
(0., 0.)	(124.02, -372.68)	(194.392, -876.188)	(365.57, -828.76)
(0., 0.)	(122.165, -373.779)	(189.38, -876.767)	(361.336, -830.281)
(0., 0.)	(119.94, -374.949)	(184.615, -877.061)	(357.193, -831.527)
(0., 0.)	(117.417, -376.139)	(179.849, -877.094)	(352.977, -832.949)
(0., 0.)	(114.767, -377.247)	(174.91, -877.046)	(348.67, -834.899)
(0., 0.)	(112.185, -378.186)	(169.734, -877.052)	(344.212, -837.298)
(0., 0.)	(109.784, -378.962)	(164.384, -877.1)	(339.444, -839.697)
(0., 0.)	(107.578, -379.644)	(158.977, -877.153)	(334.372, -842.004)
(0., 0.)	(105.515, -380.296)	(153.541, -877.196)	(329.269, -844.511)
(0., 0.)	(103.513, -380.951)	(148.016, -877.284)	(324.221, -847.186)
(0., 0.)	(101.509, -381.645)	(142.389, -877.526)	(319.075, -849.745)
(0., 0.)	(99.511, -382.424)	(136.717, -877.977)	(313.753, -852.079)
(0., 0.)	(97.578, -383.343)	(131.024, -878.569)	(308.317, -854.331)
(0., 0.)	(95.775, -384.442)	(125.282, -879.189)	(302.873, -856.685)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(94.113, -385.673)	(119.439, -879.731)	(297.409, -859.074)
(0., 0.)	(92.555, -386.92)	(113.53, -880.243)	(291.889, -861.332)
(0., 0.)	(91.042, -388.125)	(107.681, -880.932)	(286.325, -863.415)
(0., 0.)	(89.491, -389.291)	(101.885, -881.812)	(280.655, -865.393)
(0., 0.)	(87.825, -390.42)	(96.023, -882.713)	(274.876, -867.341)
(0., 0.)	(85.998, -391.513)	(90.009, -883.52)	(269.002, -869.216)
(0., 0.)	(83.994, -392.524)	(83.852, -884.246)	(263.029, -871.004)
(0., 0.)	(81.795, -393.435)	(77.615, -884.934)	(256.966, -872.668)
(0., 0.)	(79.37, -394.25)	(71.359, -885.581)	(250.82, -874.13)
(0., 0.)	(76.715, -394.969)	(65.109, -886.153)	(244.664, -875.479)
(0., 0.)	(73.93, -395.657)	(58.903, -886.654)	(238.59, -876.797)
(0., 0.)	(71.197, -396.399)	(52.794, -887.088)	(232.609, -878.019)
(0., 0.)	(68.593, -397.135)	(46.795, -887.44)	(226.727, -879.162)
(0., 0.)	(66.095, -397.778)	(40.91, -887.712)	(220.969, -880.254)
(0., 0.)	(63.671, -398.329)	(35.149, -887.918)	(215.332, -881.19)
(0., 0.)	(61.341, -398.845)	(29.54, -888.075)	(209.818, -881.92)
(0., 0.)	(59.106, -399.37)	(24.085, -888.196)	(204.467, -882.564)
(0., 0.)	(56.94, -399.936)	(18.768, -888.297)	(199.25, -883.187)
(0., 0.)	(54.836, -400.522)	(13.598, -888.379)	(194.165, -883.75)
(0., 0.)	(52.789, -401.084)	(8.594, -888.437)	(189.246, -884.245)
(0., 0.)	(50.803, -401.585)	(3.773, -888.479)	(184.517, -884.684)
(0., 0.)	(48.89, -402.022)	(-0.87, -888.511)	(179.94, -885.06)
(0., 0.)	(47.046, -402.402)	(-5.348, -888.521)	(175.433, -885.32)
(0., 0.)	(45.244, -402.743)	(-9.691, -888.513)	(170.951, -885.397)
(0., 0.)	(43.471, -403.053)	(-13.925, -888.505)	(166.584, -885.375)
(0., 0.)	(41.747, -403.361)	(-18.063, -888.515)	(162.476, -885.535)
(0., 0.)	(40.072, -403.682)	(-22.097, -888.537)	(158.556, -885.845)
(0., 0.)	(38.461, -403.979)	(-26.004, -888.57)	(154.746, -886.16)
(0., 0.)	(36.923, -404.247)	(-29.776, -888.633)	(151.014, -886.431)
(0., 0.)	(35.414, -404.517)	(-33.445, -888.729)	(147.338, -886.627)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(33.874, -404.794)	(-37.07, -888.846)	(143.721, -886.755)
(0., 0.)	(32.274, -405.035)	(-40.669, -888.965)	(140.159, -886.91)
(0., 0.)	(30.609, -405.241)	(-44.249, -889.043)	(136.65, -887.162)
(0., 0.)	(28.892, -405.426)	(-47.833, -889.034)	(133.147, -887.411)
(0., 0.)	(27.142, -405.564)	(-51.439, -888.931)	(129.569, -887.521)
(0., 0.)	(25.385, -405.638)	(-55.068, -888.74)	(125.906, -887.553)
(0., 0.)	(23.678, -405.678)	(-58.716, -888.477)	(122.237, -887.577)
(0., 0.)	(22.079, -405.736)	(-62.394, -888.165)	(118.584, -887.545)
(0., 0.)	(20.597, -405.823)	(-66.102, -887.821)	(114.9, -887.389)
(0., 0.)	(19.184, -405.917)	(-69.838, -887.47)	(111.2, -887.236)
(0., 0.)	(17.803, -406.004)	(-73.606, -887.115)	(107.523, -887.193)
(0., 0.)	(16.437, -406.092)	(-77.415, -886.703)	(103.811, -887.167)
(0., 0.)	(15.045, -406.174)	(-81.256, -886.201)	(100.005, -887.066)
(0., 0.)	(13.6, -406.23)	(-85.122, -885.638)	(96.16, -886.942)
(0., 0.)	(12.09, -406.255)	(-89.005, -885.076)	(92.295, -886.824)
(0., 0.)	(10.496, -406.272)	(-92.924, -884.568)	(88.333, -886.658)
(0., 0.)	(8.818, -406.285)	(-96.906, -884.109)	(84.32, -886.484)
(0., 0.)	(7.083, -406.281)	(-100.959, -883.668)	(80.338, -886.349)
(0., 0.)	(5.318, -406.257)	(-105.052, -883.235)	(76.361, -886.198)
(0., 0.)	(3.54, -406.232)	(-109.153, -882.822)	(72.306, -886.01)
(0., 0.)	(1.781, -406.201)	(-113.249, -882.437)	(68.164, -885.832)
(0., 0.)	(0.082, -406.142)	(-117.35, -882.067)	(63.99, -885.699)
(0., 0.)	(-1.548, -406.055)	(-121.452, -881.694)	(59.844, -885.621)
(0., 0.)	(-3.15, -405.94)	(-125.549, -881.305)	(55.747, -885.561)
(0., 0.)	(-4.78, -405.808)	(-129.631, -880.888)	(51.643, -885.415)
(0., 0.)	(-6.475, -405.689)	(-133.691, -880.447)	(47.495, -885.12)
(0., 0.)	(-8.247, -405.583)	(-137.741, -879.983)	(43.378, -884.795)
(0., 0.)	(-10.096, -405.46)	(-141.804, -879.495)	(39.345, -884.544)
(0., 0.)	(-12.009, -405.295)	(-145.892, -878.992)	(35.314, -884.273)
(0., 0.)	(-13.98, -405.094)	(-150.002, -878.495)	(31.204, -883.903)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-16.001, -404.866)	(-154.133, -878.014)	(27.024, -883.512)
(0., 0.)	(-18.057, -404.612)	(-158.3, -877.526)	(22.807, -883.172)
(0., 0.)	(-20.155, -404.331)	(-162.514, -876.997)	(18.563, -882.874)
(0., 0.)	(-22.311, -404.017)	(-166.765, -876.425)	(14.272, -882.58)
(0., 0.)	(-24.5, -403.677)	(-171.055, -875.849)	(9.899, -882.257)
(0., 0.)	(-26.676, -403.316)	(-175.408, -875.303)	(5.453, -881.905)
(0., 0.)	(-28.812, -402.932)	(-179.845, -874.787)	(0.991, -881.566)
(0., 0.)	(-30.922, -402.524)	(-184.346, -874.283)	(-3.478, -881.228)
(0., 0.)	(-33.022, -402.099)	(-188.885, -873.739)	(-7.996, -880.831)
(0., 0.)	(-35.098, -401.672)	(-193.441, -873.119)	(-12.581, -880.408)
(0., 0.)	(-37.144, -401.252)	(-197.997, -872.447)	(-17.232, -880.025)
(0., 0.)	(-39.172, -400.84)	(-202.563, -871.777)	(-21.924, -879.702)
(0., 0.)	(-41.197, -400.436)	(-207.156, -871.132)	(-26.615, -879.431)
(0., 0.)	(-43.222, -400.049)	(-211.77, -870.467)	(-31.288, -879.184)
(0., 0.)	(-45.23, -399.679)	(-216.38, -869.729)	(-35.971, -878.911)
(0., 0.)	(-47.211, -399.314)	(-220.988, -868.897)	(-40.689, -878.631)
(0., 0.)	(-49.154, -398.938)	(-225.602, -868.019)	(-45.447, -878.393)
(0., 0.)	(-51.055, -398.537)	(-230.231, -867.127)	(-50.247, -878.221)
(0., 0.)	(-52.935, -398.126)	(-234.879, -866.217)	(-55.083, -878.127)
(0., 0.)	(-54.829, -397.734)	(-239.561, -865.257)	(-59.953, -878.092)
(0., 0.)	(-56.747, -397.365)	(-244.289, -864.256)	(-64.868, -878.073)
(0., 0.)	(-58.661, -396.991)	(-249.055, -863.241)	(-69.839, -878.06)
(0., 0.)	(-60.551, -396.597)	(-253.85, -862.17)	(-74.879, -878.072)
(0., 0.)	(-62.415, -396.207)	(-258.677, -861.014)	(-80.012, -878.131)
(0., 0.)	(-64.24, -395.836)	(-263.545, -859.828)	(-85.24, -878.269)
(0., 0.)	(-66.002, -395.488)	(-268.46, -858.641)	(-90.54, -878.471)
(0., 0.)	(-67.703, -395.165)	(-273.439, -857.405)	(-95.895, -878.69)
(0., 0.)	(-69.353, -394.85)	(-278.51, -856.095)	(-101.316, -878.907)
(0., 0.)	(-70.957, -394.525)	(-283.661, -854.717)	(-106.846, -879.104)
(0., 0.)	(-72.529, -394.193)	(-288.869, -853.257)	(-112.547, -879.255)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-74.089, -393.842)	(-294.142, -851.695)	(-118.418, -879.374)
(0., 0.)	(-75.656, -393.437)	(-299.5, -850.048)	(-124.411, -879.506)
(0., 0.)	(-77.246, -392.971)	(-304.966, -848.291)	(-130.518, -879.674)
(0., 0.)	(-78.872, -392.456)	(-310.568, -846.355)	(-136.786, -879.849)
(0., 0.)	(-80.532, -391.898)	(-316.317, -844.24)	(-143.277, -879.973)
(0., 0.)	(-82.201, -391.296)	(-322.172, -841.99)	(-149.998, -880.058)
(0., 0.)	(-83.855, -390.651)	(-328.112, -839.641)	(-156.946, -880.134)
(0., 0.)	(-85.464, -389.97)	(-334.152, -837.213)	(-164.08, -880.226)
(0., 0.)	(-86.985, -389.263)	(-340.271, -834.675)	(-171.343, -880.314)
(0., 0.)	(-88.381, -388.545)	(-346.435, -832.05)	(-178.745, -880.379)
(0., 0.)	(-89.65, -387.834)	(-352.608, -829.376)	(-186.285, -880.403)
(0., 0.)	(-90.783, -387.14)	(-358.758, -826.632)	(-193.888, -880.388)
(0., 0.)	(-91.757, -386.472)	(-364.89, -823.777)	(-201.506, -880.42)
(0., 0.)	(-92.549, -385.831)	(-371.015, -820.775)	(-209.136, -880.496)
(0., 0.)	(-93.148, -385.216)	(-377.091, -817.63)	(-216.798, -880.566)
(0., 0.)	(-93.55, -384.608)	(-383.051, -814.376)	(-224.491, -880.658)
(0., 0.)	(-93.739, -384.019)	(-388.838, -811.061)	(-232.181, -880.834)
(0., 0.)	(-93.671, -383.507)	(-394.406, -807.674)	(-239.825, -881.092)
(0., 0.)	(-93.294, -383.146)	(-399.732, -804.201)	(-247.393, -881.351)
(0., 0.)	(-92.563, -382.941)	(-404.791, -800.647)	(-254.837, -881.601)
(0., 0.)	(-91.439, -382.84)	(-409.538, -796.987)	(-262.122, -881.833)
(0., 0.)	(-89.89, -382.805)	(-413.909, -793.169)	(-269.211, -881.976)
(0., 0.)	(-87.88, -382.831)	(-417.849, -789.091)	(-276.005, -881.996)
(0., 0.)	(-85.348, -382.925)	(-421.316, -784.689)	(-282.455, -881.852)
(0., 0.)	(-82.252, -383.132)	(-424.281, -779.947)	(-288.566, -881.493)
(0., 0.)	(-78.616, -383.502)	(-426.719, -774.842)	(-294.381, -880.81)
(0., 0.)	(-74.454, -384.017)	(-428.611, -769.349)	(-299.902, -879.776)
(0., 0.)	(-69.7, -384.669)	(-429.936, -763.47)	(-305.021, -878.431)
(0., 0.)	(-64.282, -385.487)	(-430.641, -757.257)	(-309.707, -876.804)
(0., 0.)	(-58.222, -386.463)	(-430.666, -750.747)	(-314.049, -874.895)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-51.661, -387.518)	(-429.983, -743.927)	(-318.063, -872.724)
(0., 0.)	(-44.777, -388.556)	(-428.55, -736.802)	(-321.629, -870.286)
(0., 0.)	(-37.712, -389.495)	(-426.283, -729.4)	(-324.588, -867.493)
(0., 0.)	(-30.514, -390.287)	(-423.089, -721.756)	(-326.879, -864.399)
(0., 0.)	(-23.154, -390.903)	(-418.939, -713.959)	(-328.566, -861.152)
(0., 0.)	(-15.584, -391.309)	(-413.893, -706.154)	(-329.734, -857.767)
(0., 0.)	(-7.774, -391.487)	(-408.069, -698.49)	(-330.45, -854.295)
(0., 0.)	(0.256, -391.461)	(-401.599, -691.098)	(-330.692, -850.883)
(0., 0.)	(8.412, -391.307)	(-394.647, -684.077)	(-330.321, -847.621)
(0., 0.)	(16.564, -391.09)	(-387.34, -677.489)	(-329.238, -844.522)
(0., 0.)	(24.641, -390.8)	(-379.759, -671.416)	(-327.384, -841.575)
(0., 0.)	(32.672, -390.347)	(-372.157, -666.088)	(-324.435, -838.675)
(0., 0.)	(40.673, -389.654)	(-365.011, -661.868)	(-319.642, -835.582)
(0., 0.)	(48.55, -388.699)	(-358.641, -658.974)	(-312.262, -832.334)
(0., 0.)	(56.157, -387.512)	(-352.856, -657.406)	(-302.319, -829.312)
(0., 0.)	(63.413, -386.126)	(-347.08, -657.063)	(-290.433, -826.912)
(0., 0.)	(70.347, -384.583)	(-340.761, -657.811)	(-277.259, -825.232)
(0., 0.)	(77.063, -382.963)	(-333.664, -659.566)	(-263.244, -824.207)
(0., 0.)	(83.655, -381.383)	(-325.82, -662.301)	(-248.625, -823.82)
(0., 0.)	(90.118, -379.901)	(-317.313, -665.981)	(-233.573, -824.126)
(0., 0.)	(96.328, -378.425)	(-308.248, -670.569)	(-218.225, -825.249)
(0., 0.)	(102.197, -376.91)	(-298.691, -676.056)	(-202.63, -827.166)
(0., 0.)	(107.715, -375.433)	(-288.671, -682.464)	(-186.687, -829.722)
(0., 0.)	(112.893, -374.059)	(-278.225, -689.82)	(-170.253, -832.803)
(0., 0.)	(117.752, -372.82)	(-267.361, -698.061)	(-153.226, -836.256)
(0., 0.)	(122.307, -371.76)	(-255.998, -707.064)	(-135.551, -839.903)
(0., 0.)	(126.526, -370.879)	(-244.03, -716.665)	(-117.256, -843.612)
(0., 0.)	(130.371, -370.129)	(-231.371, -726.691)	(-98.476, -847.311)
(0., 0.)	(133.838, -369.437)	(-218.001, -736.995)	(-79.391, -850.947)
(0., 0.)	(136.921, -368.743)	(-203.976, -747.446)	(-60.101, -854.447)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(139.62, -368.059)	(-189.419, -757.925)	(-40.629, -857.771)
(0., 0.)	(141.916, -367.413)	(-174.429, -768.389)	(-21.031, -860.828)
(0., 0.)	(143.79, -366.811)	(-158.992, -778.831)	(-1.374, -863.603)
(0., 0.)	(145.254, -366.294)	(-143.04, -789.15)	(18.348, -866.104)
(0., 0.)	(146.324, -365.964)	(-126.577, -799.16)	(38.125, -868.382)
(0., 0.)	(147.033, -365.938)	(-109.667, -808.715)	(57.917, -870.469)
(0., 0.)	(147.386, -366.224)	(-92.418, -817.787)	(77.686, -872.37)
(0., 0.)	(147.379, -366.771)	(-74.938, -826.385)	(97.344, -873.987)
(0., 0.)	(147.055, -367.518)	(-57.33, -834.472)	(116.83, -875.241)
(0., 0.)	(146.508, -368.418)	(-39.652, -841.942)	(136.119, -876.199)
(0., 0.)	(145.829, -369.367)	(-21.925, -848.721)	(155.179, -876.826)
(0., 0.)	(145.058, -370.253)	(-4.176, -854.775)	(173.994, -877.01)
(0., 0.)	(144.226, -371.058)	(13.526, -860.089)	(192.547, -876.67)
(0., 0.)	(143.4, -371.837)	(31.082, -864.682)	(210.784, -875.83)
(0., 0.)	(142.61, -372.636)	(48.376, -868.59)	(228.636, -874.6)
(0., 0.)	(141.779, -373.481)	(65.27, -871.903)	(246.015, -873.058)
(0., 0.)	(140.809, -374.371)	(81.635, -874.676)	(262.67, -871.002)
(0., 0.)	(139.726, -375.201)	(97.367, -876.903)	(278.428, -868.258)
(0., 0.)	(138.685, -375.791)	(112.405, -878.561)	(293.233, -864.969)
(0., 0.)	(137.86, -376.069)	(126.685, -879.616)	(307.075, -861.338)
(0., 0.)	(137.312, -376.111)	(140.122, -880.094)	(319.977, -857.496)
(0., 0.)	(136.995, -375.997)	(152.672, -880.083)	(331.951, -853.578)
(0., 0.)	(136.854, -375.722)	(164.343, -879.674)	(343.006, -849.859)
(0., 0.)	(136.873, -375.278)	(175.136, -878.987)	(353.123, -846.479)
(0., 0.)	(137.007, -374.664)	(185.034, -878.176)	(362.278, -843.297)
(0., 0.)	(137.202, -373.868)	(193.978, -877.289)	(370.449, -840.013)
(0., 0.)	(137.38, -372.93)	(201.954, -876.379)	(377.511, -836.365)
(0., 0.)	(137.492, -371.942)	(208.998, -875.528)	(383.32, -832.341)
(0., 0.)	(137.5, -371.)	(215.107, -874.78)	(387.984, -828.359)
(0., 0.)	(137.397, -370.192)	(220.26, -874.15)	(391.753, -824.946)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(137.171, -369.57)	(224.416, -873.596)	(394.729, -822.409)
(0., 0.)	(136.792, -369.14)	(227.525, -873.116)	(396.86, -820.7)
(0., 0.)	(136.269, -368.929)	(229.568, -872.8)	(398.109, -819.632)
(0., 0.)	(135.674, -368.949)	(230.544, -872.718)	(398.438, -819.019)
(0., 0.)	(135.062, -369.134)	(230.453, -872.871)	(397.839, -818.784)
(0., 0.)	(134.446, -369.37)	(229.27, -873.249)	(396.319, -818.991)
(0., 0.)	(133.801, -369.629)	(226.965, -873.786)	(393.91, -819.729)
(0., 0.)	(133.082, -369.957)	(223.547, -874.34)	(390.681, -820.952)
(0., 0.)	(132.24, -370.433)	(219.118, -874.895)	(386.768, -822.479)
(0., 0.)	(131.217, -371.114)	(213.911, -875.639)	(382.319, -824.233)
(0., 0.)	(129.927, -371.975)	(208.184, -876.66)	(377.49, -826.265)
(0., 0.)	(128.293, -372.975)	(202.19, -877.783)	(372.478, -828.52)
(0., 0.)	(126.275, -374.127)	(196.221, -878.742)	(367.581, -830.689)
(0., 0.)	(123.875, -375.429)	(190.499, -879.419)	(362.89, -832.457)
(0., 0.)	(121.121, -376.806)	(184.968, -879.782)	(358.145, -833.905)
(0., 0.)	(118.102, -378.156)	(179.431, -879.841)	(353.19, -835.332)
(0., 0.)	(114.956, -379.397)	(173.686, -879.689)	(348.006, -836.992)
(0., 0.)	(111.833, -380.477)	(167.657, -879.477)	(342.56, -838.943)
(0., 0.)	(108.857, -381.396)	(161.409, -879.323)	(336.896, -841.119)
(0., 0.)	(106.088, -382.196)	(155.068, -879.264)	(331.106, -843.47)
(0., 0.)	(103.518, -382.937)	(148.695, -879.272)	(325.196, -845.86)
(0., 0.)	(101.079, -383.663)	(142.281, -879.345)	(319.111, -848.195)
(0., 0.)	(98.7, -384.418)	(135.831, -879.533)	(312.957, -850.577)
(0., 0.)	(96.387, -385.22)	(129.412, -879.891)	(306.899, -853.126)
(0., 0.)	(94.232, -386.124)	(123.093, -880.438)	(300.957, -855.753)
(0., 0.)	(92.346, -387.173)	(116.89, -881.147)	(295.072, -858.324)
(0., 0.)	(90.761, -388.344)	(110.753, -881.965)	(289.229, -860.814)
(0., 0.)	(89.417, -389.582)	(104.611, -882.833)	(283.433, -863.257)
(0., 0.)	(88.21, -390.83)	(98.457, -883.75)	(277.62, -865.606)
(0., 0.)	(86.994, -392.059)	(92.346, -884.765)	(271.721, -867.789)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(85.576, -393.226)	(86.253, -885.805)	(265.762, -869.735)
(0., 0.)	(83.772, -394.288)	(80.128, -886.736)	(259.739, -871.415)
(0., 0.)	(81.478, -395.245)	(73.954, -887.497)	(253.684, -872.955)
(0., 0.)	(78.709, -396.108)	(67.747, -888.116)	(247.636, -874.392)
(0., 0.)	(75.613, -396.865)	(61.56, -888.672)	(241.571, -875.671)
(0., 0.)	(72.436, -397.53)	(55.457, -889.203)	(235.553, -876.836)
(0., 0.)	(69.434, -398.198)	(49.48, -889.709)	(229.67, -877.95)
(0., 0.)	(66.697, -398.896)	(43.655, -890.18)	(223.952, -878.991)
(0., 0.)	(64.179, -399.58)	(38.008, -890.61)	(218.401, -879.961)
(0., 0.)	(61.831, -400.198)	(32.556, -890.996)	(213.093, -880.939)
(0., 0.)	(59.627, -400.72)	(27.32, -891.316)	(208.034, -881.942)
(0., 0.)	(57.561, -401.194)	(22.302, -891.568)	(203.175, -882.922)
(0., 0.)	(55.603, -401.659)	(17.463, -891.769)	(198.491, -883.813)
(0., 0.)	(53.691, -402.135)	(12.752, -891.937)	(193.935, -884.518)
(0., 0.)	(51.77, -402.62)	(8.131, -892.092)	(189.444, -885.065)
(0., 0.)	(49.799, -403.078)	(3.557, -892.228)	(184.962, -885.535)
(0., 0.)	(47.791, -403.492)	(-1.007, -892.313)	(180.467, -885.929)
(0., 0.)	(45.785, -403.854)	(-5.568, -892.326)	(175.988, -886.258)
(0., 0.)	(43.814, -404.157)	(-10.1, -892.302)	(171.556, -886.575)
(0., 0.)	(41.881, -404.433)	(-14.572, -892.296)	(167.162, -886.871)
(0., 0.)	(39.982, -404.692)	(-18.964, -892.308)	(162.776, -887.058)
(0., 0.)	(38.147, -404.918)	(-23.249, -892.291)	(158.39, -887.048)
(0., 0.)	(36.408, -405.097)	(-27.395, -892.245)	(154.09, -886.917)
(0., 0.)	(34.775, -405.234)	(-31.397, -892.201)	(150.041, -886.901)
(0., 0.)	(33.224, -405.361)	(-35.282, -892.15)	(146.22, -887.072)
(0., 0.)	(31.722, -405.489)	(-39.083, -892.08)	(142.513, -887.317)
(0., 0.)	(30.261, -405.587)	(-42.796, -892.011)	(138.89, -887.55)
(0., 0.)	(28.826, -405.637)	(-46.413, -891.942)	(135.336, -887.704)
(0., 0.)	(27.405, -405.671)	(-49.962, -891.824)	(131.805, -887.74)
(0., 0.)	(25.98, -405.717)	(-53.487, -891.656)	(128.28, -887.699)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(24.552, -405.777)	(-57.018, -891.445)	(124.785, -887.676)
(0., 0.)	(23.147, -405.853)	(-60.568, -891.167)	(121.327, -887.735)
(0., 0.)	(21.782, -405.933)	(-64.123, -890.808)	(117.849, -887.753)
(0., 0.)	(20.444, -405.998)	(-67.685, -890.359)	(114.304, -887.607)
(0., 0.)	(19.098, -406.034)	(-71.275, -889.823)	(110.733, -887.377)
(0., 0.)	(17.713, -406.04)	(-74.904, -889.244)	(107.165, -887.193)
(0., 0.)	(16.285, -406.018)	(-78.602, -888.666)	(103.527, -887.028)
(0., 0.)	(14.825, -405.987)	(-82.411, -888.116)	(99.751, -886.774)
(0., 0.)	(13.329, -405.976)	(-86.338, -887.6)	(95.877, -886.495)
(0., 0.)	(11.802, -405.992)	(-90.374, -887.108)	(91.935, -886.323)
(0., 0.)	(10.259, -406.02)	(-94.505, -886.625)	(87.883, -886.22)
(0., 0.)	(8.673, -406.028)	(-98.706, -886.151)	(83.692, -886.069)
(0., 0.)	(7.003, -405.99)	(-102.955, -885.68)	(79.413, -885.852)
(0., 0.)	(5.243, -405.924)	(-107.264, -885.197)	(75.094, -885.631)
(0., 0.)	(3.413, -405.872)	(-111.644, -884.689)	(70.734, -885.457)
(0., 0.)	(1.526, -405.828)	(-116.087, -884.154)	(66.305, -885.308)
(0., 0.)	(-0.41, -405.756)	(-120.589, -883.587)	(61.797, -885.082)
(0., 0.)	(-2.388, -405.618)	(-125.143, -882.999)	(57.219, -884.734)
(0., 0.)	(-4.399, -405.412)	(-129.739, -882.388)	(52.604, -884.347)
(0., 0.)	(-6.417, -405.165)	(-134.375, -881.731)	(47.963, -883.999)
(0., 0.)	(-8.389, -404.914)	(-139.042, -881.063)	(43.267, -883.698)
(0., 0.)	(-10.284, -404.675)	(-143.736, -880.461)	(38.523, -883.418)
(0., 0.)	(-12.117, -404.423)	(-148.46, -879.933)	(33.777, -883.117)
(0., 0.)	(-13.927, -404.136)	(-153.215, -879.406)	(29.042, -882.768)
(0., 0.)	(-15.745, -403.824)	(-157.987, -878.802)	(24.306, -882.427)
(0., 0.)	(-17.581, -403.522)	(-162.761, -878.102)	(19.534, -882.143)
(0., 0.)	(-19.422, -403.243)	(-167.525, -877.363)	(14.683, -881.827)
(0., 0.)	(-21.247, -402.979)	(-172.27, -876.649)	(9.79, -881.399)
(0., 0.)	(-23.064, -402.699)	(-177.022, -875.971)	(4.957, -880.963)
(0., 0.)	(-24.892, -402.396)	(-181.802, -875.33)	(0.202, -880.632)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-26.743, -402.076)	(-186.584, -874.722)	(-4.548, -880.37)
(0., 0.)	(-28.623, -401.737)	(-191.337, -874.106)	(-9.344, -880.102)
(0., 0.)	(-30.529, -401.363)	(-196.049, -873.445)	(-14.17, -879.821)
(0., 0.)	(-32.464, -400.96)	(-200.732, -872.745)	(-18.984, -879.553)
(0., 0.)	(-34.435, -400.55)	(-205.41, -872.025)	(-23.762, -879.289)
(0., 0.)	(-36.438, -400.139)	(-210.07, -871.317)	(-28.524, -879.02)
(0., 0.)	(-38.436, -399.726)	(-214.705, -870.62)	(-33.291, -878.79)
(0., 0.)	(-40.396, -399.315)	(-219.325, -869.886)	(-38.04, -878.638)
(0., 0.)	(-42.306, -398.915)	(-223.927, -869.075)	(-42.77, -878.585)
(0., 0.)	(-44.173, -398.532)	(-228.514, -868.154)	(-47.507, -878.608)
(0., 0.)	(-46.006, -398.16)	(-233.095, -867.141)	(-52.273, -878.649)
(0., 0.)	(-47.813, -397.798)	(-237.685, -866.054)	(-57.11, -878.666)
(0., 0.)	(-49.588, -397.475)	(-242.299, -864.897)	(-62.027, -878.682)
(0., 0.)	(-51.302, -397.208)	(-246.901, -863.732)	(-66.952, -878.773)
(0., 0.)	(-52.895, -396.969)	(-251.455, -862.581)	(-71.838, -878.965)
(0., 0.)	(-54.302, -396.744)	(-255.932, -861.395)	(-76.689, -879.204)
(0., 0.)	(-55.495, -396.553)	(-260.273, -860.183)	(-81.449, -879.459)
(0., 0.)	(-56.505, -396.398)	(-264.438, -859.006)	(-86.034, -879.776)
(0., 0.)	(-57.409, -396.25)	(-268.441, -857.854)	(-90.451, -880.167)
(0., 0.)	(-58.28, -396.065)	(-272.343, -856.648)	(-94.798, -880.589)
(0., 0.)	(-59.182, -395.839)	(-276.182, -855.37)	(-99.17, -881.011)
(0., 0.)	(-60.174, -395.583)	(-279.984, -854.064)	(-103.596, -881.424)
(0., 0.)	(-61.248, -395.28)	(-283.798, -852.735)	(-108.078, -881.852)
(0., 0.)	(-62.37, -394.918)	(-287.686, -851.311)	(-112.644, -882.311)
(0., 0.)	(-63.531, -394.5)	(-291.683, -849.765)	(-117.36, -882.763)
(0., 0.)	(-64.723, -394.031)	(-295.797, -848.145)	(-122.29, -883.204)
(0., 0.)	(-65.959, -393.535)	(-300.048, -846.466)	(-127.449, -883.671)
(0., 0.)	(-67.242, -393.028)	(-304.449, -844.705)	(-132.78, -884.148)
(0., 0.)	(-68.552, -392.515)	(-309.006, -842.87)	(-138.233, -884.566)
(0., 0.)	(-69.864, -391.98)	(-313.721, -841.022)	(-143.844, -884.958)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-71.167, -391.393)	(-318.566, -839.202)	(-149.636, -885.428)
(0., 0.)	(-72.463, -390.749)	(-323.539, -837.386)	(-155.559, -885.984)
(0., 0.)	(-73.741, -390.111)	(-328.617, -835.493)	(-161.569, -886.478)
(0., 0.)	(-74.972, -389.533)	(-333.741, -833.456)	(-167.662, -886.842)
(0., 0.)	(-76.114, -388.981)	(-338.859, -831.286)	(-173.879, -887.17)
(0., 0.)	(-77.133, -388.42)	(-343.95, -829.031)	(-180.221, -887.49)
(0., 0.)	(-77.996, -387.89)	(-349.021, -826.709)	(-186.608, -887.72)
(0., 0.)	(-78.672, -387.442)	(-354.087, -824.299)	(-193.006, -887.862)
(0., 0.)	(-79.134, -387.061)	(-359.123, -821.767)	(-199.449, -887.978)
(0., 0.)	(-79.395, -386.728)	(-364.096, -819.122)	(-205.983, -888.076)
(0., 0.)	(-79.476, -386.437)	(-369.025, -816.374)	(-212.618, -888.151)
(0., 0.)	(-79.387, -386.195)	(-373.935, -813.51)	(-219.281, -888.224)
(0., 0.)	(-79.141, -385.985)	(-378.783, -810.529)	(-225.895, -888.293)
(0., 0.)	(-78.734, -385.773)	(-383.526, -807.444)	(-232.469, -888.333)
(0., 0.)	(-78.163, -385.533)	(-388.157, -804.192)	(-239.041, -888.275)
(0., 0.)	(-77.46, -385.266)	(-392.659, -800.721)	(-245.604, -888.042)
(0., 0.)	(-76.654, -384.989)	(-397.011, -797.038)	(-252.098, -887.649)
(0., 0.)	(-75.727, -384.723)	(-401.203, -793.182)	(-258.484, -887.18)
(0., 0.)	(-74.627, -384.499)	(-405.187, -789.181)	(-264.785, -886.649)
(0., 0.)	(-73.283, -384.328)	(-408.872, -785.014)	(-270.978, -886.027)
(0., 0.)	(-71.612, -384.226)	(-412.22, -780.64)	(-277.014, -885.273)
(0., 0.)	(-69.535, -384.228)	(-415.209, -776.033)	(-282.84, -884.338)
(0., 0.)	(-66.965, -384.394)	(-417.782, -771.175)	(-288.391, -883.219)
(0., 0.)	(-63.826, -384.784)	(-419.888, -766.071)	(-293.662, -881.935)
(0., 0.)	(-60.082, -385.402)	(-421.47, -760.703)	(-298.637, -880.503)
(0., 0.)	(-55.755, -386.18)	(-422.454, -755.05)	(-303.29, -878.885)
(0., 0.)	(-50.931, -387.028)	(-422.788, -749.106)	(-307.6, -877.062)
(0., 0.)	(-45.718, -387.876)	(-422.461, -742.902)	(-311.519, -875.065)
(0., 0.)	(-40.208, -388.684)	(-421.427, -736.48)	(-315.028, -872.866)
(0., 0.)	(-34.447, -389.433)	(-419.598, -729.814)	(-318.034, -870.355)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-28.44, -390.12)	(-416.896, -722.872)	(-320.416, -867.538)
(0., 0.)	(-22.152, -390.719)	(-413.299, -715.749)	(-322.221, -864.589)
(0., 0.)	(-15.525, -391.203)	(-408.894, -708.622)	(-323.627, -861.578)
(0., 0.)	(-8.541, -391.548)	(-403.82, -701.622)	(-324.665, -858.433)
(0., 0.)	(-1.267, -391.724)	(-398.196, -694.782)	(-325.205, -855.143)
(0., 0.)	(6.161, -391.714)	(-392.107, -688.128)	(-325.05, -851.795)
(0., 0.)	(13.63, -391.548)	(-385.675, -681.696)	(-324.213, -848.468)
(0., 0.)	(21.112, -391.231)	(-379.079, -675.563)	(-322.945, -845.248)
(0., 0.)	(28.632, -390.708)	(-372.59, -669.894)	(-321.238, -842.172)
(0., 0.)	(36.188, -389.956)	(-366.667, -665.)	(-318.304, -838.942)
(0., 0.)	(43.672, -389.014)	(-361.717, -661.227)	(-312.709, -835.155)
(0., 0.)	(50.914, -387.931)	(-357.556, -658.712)	(-303.584, -830.885)
(0., 0.)	(57.786, -386.699)	(-353.494, -657.403)	(-291.378, -826.423)
(0., 0.)	(64.263, -385.337)	(-348.803, -657.191)	(-277.214, -822.032)
(0., 0.)	(70.382, -383.949)	(-343.079, -657.996)	(-262.182, -818.092)
(0., 0.)	(76.244, -382.64)	(-336.291, -659.753)	(-247.157, -815.028)
(0., 0.)	(81.996, -381.461)	(-328.664, -662.405)	(-232.701, -813.193)
(0., 0.)	(87.692, -380.37)	(-320.484, -665.919)	(-219.005, -812.724)
(0., 0.)	(93.225, -379.243)	(-311.934, -670.354)	(-205.845, -813.449)
(0., 0.)	(98.509, -378.03)	(-303.037, -675.794)	(-192.688, -815.147)
(0., 0.)	(103.538, -376.815)	(-293.677, -682.194)	(-178.893, -817.653)
(0., 0.)	(108.297, -375.706)	(-283.725, -689.437)	(-164.103, -820.642)
(0., 0.)	(112.745, -374.732)	(-273.113, -697.427)	(-148.339, -823.716)
(0., 0.)	(116.835, -373.852)	(-261.805, -706.101)	(-131.756, -826.842)
(0., 0.)	(120.571, -373.05)	(-249.803, -715.402)	(-114.515, -830.286)
(0., 0.)	(123.977, -372.347)	(-237.183, -725.237)	(-96.906, -834.197)
(0., 0.)	(127.063, -371.721)	(-224.036, -735.503)	(-79.145, -838.573)
(0., 0.)	(129.815, -371.117)	(-210.405, -746.103)	(-61.274, -843.221)
(0., 0.)	(132.249, -370.543)	(-196.295, -756.912)	(-43.18, -847.889)
(0., 0.)	(134.384, -370.051)	(-181.696, -767.737)	(-24.797, -852.42)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(136.206, -369.649)	(-166.593, -778.375)	(-6.188, -856.594)
(0., 0.)	(137.66, -369.375)	(-151.004, -788.738)	(12.606, -860.238)
(0., 0.)	(138.723, -369.301)	(-134.941, -798.771)	(31.576, -863.4)
(0., 0.)	(139.423, -369.473)	(-118.429, -808.445)	(50.705, -866.235)
(0., 0.)	(139.789, -369.856)	(-101.5, -817.696)	(69.966, -868.757)
(0., 0.)	(139.837, -370.415)	(-84.197, -826.416)	(89.32, -870.918)
(0., 0.)	(139.62, -371.11)	(-66.577, -834.535)	(108.71, -872.727)
(0., 0.)	(139.201, -371.885)	(-48.733, -842.012)	(128.03, -874.194)
(0., 0.)	(138.638, -372.675)	(-30.767, -848.775)	(147.16, -875.283)
(0., 0.)	(137.976, -373.403)	(-12.786, -854.761)	(166.032, -875.995)
(0., 0.)	(137.243, -374.095)	(5.095, -859.947)	(184.568, -876.381)
(0., 0.)	(136.447, -374.856)	(22.76, -864.332)	(202.681, -876.583)
(0., 0.)	(135.592, -375.714)	(40.083, -867.921)	(220.363, -876.747)
(0., 0.)	(134.725, -376.539)	(56.988, -870.732)	(237.584, -876.849)
(0., 0.)	(133.921, -377.146)	(73.428, -872.808)	(254.176, -876.741)
(0., 0.)	(133.21, -377.463)	(89.345, -874.232)	(270.092, -876.417)
(0., 0.)	(132.603, -377.53)	(104.636, -875.099)	(285.279, -875.708)
(0., 0.)	(132.151, -377.43)	(119.198, -875.491)	(299.663, -874.346)
(0., 0.)	(131.887, -377.207)	(132.97, -875.575)	(313.205, -872.112)
(0., 0.)	(131.811, -376.808)	(145.934, -875.555)	(325.829, -868.627)
(0., 0.)	(131.901, -376.152)	(158.111, -875.525)	(337.429, -863.756)
(0., 0.)	(132.097, -375.231)	(169.56, -875.502)	(347.977, -857.996)
(0., 0.)	(132.312, -374.139)	(180.324, -875.495)	(357.497, -852.)
(0., 0.)	(132.443, -372.997)	(190.281, -875.32)	(366.013, -846.196)
(0., 0.)	(132.383, -371.892)	(199.238, -874.729)	(373.598, -840.904)
(0., 0.)	(132.07, -370.897)	(207.112, -873.72)	(380.312, -836.312)
(0., 0.)	(131.513, -370.036)	(213.901, -872.502)	(386.146, -832.31)
(0., 0.)	(130.79, -369.296)	(219.612, -871.368)	(391.045, -828.692)
(0., 0.)	(130.003, -368.696)	(224.264, -870.602)	(394.905, -825.31)
(0., 0.)	(129.236, -368.261)	(227.825, -870.308)	(397.511, -822.088)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(128.525, -367.986)	(230.181, -870.376)	(398.863, -819.349)
(0., 0.)	(127.872, -367.847)	(231.194, -870.666)	(399.089, -817.564)
(0., 0.)	(127.284, -367.839)	(230.801, -871.173)	(398.3, -816.91)
(0., 0.)	(126.751, -367.962)	(228.998, -871.949)	(396.492, -817.322)
(0., 0.)	(126.215, -368.224)	(225.848, -873.046)	(393.63, -818.635)
(0., 0.)	(125.586, -368.67)	(221.476, -874.454)	(389.755, -820.664)
(0., 0.)	(124.744, -369.333)	(216.007, -876.085)	(384.94, -823.129)
(0., 0.)	(123.579, -370.218)	(209.536, -877.818)	(379.17, -825.745)
(0., 0.)	(122.024, -371.323)	(202.253, -879.566)	(372.561, -828.424)
(0., 0.)	(120.066, -372.656)	(194.595, -881.271)	(365.674, -831.213)
(0., 0.)	(117.724, -374.222)	(187.207, -882.836)	(359.123, -833.669)
(0., 0.)	(114.998, -375.965)	(180.605, -884.104)	(353.264, -835.267)
(0., 0.)	(111.873, -377.736)	(174.794, -884.8)	(347.978, -836.157)
(0., 0.)	(108.372, -379.377)	(169.36, -884.801)	(342.921, -837.075)
(0., 0.)	(104.628, -380.787)	(163.842, -884.348)	(337.907, -838.562)
(0., 0.)	(100.867, -381.915)	(158.016, -883.823)	(332.789, -840.489)
(0., 0.)	(97.32, -382.727)	(151.942, -883.445)	(327.391, -842.416)
(0., 0.)	(94.133, -383.224)	(145.789, -883.173)	(321.679, -844.075)
(0., 0.)	(91.369, -383.565)	(139.589, -882.791)	(315.833, -845.724)
(0., 0.)	(88.991, -384.018)	(133.37, -882.346)	(310.067, -847.727)
(0., 0.)	(86.86, -384.689)	(127.217, -882.148)	(304.397, -850.037)
(0., 0.)	(84.869, -385.506)	(121.111, -882.315)	(298.714, -852.34)
(0., 0.)	(83.061, -386.408)	(115.011, -882.747)	(292.972, -854.615)
(0., 0.)	(81.555, -387.41)	(108.94, -883.351)	(287.265, -857.044)
(0., 0.)	(80.406, -388.538)	(102.943, -884.131)	(281.638, -859.623)
(0., 0.)	(79.544, -389.806)	(96.997, -885.066)	(276.023, -862.195)
(0., 0.)	(78.849, -391.191)	(91.025, -886.054)	(270.359, -864.67)
(0., 0.)	(78.174, -392.608)	(84.97, -887.002)	(264.617, -866.955)
(0., 0.)	(77.325, -393.936)	(78.818, -887.874)	(258.752, -868.958)
(0., 0.)	(76.072, -395.067)	(72.58, -888.642)	(252.741, -870.707)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(74.231, -395.99)	(66.266, -889.266)	(246.567, -872.203)
(0., 0.)	(71.801, -396.754)	(59.916, -889.738)	(240.345, -873.507)
(0., 0.)	(68.957, -397.387)	(53.589, -890.094)	(234.211, -874.742)
(0., 0.)	(65.946, -397.898)	(47.361, -890.384)	(228.156, -875.9)
(0., 0.)	(62.995, -398.333)	(41.27, -890.652)	(222.168, -876.955)
(0., 0.)	(60.251, -398.778)	(35.334, -890.91)	(216.347, -877.973)
(0., 0.)	(57.762, -399.284)	(29.558, -891.149)	(210.726, -878.944)
(0., 0.)	(55.513, -399.843)	(23.948, -891.357)	(205.274, -879.845)
(0., 0.)	(53.457, -400.388)	(18.502, -891.524)	(199.992, -880.709)
(0., 0.)	(51.521, -400.877)	(13.21, -891.642)	(194.864, -881.536)
(0., 0.)	(49.661, -401.332)	(8.074, -891.69)	(189.921, -882.32)
(0., 0.)	(47.85, -401.806)	(3.084, -891.673)	(185.123, -883.021)
(0., 0.)	(46.052, -402.281)	(-1.792, -891.624)	(180.418, -883.594)
(0., 0.)	(44.211, -402.716)	(-6.596, -891.586)	(175.792, -884.078)
(0., 0.)	(42.288, -403.114)	(-11.35, -891.542)	(171.138, -884.465)
(0., 0.)	(40.281, -403.511)	(-16.054, -891.483)	(166.385, -884.635)
(0., 0.)	(38.233, -403.903)	(-20.681, -891.428)	(161.66, -884.635)
(0., 0.)	(36.194, -404.235)	(-25.23, -891.373)	(157.15, -884.787)
(0., 0.)	(34.199, -404.484)	(-29.714, -891.291)	(152.812, -885.149)
(0., 0.)	(32.276, -404.698)	(-34.138, -891.17)	(148.53, -885.523)
(0., 0.)	(30.43, -404.924)	(-38.489, -891.019)	(144.282, -885.77)
(0., 0.)	(28.659, -405.163)	(-42.76, -890.829)	(140.097, -885.931)
(0., 0.)	(26.982, -405.37)	(-46.949, -890.588)	(135.991, -886.06)
(0., 0.)	(25.421, -405.521)	(-51.057, -890.334)	(131.941, -886.142)
(0., 0.)	(23.94, -405.618)	(-55.11, -890.118)	(127.889, -886.185)
(0., 0.)	(22.462, -405.677)	(-59.141, -889.929)	(123.842, -886.255)
(0., 0.)	(20.946, -405.726)	(-63.17, -889.712)	(119.876, -886.398)
(0., 0.)	(19.386, -405.761)	(-67.199, -889.437)	(115.986, -886.582)
(0., 0.)	(17.804, -405.792)	(-71.206, -889.106)	(112.102, -886.737)
(0., 0.)	(16.248, -405.846)	(-75.179, -888.723)	(108.198, -886.831)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(14.761, -405.922)	(-79.133, -888.294)	(104.293, -886.848)
(0., 0.)	(13.341, -405.98)	(-83.114, -887.825)	(100.389, -886.834)
(0., 0.)	(11.95, -405.987)	(-87.154, -887.33)	(96.427, -886.808)
(0., 0.)	(10.556, -405.963)	(-91.254, -886.813)	(92.364, -886.71)
(0., 0.)	(9.12, -405.947)	(-95.401, -886.268)	(88.249, -886.572)
(0., 0.)	(7.63, -405.966)	(-99.591, -885.697)	(84.091, -886.416)
(0., 0.)	(6.098, -406.009)	(-103.823, -885.119)	(79.85, -886.212)
(0., 0.)	(4.52, -406.053)	(-108.104, -884.584)	(75.564, -886.024)
(0., 0.)	(2.885, -406.077)	(-112.436, -884.104)	(71.252, -885.869)
(0., 0.)	(1.19, -406.075)	(-116.793, -883.656)	(66.872, -885.653)
(0., 0.)	(-0.559, -406.038)	(-121.144, -883.215)	(62.46, -885.401)
(0., 0.)	(-2.348, -405.948)	(-125.475, -882.776)	(58.084, -885.2)
(0., 0.)	(-4.168, -405.813)	(-129.787, -882.336)	(53.756, -885.043)
(0., 0.)	(-6.011, -405.653)	(-134.088, -881.877)	(49.453, -884.887)
(0., 0.)	(-7.865, -405.488)	(-138.376, -881.403)	(45.133, -884.675)
(0., 0.)	(-9.721, -405.321)	(-142.631, -880.926)	(40.798, -884.356)
(0., 0.)	(-11.568, -405.142)	(-146.832, -880.458)	(36.539, -884.038)
(0., 0.)	(-13.405, -404.95)	(-150.996, -879.993)	(32.396, -883.817)
(0., 0.)	(-15.235, -404.737)	(-155.158, -879.524)	(28.262, -883.602)
(0., 0.)	(-17.07, -404.486)	(-159.328, -879.042)	(24.052, -883.309)
(0., 0.)	(-18.944, -404.192)	(-163.493, -878.523)	(19.78, -882.967)
(0., 0.)	(-20.869, -403.865)	(-167.651, -877.934)	(15.501, -882.604)
(0., 0.)	(-22.824, -403.511)	(-171.816, -877.271)	(11.266, -882.237)
(0., 0.)	(-24.805, -403.124)	(-176.007, -876.586)	(7.073, -881.894)
(0., 0.)	(-26.821, -402.695)	(-180.221, -875.933)	(2.837, -881.536)
(0., 0.)	(-28.864, -402.226)	(-184.437, -875.294)	(-1.499, -881.131)
(0., 0.)	(-30.905, -401.717)	(-188.643, -874.616)	(-5.878, -880.727)
(0., 0.)	(-32.933, -401.143)	(-192.858, -873.869)	(-10.236, -880.366)
(0., 0.)	(-34.977, -400.497)	(-197.108, -873.074)	(-14.583, -880.062)
(0., 0.)	(-37.028, -399.821)	(-201.413, -872.274)	(-18.96, -879.784)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-39.061, -399.165)	(-205.776, -871.5)	(-23.407, -879.455)
(0., 0.)	(-41.072, -398.541)	(-210.186, -870.715)	(-27.91, -879.085)
(0., 0.)	(-43.066, -397.951)	(-214.634, -869.89)	(-32.451, -878.741)
(0., 0.)	(-45.025, -397.42)	(-219.102, -869.006)	(-37.051, -878.417)
(0., 0.)	(-46.935, -396.995)	(-223.585, -868.036)	(-41.728, -878.125)
(0., 0.)	(-48.802, -396.683)	(-228.115, -866.982)	(-46.469, -877.909)
(0., 0.)	(-50.662, -396.457)	(-232.713, -865.901)	(-51.269, -877.77)
(0., 0.)	(-52.566, -396.261)	(-237.359, -864.834)	(-56.119, -877.705)
(0., 0.)	(-54.545, -396.034)	(-242.021, -863.784)	(-61., -877.713)
(0., 0.)	(-56.574, -395.736)	(-246.694, -862.732)	(-65.929, -877.721)
(0., 0.)	(-58.604, -395.371)	(-251.405, -861.636)	(-70.932, -877.695)
(0., 0.)	(-60.574, -394.981)	(-256.156, -860.498)	(-75.987, -877.702)
(0., 0.)	(-62.429, -394.627)	(-260.904, -859.351)	(-81.064, -877.802)
(0., 0.)	(-64.135, -394.345)	(-265.61, -858.17)	(-86.143, -877.979)
(0., 0.)	(-65.675, -394.136)	(-270.291, -856.909)	(-91.224, -878.15)
(0., 0.)	(-67.047, -393.998)	(-274.959, -855.552)	(-96.303, -878.289)
(0., 0.)	(-68.28, -393.886)	(-279.59, -854.151)	(-101.39, -878.448)
(0., 0.)	(-69.469, -393.726)	(-284.18, -852.784)	(-106.496, -878.648)
(0., 0.)	(-70.702, -393.46)	(-288.776, -851.434)	(-111.616, -878.821)
(0., 0.)	(-72.013, -393.081)	(-293.426, -849.996)	(-116.772, -878.955)
(0., 0.)	(-73.393, -392.618)	(-298.146, -848.427)	(-122.055, -879.128)
(0., 0.)	(-74.824, -392.119)	(-302.929, -846.759)	(-127.507, -879.346)
(0., 0.)	(-76.272, -391.618)	(-307.788, -845.036)	(-133.082, -879.555)
(0., 0.)	(-77.691, -391.129)	(-312.712, -843.258)	(-138.773, -879.807)
(0., 0.)	(-79.06, -390.661)	(-317.687, -841.389)	(-144.585, -880.159)
(0., 0.)	(-80.387, -390.208)	(-322.734, -839.414)	(-150.483, -880.532)
(0., 0.)	(-81.662, -389.746)	(-327.872, -837.327)	(-156.505, -880.818)
(0., 0.)	(-82.857, -389.245)	(-333.087, -835.139)	(-162.714, -881.051)
(0., 0.)	(-83.948, -388.706)	(-338.35, -832.87)	(-169.058, -881.267)
(0., 0.)	(-84.945, -388.163)	(-343.628, -830.542)	(-175.465, -881.49)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-85.847, -387.621)	(-348.907, -828.137)	(-181.942, -881.697)
(0., 0.)	(-86.647, -387.066)	(-354.207, -825.626)	(-188.557, -881.826)
(0., 0.)	(-87.343, -386.501)	(-359.526, -823.031)	(-195.311, -881.906)
(0., 0.)	(-87.935, -385.96)	(-364.834, -820.397)	(-202.111, -882.075)
(0., 0.)	(-88.415, -385.48)	(-370.127, -817.73)	(-208.911, -882.345)
(0., 0.)	(-88.749, -385.065)	(-375.394, -814.982)	(-215.727, -882.598)
(0., 0.)	(-88.882, -384.714)	(-380.593, -812.128)	(-222.555, -882.775)
(0., 0.)	(-88.76, -384.425)	(-385.662, -809.183)	(-229.341, -882.932)
(0., 0.)	(-88.367, -384.202)	(-390.554, -806.13)	(-236.046, -883.074)
(0., 0.)	(-87.706, -384.077)	(-395.236, -802.906)	(-242.64, -883.151)
(0., 0.)	(-86.787, -384.033)	(-399.678, -799.486)	(-249.071, -883.16)
(0., 0.)	(-85.616, -384.023)	(-403.847, -795.885)	(-255.31, -883.094)
(0., 0.)	(-84.192, -384.027)	(-407.708, -792.093)	(-261.36, -882.916)
(0., 0.)	(-82.481, -384.018)	(-411.241, -788.078)	(-267.277, -882.543)
(0., 0.)	(-80.438, -384.003)	(-414.431, -783.831)	(-273.066, -881.949)
(0., 0.)	(-78.017, -384.05)	(-417.258, -779.313)	(-278.677, -881.156)
(0., 0.)	(-75.151, -384.208)	(-419.655, -774.449)	(-284.041, -880.178)
(0., 0.)	(-71.74, -384.52)	(-421.529, -769.204)	(-289.098, -878.949)
(0., 0.)	(-67.663, -385.058)	(-422.834, -763.588)	(-293.844, -877.431)
(0., 0.)	(-62.833, -385.865)	(-423.567, -757.632)	(-298.297, -875.672)
(0., 0.)	(-57.27, -386.883)	(-423.725, -751.344)	(-302.494, -873.703)
(0., 0.)	(-51.14, -387.982)	(-423.28, -744.752)	(-306.455, -871.502)
(0., 0.)	(-44.686, -389.046)	(-422.171, -737.902)	(-310.09, -869.033)
(0., 0.)	(-38.077, -390.017)	(-420.308, -730.821)	(-313.229, -866.296)
(0., 0.)	(-31.34, -390.867)	(-417.596, -723.526)	(-315.748, -863.346)
(0., 0.)	(-24.443, -391.553)	(-414.003, -716.066)	(-317.656, -860.234)
(0., 0.)	(-17.367, -392.02)	(-409.59, -708.539)	(-319.095, -857.019)
(0., 0.)	(-10.098, -392.263)	(-404.483, -701.144)	(-320.142, -853.751)
(0., 0.)	(-2.632, -392.322)	(-398.802, -694.057)	(-320.758, -850.533)
(0., 0.)	(4.987, -392.237)	(-392.651, -687.31)	(-320.902, -847.408)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(12.677, -392.03)	(-386.146, -680.886)	(-320.599, -844.382)
(0., 0.)	(20.36, -391.668)	(-379.395, -674.829)	(-319.911, -841.562)
(0., 0.)	(27.994, -391.118)	(-372.538, -669.28)	(-318.789, -839.037)
(0., 0.)	(35.536, -390.389)	(-365.893, -664.481)	(-316.891, -836.588)
(0., 0.)	(42.885, -389.486)	(-359.896, -660.688)	(-313.393, -833.86)
(0., 0.)	(49.938, -388.406)	(-354.715, -658.062)	(-307.422, -830.922)
(0., 0.)	(56.694, -387.183)	(-350.014, -656.684)	(-298.826, -828.178)
(0., 0.)	(63.213, -385.87)	(-345.209, -656.522)	(-288.045, -825.904)
(0., 0.)	(69.506, -384.495)	(-339.846, -657.362)	(-275.595, -824.083)
(0., 0.)	(75.576, -383.094)	(-333.776, -659.037)	(-262.013, -822.706)
(0., 0.)	(81.468, -381.739)	(-327.026, -661.558)	(-247.855, -821.839)
(0., 0.)	(87.216, -380.488)	(-319.668, -664.976)	(-233.5, -821.612)
(0., 0.)	(92.768, -379.29)	(-311.808, -669.3)	(-219.057, -822.178)
(0., 0.)	(98.068, -378.108)	(-303.531, -674.517)	(-204.537, -823.488)
(0., 0.)	(103.114, -376.964)	(-294.828, -680.582)	(-189.874, -825.424)
(0., 0.)	(107.919, -375.924)	(-285.609, -687.407)	(-174.871, -827.927)
(0., 0.)	(112.471, -375.049)	(-275.786, -694.894)	(-159.327, -830.867)
(0., 0.)	(116.723, -374.312)	(-265.332, -702.938)	(-143.206, -834.018)
(0., 0.)	(120.624, -373.61)	(-254.294, -711.472)	(-126.574, -837.205)
(0., 0.)	(124.159, -372.899)	(-242.742, -720.456)	(-109.545, -840.403)
(0., 0.)	(127.338, -372.182)	(-230.698, -729.783)	(-92.235, -843.663)
(0., 0.)	(130.195, -371.441)	(-218.117, -739.353)	(-74.719, -846.983)
(0., 0.)	(132.769, -370.637)	(-204.948, -749.134)	(-56.983, -850.329)
(0., 0.)	(135.113, -369.751)	(-191.205, -759.037)	(-38.992, -853.686)
(0., 0.)	(137.238, -368.852)	(-176.879, -768.908)	(-20.774, -857.002)
(0., 0.)	(139.112, -368.071)	(-161.967, -778.614)	(-2.356, -860.08)
(0., 0.)	(140.691, -367.488)	(-146.541, -788.086)	(16.258, -862.809)
(0., 0.)	(141.941, -367.091)	(-130.694, -797.275)	(35.02, -865.304)
(0., 0.)	(142.871, -366.901)	(-114.498, -806.174)	(53.872, -867.629)
(0., 0.)	(143.532, -366.937)	(-97.973, -814.757)	(72.801, -869.624)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(143.973, -367.113)	(-81.141, -822.921)	(91.683, -871.135)
(0., 0.)	(144.236, -367.323)	(-64.075, -830.55)	(110.439, -872.202)
(0., 0.)	(144.354, -367.549)	(-46.869, -837.531)	(129.04, -872.948)
(0., 0.)	(144.334, -367.833)	(-29.607, -843.835)	(147.434, -873.505)
(0., 0.)	(144.171, -368.211)	(-12.367, -849.474)	(165.565, -873.906)
(0., 0.)	(143.853, -368.709)	(4.787, -854.459)	(183.37, -874.044)
(0., 0.)	(143.37, -369.363)	(21.773, -858.825)	(200.831, -873.831)
(0., 0.)	(142.756, -370.168)	(38.472, -862.657)	(217.963, -873.282)
(0., 0.)	(142.082, -371.022)	(54.801, -865.974)	(234.651, -872.348)
(0., 0.)	(141.402, -371.793)	(70.73, -868.792)	(250.683, -870.833)
(0., 0.)	(140.71, -372.426)	(86.198, -871.204)	(266.003, -868.809)
(0., 0.)	(139.968, -372.923)	(101.133, -873.265)	(280.657, -866.383)
(0., 0.)	(139.177, -373.263)	(115.498, -874.974)	(294.571, -863.38)
(0., 0.)	(138.422, -373.413)	(129.268, -876.279)	(307.699, -859.761)
(0., 0.)	(137.761, -373.426)	(142.367, -877.139)	(320.063, -855.718)
(0., 0.)	(137.223, -373.36)	(154.717, -877.599)	(331.56, -851.393)
(0., 0.)	(136.815, -373.148)	(166.291, -877.709)	(342.077, -846.952)
(0., 0.)	(136.48, -372.672)	(177.037, -877.501)	(351.667, -842.609)
(0., 0.)	(136.122, -371.929)	(186.89, -877.072)	(360.378, -838.449)
(0., 0.)	(135.694, -371.022)	(195.794, -876.513)	(368.146, -834.393)
(0., 0.)	(135.184, -370.061)	(203.71, -875.841)	(374.949, -830.453)
(0., 0.)	(134.585, -369.12)	(210.601, -875.079)	(380.737, -826.627)
(0., 0.)	(133.906, -368.25)	(216.437, -874.307)	(385.405, -823.032)
(0., 0.)	(133.148, -367.521)	(221.197, -873.687)	(389., -819.984)
(0., 0.)	(132.28, -367.014)	(224.856, -873.352)	(391.645, -817.734)
(0., 0.)	(131.244, -366.756)	(227.371, -873.361)	(393.348, -816.268)
(0., 0.)	(130.032, -366.743)	(228.65, -873.652)	(393.969, -815.403)
(0., 0.)	(128.715, -366.964)	(228.588, -874.117)	(393.382, -815.069)
(0., 0.)	(127.398, -367.391)	(227.109, -874.68)	(391.613, -815.353)
(0., 0.)	(126.139, -367.935)	(224.196, -875.263)	(388.784, -816.236)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(124.927, -368.534)	(219.925, -875.882)	(384.982, -817.638)
(0., 0.)	(123.687, -369.224)	(214.486, -876.697)	(380.301, -819.444)
(0., 0.)	(122.308, -370.082)	(208.135, -877.819)	(374.895, -821.622)
(0., 0.)	(120.698, -371.169)	(201.249, -879.144)	(369.118, -824.173)
(0., 0.)	(118.776, -372.505)	(194.397, -880.444)	(363.559, -826.751)
(0., 0.)	(116.441, -374.029)	(188.059, -881.499)	(358.582, -828.779)
(0., 0.)	(113.638, -375.618)	(182.269, -882.073)	(353.929, -830.177)
(0., 0.)	(110.415, -377.133)	(176.711, -882.082)	(349.237, -831.472)
(0., 0.)	(106.945, -378.46)	(171.024, -881.781)	(344.407, -833.205)
(0., 0.)	(103.469, -379.57)	(165.001, -881.448)	(339.307, -835.296)
(0., 0.)	(100.222, -380.5)	(158.617, -881.109)	(333.685, -837.293)
(0., 0.)	(97.341, -381.276)	(151.961, -880.707)	(327.568, -839.069)
(0., 0.)	(94.854, -381.93)	(145.179, -880.315)	(321.255, -841.032)
(0., 0.)	(92.692, -382.549)	(138.387, -880.103)	(314.971, -843.559)
(0., 0.)	(90.743, -383.219)	(131.63, -880.192)	(308.751, -846.519)
(0., 0.)	(88.919, -383.998)	(124.894, -880.572)	(302.56, -849.671)
(0., 0.)	(87.233, -384.924)	(118.195, -881.181)	(296.43, -852.902)
(0., 0.)	(85.764, -386.022)	(111.615, -882.006)	(290.403, -856.108)
(0., 0.)	(84.568, -387.304)	(105.188, -883.013)	(284.473, -859.209)
(0., 0.)	(83.626, -388.784)	(98.844, -884.083)	(278.567, -862.128)
(0., 0.)	(82.844, -390.403)	(92.482, -885.106)	(272.612, -864.813)
(0., 0.)	(82.025, -392.006)	(86.057, -886.031)	(266.484, -867.159)
(0., 0.)	(80.883, -393.428)	(79.571, -886.838)	(260.129, -869.142)
(0., 0.)	(79.14, -394.595)	(73.024, -887.487)	(253.744, -870.961)
(0., 0.)	(76.722, -395.535)	(66.425, -887.931)	(247.438, -872.632)
(0., 0.)	(73.807, -396.318)	(59.879, -888.239)	(241.227, -874.113)
(0., 0.)	(70.674, -397.009)	(53.545, -888.567)	(235.089, -875.395)
(0., 0.)	(67.554, -397.66)	(47.431, -888.887)	(229.051, -876.538)
(0., 0.)	(64.571, -398.279)	(41.465, -889.098)	(223.177, -877.601)
(0., 0.)	(61.787, -398.86)	(35.618, -889.187)	(217.479, -878.585)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(59.209, -399.385)	(29.919, -889.204)	(211.973, -879.486)
(0., 0.)	(56.827, -399.852)	(24.394, -889.197)	(206.632, -880.269)
(0., 0.)	(54.611, -400.23)	(19.042, -889.182)	(201.473, -880.903)
(0., 0.)	(52.496, -400.511)	(13.836, -889.175)	(196.468, -881.379)
(0., 0.)	(50.459, -400.783)	(8.737, -889.198)	(191.53, -881.836)
(0., 0.)	(48.515, -401.144)	(3.724, -889.246)	(186.613, -882.398)
(0., 0.)	(46.626, -401.618)	(-1.208, -889.296)	(181.73, -882.917)
(0., 0.)	(44.735, -402.15)	(-6.067, -889.334)	(176.949, -883.281)
(0., 0.)	(42.817, -402.651)	(-10.85, -889.353)	(172.289, -883.566)
(0., 0.)	(40.891, -403.061)	(-15.55, -889.342)	(167.692, -883.848)
(0., 0.)	(38.965, -403.379)	(-20.159, -889.324)	(163.167, -884.164)
(0., 0.)	(37.041, -403.639)	(-24.669, -889.329)	(158.751, -884.446)
(0., 0.)	(35.127, -403.86)	(-29.078, -889.351)	(154.401, -884.611)
(0., 0.)	(33.235, -404.063)	(-33.398, -889.351)	(150.128, -884.722)
(0., 0.)	(31.38, -404.291)	(-37.622, -889.289)	(146.008, -884.856)
(0., 0.)	(29.584, -404.532)	(-41.721, -889.17)	(142.01, -884.99)
(0., 0.)	(27.87, -404.731)	(-45.694, -889.029)	(138.063, -885.101)
(0., 0.)	(26.27, -404.858)	(-49.589, -888.868)	(134.182, -885.24)
(0., 0.)	(24.8, -404.942)	(-53.446, -888.679)	(130.375, -885.403)
(0., 0.)	(23.442, -405.037)	(-57.264, -888.455)	(126.604, -885.511)
(0., 0.)	(22.127, -405.161)	(-61.035, -888.192)	(122.873, -885.582)
(0., 0.)	(20.807, -405.3)	(-64.77, -887.897)	(119.186, -885.652)
(0., 0.)	(19.497, -405.436)	(-68.509, -887.557)	(115.471, -885.671)
(0., 0.)	(18.203, -405.534)	(-72.285, -887.148)	(111.73, -885.673)
(0., 0.)	(16.885, -405.582)	(-76.124, -886.677)	(107.982, -885.661)
(0., 0.)	(15.513, -405.625)	(-80.036, -886.167)	(104.154, -885.548)
(0., 0.)	(14.074, -405.706)	(-83.998, -885.612)	(100.172, -885.293)
(0., 0.)	(12.587, -405.803)	(-87.968, -885.024)	(96.089, -884.946)
(0., 0.)	(11.098, -405.886)	(-91.94, -884.44)	(92.078, -884.682)
(0., 0.)	(9.657, -405.957)	(-95.909, -883.892)	(88.158, -884.514)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(8.276, -406.016)	(-99.845, -883.377)	(84.314, -884.395)
(0., 0.)	(6.933, -406.035)	(-103.694, -882.901)	(80.543, -884.286)
(0., 0.)	(5.613, -406.009)	(-107.457, -882.46)	(76.775, -884.146)
(0., 0.)	(4.315, -405.975)	(-111.188, -882.035)	(72.982, -883.977)
(0., 0.)	(3.032, -405.946)	(-114.914, -881.611)	(69.224, -883.828)
(0., 0.)	(1.729, -405.897)	(-118.628, -881.182)	(65.528, -883.686)
(0., 0.)	(0.354, -405.823)	(-122.319, -880.755)	(61.865, -883.519)
(0., 0.)	(-1.116, -405.742)	(-125.984, -880.318)	(58.185, -883.316)
(0., 0.)	(-2.664, -405.664)	(-129.647, -879.864)	(54.47, -883.066)
(0., 0.)	(-4.256, -405.572)	(-133.338, -879.398)	(50.733, -882.782)
(0., 0.)	(-5.86, -405.434)	(-137.062, -878.937)	(46.997, -882.542)
(0., 0.)	(-7.487, -405.246)	(-140.807, -878.492)	(43.243, -882.376)
(0., 0.)	(-9.183, -405.055)	(-144.563, -878.053)	(39.425, -882.203)
(0., 0.)	(-10.967, -404.884)	(-148.342, -877.591)	(35.554, -881.998)
(0., 0.)	(-12.831, -404.677)	(-152.183, -877.104)	(31.644, -881.784)
(0., 0.)	(-14.788, -404.389)	(-156.114, -876.604)	(27.652, -881.553)
(0., 0.)	(-16.849, -404.058)	(-160.126, -876.128)	(23.585, -881.308)
(0., 0.)	(-18.992, -403.725)	(-164.198, -875.675)	(19.472, -881.059)
(0., 0.)	(-21.168, -403.377)	(-168.318, -875.21)	(15.334, -880.822)
(0., 0.)	(-23.364, -402.993)	(-172.47, -874.703)	(11.175, -880.614)
(0., 0.)	(-25.58, -402.577)	(-176.637, -874.152)	(6.976, -880.397)
(0., 0.)	(-27.83, -402.153)	(-180.812, -873.582)	(2.719, -880.116)
(0., 0.)	(-30.102, -401.703)	(-184.994, -872.983)	(-1.555, -879.845)
(0., 0.)	(-32.356, -401.216)	(-189.191, -872.352)	(-5.816, -879.675)
(0., 0.)	(-34.572, -400.696)	(-193.422, -871.713)	(-10.108, -879.543)
(0., 0.)	(-36.778, -400.163)	(-197.679, -871.1)	(-14.474, -879.373)
(0., 0.)	(-39.003, -399.64)	(-201.962, -870.478)	(-18.898, -879.179)
(0., 0.)	(-41.241, -399.137)	(-206.285, -869.799)	(-23.347, -878.975)
(0., 0.)	(-43.468, -398.667)	(-210.66, -869.031)	(-27.821, -878.766)
(0., 0.)	(-45.673, -398.22)	(-215.061, -868.169)	(-32.315, -878.583)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-47.837, -397.79)	(-219.462, -867.228)	(-36.837, -878.437)
(0., 0.)	(-49.936, -397.386)	(-223.87, -866.244)	(-41.417, -878.311)
(0., 0.)	(-51.947, -397.028)	(-228.291, -865.269)	(-46.078, -878.242)
(0., 0.)	(-53.874, -396.704)	(-232.728, -864.28)	(-50.785, -878.269)
(0., 0.)	(-55.737, -396.378)	(-237.163, -863.266)	(-55.489, -878.375)
(0., 0.)	(-57.541, -396.039)	(-241.575, -862.245)	(-60.18, -878.522)
(0., 0.)	(-59.254, -395.747)	(-245.995, -861.218)	(-64.905, -878.672)
(0., 0.)	(-60.867, -395.54)	(-250.457, -860.204)	(-69.689, -878.843)
(0., 0.)	(-62.424, -395.36)	(-254.947, -859.222)	(-74.517, -879.091)
(0., 0.)	(-63.996, -395.135)	(-259.461, -858.246)	(-79.373, -879.419)
(0., 0.)	(-65.606, -394.851)	(-264.022, -857.203)	(-84.287, -879.777)
(0., 0.)	(-67.242, -394.543)	(-268.643, -856.059)	(-89.308, -880.076)
(0., 0.)	(-68.878, -394.26)	(-273.313, -854.844)	(-94.464, -880.313)
(0., 0.)	(-70.518, -394.002)	(-278.057, -853.595)	(-99.757, -880.553)
(0., 0.)	(-72.188, -393.7)	(-282.901, -852.286)	(-105.144, -880.794)
(0., 0.)	(-73.901, -393.321)	(-287.856, -850.863)	(-110.621, -880.995)
(0., 0.)	(-75.642, -392.885)	(-292.923, -849.326)	(-116.257, -881.192)
(0., 0.)	(-77.402, -392.381)	(-298.112, -847.714)	(-122.115, -881.414)
(0., 0.)	(-79.205, -391.799)	(-303.427, -846.016)	(-128.158, -881.587)
(0., 0.)	(-81.041, -391.161)	(-308.87, -844.176)	(-134.369, -881.705)
(0., 0.)	(-82.853, -390.496)	(-314.435, -842.184)	(-140.8, -881.806)
(0., 0.)	(-84.605, -389.814)	(-320.099, -840.059)	(-147.453, -881.879)
(0., 0.)	(-86.288, -389.123)	(-325.863, -837.829)	(-154.242, -881.917)
(0., 0.)	(-87.893, -388.417)	(-331.736, -835.514)	(-161.132, -881.932)
(0., 0.)	(-89.374, -387.688)	(-337.696, -833.108)	(-168.161, -881.932)
(0., 0.)	(-90.686, -386.949)	(-343.711, -830.63)	(-175.309, -881.943)
(0., 0.)	(-91.806, -386.234)	(-349.716, -828.056)	(-182.488, -881.922)
(0., 0.)	(-92.703, -385.56)	(-355.642, -825.367)	(-189.707, -881.866)
(0., 0.)	(-93.347, -384.92)	(-361.478, -822.572)	(-196.976, -881.836)
(0., 0.)	(-93.749, -384.278)	(-367.203, -819.678)	(-204.222, -881.871)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-93.935, -383.641)	(-372.777, -816.685)	(-211.411, -881.943)
(0., 0.)	(-93.881, -383.076)	(-378.176, -813.59)	(-218.556, -882.005)
(0., 0.)	(-93.529, -382.614)	(-383.37, -810.4)	(-225.635, -882.078)
(0., 0.)	(-92.826, -382.223)	(-388.302, -807.095)	(-232.606, -882.16)
(0., 0.)	(-91.75, -381.888)	(-392.934, -803.674)	(-239.423, -882.245)
(0., 0.)	(-90.304, -381.652)	(-397.238, -800.143)	(-246.022, -882.372)
(0., 0.)	(-88.474, -381.552)	(-401.183, -796.455)	(-252.365, -882.498)
(0., 0.)	(-86.233, -381.56)	(-404.735, -792.532)	(-258.43, -882.503)
(0., 0.)	(-83.571, -381.65)	(-407.847, -788.303)	(-264.231, -882.29)
(0., 0.)	(-80.459, -381.847)	(-410.485, -783.73)	(-269.771, -881.867)
(0., 0.)	(-76.872, -382.169)	(-412.674, -778.791)	(-275.073, -881.233)
(0., 0.)	(-72.794, -382.621)	(-414.415, -773.469)	(-280.163, -880.336)
(0., 0.)	(-68.217, -383.227)	(-415.69, -767.771)	(-285.031, -879.137)
(0., 0.)	(-63.181, -384.003)	(-416.489, -761.741)	(-289.646, -877.685)
(0., 0.)	(-57.775, -384.887)	(-416.762, -755.415)	(-293.99, -876.022)
(0., 0.)	(-52.087, -385.76)	(-416.485, -748.836)	(-298.108, -874.118)
(0., 0.)	(-46.173, -386.571)	(-415.653, -742.05)	(-302., -871.952)
(0., 0.)	(-40.059, -387.348)	(-414.2, -735.055)	(-305.556, -869.604)
(0., 0.)	(-33.771, -388.113)	(-412.038, -727.864)	(-308.639, -867.089)
(0., 0.)	(-27.335, -388.838)	(-409.097, -720.539)	(-311.166, -864.372)
(0., 0.)	(-20.741, -389.478)	(-405.393, -713.178)	(-313.223, -861.48)
(0., 0.)	(-13.944, -389.982)	(-401.012, -705.921)	(-314.918, -858.565)
(0., 0.)	(-6.912, -390.31)	(-396.064, -698.885)	(-316.297, -855.659)
(0., 0.)	(0.322, -390.464)	(-390.653, -692.119)	(-317.281, -852.705)
(0., 0.)	(7.686, -390.473)	(-384.879, -685.685)	(-317.759, -849.829)
(0., 0.)	(15.14, -390.352)	(-378.835, -679.669)	(-317.737, -847.23)
(0., 0.)	(22.647, -390.072)	(-372.633, -674.124)	(-317.329, -844.947)
(0., 0.)	(30.158, -389.57)	(-366.497, -669.123)	(-316.461, -842.775)
(0., 0.)	(37.641, -388.832)	(-360.807, -664.9)	(-314.409, -840.354)
(0., 0.)	(45.092, -387.929)	(-355.81, -661.702)	(-310.005, -837.507)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(52.43, -386.902)	(-351.182, -659.586)	(-302.553, -834.556)
(0., 0.)	(59.489, -385.716)	(-346.202, -658.441)	(-292.161, -831.863)
(0., 0.)	(66.203, -384.381)	(-340.331, -658.1)	(-279.49, -829.4)
(0., 0.)	(72.628, -382.964)	(-333.511, -658.445)	(-265.383, -827.046)
(0., 0.)	(78.859, -381.549)	(-326.038, -659.506)	(-250.713, -824.943)
(0., 0.)	(84.919, -380.186)	(-318.3, -661.4)	(-236.202, -823.338)
(0., 0.)	(90.77, -378.854)	(-310.565, -664.211)	(-222.117, -822.457)
(0., 0.)	(96.37, -377.505)	(-302.896, -667.976)	(-208.394, -822.373)
(0., 0.)	(101.677, -376.131)	(-295.143, -672.724)	(-194.78, -822.963)
(0., 0.)	(106.635, -374.779)	(-287.035, -678.407)	(-180.888, -824.032)
(0., 0.)	(111.195, -373.485)	(-278.308, -684.883)	(-166.349, -825.458)
(0., 0.)	(115.379, -372.293)	(-268.78, -691.997)	(-150.973, -827.182)
(0., 0.)	(119.253, -371.21)	(-258.425, -699.677)	(-134.799, -829.13)
(0., 0.)	(122.841, -370.176)	(-247.343, -707.93)	(-118.006, -831.297)
(0., 0.)	(126.151, -369.171)	(-235.631, -716.766)	(-100.809, -833.828)
(0., 0.)	(129.229, -368.242)	(-223.315, -726.116)	(-83.408, -836.863)
(0., 0.)	(132.115, -367.369)	(-210.405, -735.842)	(-65.892, -840.364)
(0., 0.)	(134.833, -366.508)	(-196.904, -745.751)	(-48.236, -844.202)
(0., 0.)	(137.407, -365.714)	(-182.824, -755.694)	(-30.342, -848.15)
(0., 0.)	(139.817, -365.1)	(-168.179, -765.617)	(-12.093, -851.953)
(0., 0.)	(141.984, -364.719)	(-153.018, -775.518)	(6.551, -855.45)
(0., 0.)	(143.808, -364.523)	(-137.424, -785.361)	(25.504, -858.602)
(0., 0.)	(145.24, -364.445)	(-121.443, -794.994)	(44.594, -861.338)
(0., 0.)	(146.31, -364.485)	(-105.085, -804.223)	(63.727, -863.587)
(0., 0.)	(147.071, -364.656)	(-88.364, -812.921)	(82.856, -865.38)
(0., 0.)	(147.575, -364.915)	(-71.353, -821.084)	(101.922, -866.83)
(0., 0.)	(147.852, -365.229)	(-54.184, -828.694)	(120.865, -868.024)
(0., 0.)	(147.916, -365.619)	(-36.966, -835.687)	(139.563, -869.02)
(0., 0.)	(147.781, -366.108)	(-19.756, -842.012)	(157.898, -869.794)
(0., 0.)	(147.464, -366.7)	(-2.623, -847.664)	(175.906, -870.317)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(146.982, -367.398)	(14.334, -852.678)	(193.614, -870.527)
(0., 0.)	(146.359, -368.173)	(31.023, -857.133)	(210.879, -870.237)
(0., 0.)	(145.617, -368.992)	(47.407, -861.095)	(227.581, -869.342)
(0., 0.)	(144.774, -369.865)	(63.446, -864.591)	(243.731, -867.769)
(0., 0.)	(143.849, -370.766)	(79.03, -867.623)	(259.287, -865.375)
(0., 0.)	(142.88, -371.635)	(94.047, -870.114)	(274.104, -862.242)
(0., 0.)	(141.941, -372.34)	(108.443, -872.019)	(288.03, -858.52)
(0., 0.)	(141.121, -372.756)	(122.191, -873.421)	(300.976, -854.375)
(0., 0.)	(140.455, -372.903)	(135.229, -874.395)	(312.936, -849.998)
(0., 0.)	(139.91, -372.916)	(147.42, -874.903)	(323.978, -845.711)
(0., 0.)	(139.423, -372.867)	(158.674, -874.971)	(334.157, -841.796)
(0., 0.)	(138.99, -372.688)	(168.998, -874.783)	(343.404, -838.318)
(0., 0.)	(138.665, -372.295)	(178.375, -874.464)	(351.588, -835.066)
(0., 0.)	(138.444, -371.688)	(186.755, -874.063)	(358.629, -831.731)
(0., 0.)	(138.207, -370.941)	(194.102, -873.658)	(364.562, -828.311)
(0., 0.)	(137.851, -370.142)	(200.382, -873.296)	(369.428, -824.975)
(0., 0.)	(137.383, -369.396)	(205.554, -872.927)	(373.3, -821.941)
(0., 0.)	(136.827, -368.81)	(209.615, -872.598)	(376.276, -819.466)
(0., 0.)	(136.142, -368.428)	(212.55, -872.388)	(378.435, -817.698)
(0., 0.)	(135.262, -368.245)	(214.291, -872.31)	(379.745, -816.673)
(0., 0.)	(134.154, -368.263)	(214.808, -872.395)	(380.134, -816.314)
(0., 0.)	(132.85, -368.479)	(214.116, -872.705)	(379.57, -816.489)
(0., 0.)	(131.42, -368.874)	(212.23, -873.262)	(377.999, -817.105)
(0., 0.)	(129.905, -369.407)	(209.133, -873.992)	(375.413, -818.138)
(0., 0.)	(128.318, -370.061)	(204.876, -874.874)	(371.88, -819.589)
(0., 0.)	(126.627, -370.823)	(199.639, -875.987)	(367.529, -821.473)
(0., 0.)	(124.746, -371.687)	(193.628, -877.356)	(362.421, -823.801)
(0., 0.)	(122.585, -372.706)	(187.027, -878.834)	(356.694, -826.509)
(0., 0.)	(120.105, -373.937)	(180.212, -880.196)	(350.832, -829.313)
(0., 0.)	(117.292, -375.37)	(173.764, -881.299)	(345.423, -831.708)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(114.148, -376.932)	(168.059, -882.09)	(340.601, -833.35)
(0., 0.)	(110.7, -378.498)	(162.987, -882.472)	(336.09, -834.424)
(0., 0.)	(107.05, -379.944)	(158.128, -882.427)	(331.621, -835.556)
(0., 0.)	(103.381, -381.154)	(153.177, -882.208)	(327.089, -837.118)
(0., 0.)	(99.898, -382.083)	(148.039, -882.053)	(322.424, -838.933)
(0., 0.)	(96.748, -382.768)	(142.741, -881.947)	(317.579, -840.657)
(0., 0.)	(93.987, -383.253)	(137.421, -881.781)	(312.633, -842.31)
(0., 0.)	(91.611, -383.629)	(132.177, -881.544)	(307.779, -844.17)
(0., 0.)	(89.584, -384.041)	(126.98, -881.358)	(303.126, -846.345)
(0., 0.)	(87.819, -384.586)	(121.784, -881.413)	(298.55, -848.69)
(0., 0.)	(86.229, -385.287)	(116.622, -881.805)	(293.816, -850.921)
(0., 0.)	(84.794, -386.14)	(111.542, -882.476)	(288.912, -853.008)
(0., 0.)	(83.546, -387.141)	(106.546, -883.265)	(284.139, -855.286)
(0., 0.)	(82.507, -388.289)	(101.611, -884.072)	(279.553, -857.771)
(0., 0.)	(81.648, -389.544)	(96.677, -884.859)	(274.954, -860.134)
(0., 0.)	(80.882, -390.836)	(91.672, -885.568)	(270.235, -862.197)
(0., 0.)	(80.059, -392.092)	(86.574, -886.223)	(265.407, -864.096)
(0., 0.)	(78.969, -393.236)	(81.441, -886.945)	(260.458, -865.921)
(0., 0.)	(77.453, -394.235)	(76.256, -887.685)	(255.389, -867.643)
(0., 0.)	(75.468, -395.079)	(70.963, -888.317)	(250.209, -869.18)
(0., 0.)	(73.064, -395.787)	(65.566, -888.814)	(244.972, -870.593)
(0., 0.)	(70.372, -396.371)	(60.112, -889.229)	(239.713, -871.998)
(0., 0.)	(67.568, -396.832)	(54.654, -889.622)	(234.431, -873.418)
(0., 0.)	(64.858, -397.254)	(49.211, -890.003)	(229.151, -874.784)
(0., 0.)	(62.42, -397.761)	(43.783, -890.342)	(223.877, -876.043)
(0., 0.)	(60.245, -398.348)	(38.365, -890.612)	(218.649, -877.254)
(0., 0.)	(58.206, -398.963)	(32.942, -890.819)	(213.428, -878.463)
(0., 0.)	(56.202, -399.567)	(27.494, -890.97)	(208.171, -879.661)
(0., 0.)	(54.19, -400.119)	(22.015, -891.072)	(202.849, -880.763)
(0., 0.)	(52.153, -400.627)	(16.497, -891.142)	(197.493, -881.737)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(50.106, -401.127)	(10.926, -891.201)	(192.105, -882.594)
(0., 0.)	(48.09, -401.621)	(5.304, -891.265)	(186.659, -883.325)
(0., 0.)	(46.102, -402.097)	(-0.341, -891.334)	(181.195, -883.989)
(0., 0.)	(44.101, -402.57)	(-5.958, -891.375)	(175.727, -884.535)
(0., 0.)	(42.047, -403.061)	(-11.505, -891.362)	(170.325, -884.933)
(0., 0.)	(39.909, -403.571)	(-16.95, -891.337)	(165.048, -885.316)
(0., 0.)	(37.701, -404.071)	(-22.263, -891.356)	(159.841, -885.75)
(0., 0.)	(35.504, -404.526)	(-27.435, -891.404)	(154.707, -886.181)
(0., 0.)	(33.395, -404.934)	(-32.475, -891.41)	(149.773, -886.574)
(0., 0.)	(31.401, -405.287)	(-37.399, -891.329)	(145.038, -886.904)
(0., 0.)	(29.511, -405.589)	(-42.216, -891.169)	(140.365, -887.166)
(0., 0.)	(27.648, -405.857)	(-46.937, -890.978)	(135.7, -887.376)
(0., 0.)	(25.728, -406.076)	(-51.582, -890.785)	(131.01, -887.416)
(0., 0.)	(23.729, -406.233)	(-56.153, -890.569)	(126.316, -887.222)
(0., 0.)	(21.685, -406.349)	(-60.627, -890.302)	(121.803, -887.093)
(0., 0.)	(19.638, -406.445)	(-65.012, -889.997)	(117.47, -887.153)
(0., 0.)	(17.639, -406.525)	(-69.332, -889.681)	(113.211, -887.287)
(0., 0.)	(15.771, -406.594)	(-73.581, -889.359)	(109.037, -887.421)
(0., 0.)	(14.094, -406.641)	(-77.726, -889.025)	(104.97, -887.528)
(0., 0.)	(12.621, -406.677)	(-81.77, -888.668)	(100.969, -887.598)
(0., 0.)	(11.304, -406.75)	(-85.766, -888.295)	(97.019, -887.669)
(0., 0.)	(10.053, -406.882)	(-89.753, -887.931)	(93.106, -887.737)
(0., 0.)	(8.768, -407.019)	(-93.742, -887.541)	(89.143, -887.73)
(0., 0.)	(7.364, -407.083)	(-97.744, -887.067)	(85.126, -887.66)
(0., 0.)	(5.814, -407.055)	(-101.779, -886.528)	(81.131, -887.599)
(0., 0.)	(4.144, -406.987)	(-105.852, -885.979)	(77.138, -887.482)
(0., 0.)	(2.386, -406.933)	(-109.944, -885.439)	(73.057, -887.219)
(0., 0.)	(0.57, -406.907)	(-114.014, -884.9)	(68.922, -886.926)
(0., 0.)	(-1.254, -406.883)	(-118.036, -884.339)	(64.833, -886.737)
(0., 0.)	(-3.038, -406.835)	(-122.004, -883.756)	(60.817, -886.595)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-4.784, -406.747)	(-125.947, -883.183)	(56.827, -886.38)
(0., 0.)	(-6.517, -406.63)	(-129.898, -882.637)	(52.846, -886.12)
(0., 0.)	(-8.249, -406.516)	(-133.866, -882.139)	(48.871, -885.9)
(0., 0.)	(-9.998, -406.406)	(-137.843, -881.669)	(44.865, -885.693)
(0., 0.)	(-11.772, -406.281)	(-141.813, -881.204)	(40.822, -885.456)
(0., 0.)	(-13.563, -406.129)	(-145.779, -880.729)	(36.796, -885.233)
(0., 0.)	(-15.377, -405.963)	(-149.778, -880.227)	(32.774, -885.038)
(0., 0.)	(-17.199, -405.79)	(-153.827, -879.709)	(28.684, -884.797)
(0., 0.)	(-19., -405.594)	(-157.895, -879.192)	(24.533, -884.512)
(0., 0.)	(-20.776, -405.364)	(-161.943, -878.674)	(20.401, -884.257)
(0., 0.)	(-22.572, -405.094)	(-165.975, -878.128)	(16.316, -884.053)
(0., 0.)	(-24.449, -404.778)	(-170.013, -877.56)	(12.244, -883.871)
(0., 0.)	(-26.418, -404.401)	(-174.062, -876.991)	(8.146, -883.663)
(0., 0.)	(-28.443, -403.955)	(-178.118, -876.422)	(4.028, -883.415)
(0., 0.)	(-30.495, -403.445)	(-182.183, -875.839)	(-0.08, -883.164)
(0., 0.)	(-32.565, -402.891)	(-186.258, -875.222)	(-4.189, -882.918)
(0., 0.)	(-34.62, -402.323)	(-190.333, -874.538)	(-8.343, -882.631)
(0., 0.)	(-36.64, -401.749)	(-194.398, -873.787)	(-12.538, -882.336)
(0., 0.)	(-38.625, -401.184)	(-198.458, -873.021)	(-16.738, -882.11)
(0., 0.)	(-40.581, -400.635)	(-202.541, -872.269)	(-20.952, -881.935)
(0., 0.)	(-42.525, -400.09)	(-206.65, -871.508)	(-25.185, -881.773)
(0., 0.)	(-44.454, -399.555)	(-210.761, -870.701)	(-29.443, -881.628)
(0., 0.)	(-46.346, -399.054)	(-214.867, -869.869)	(-33.739, -881.503)
(0., 0.)	(-48.179, -398.618)	(-218.975, -869.03)	(-38.061, -881.398)
(0., 0.)	(-49.967, -398.259)	(-223.105, -868.175)	(-42.381, -881.335)
(0., 0.)	(-51.749, -397.957)	(-227.28, -867.276)	(-46.703, -881.303)
(0., 0.)	(-53.563, -397.686)	(-231.48, -866.339)	(-51.061, -881.288)
(0., 0.)	(-55.442, -397.424)	(-235.706, -865.367)	(-55.498, -881.286)
(0., 0.)	(-57.383, -397.142)	(-239.987, -864.353)	(-60.063, -881.276)
(0., 0.)	(-59.33, -396.827)	(-244.331, -863.296)	(-64.766, -881.264)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-61.21, -396.481)	(-248.743, -862.205)	(-69.54, -881.29)
(0., 0.)	(-62.996, -396.123)	(-253.227, -861.114)	(-74.349, -881.379)
(0., 0.)	(-64.697, -395.803)	(-257.777, -860.019)	(-79.209, -881.514)
(0., 0.)	(-66.331, -395.52)	(-262.413, -858.878)	(-84.156, -881.633)
(0., 0.)	(-67.936, -395.214)	(-267.136, -857.671)	(-89.239, -881.662)
(0., 0.)	(-69.556, -394.861)	(-271.939, -856.415)	(-94.485, -881.614)
(0., 0.)	(-71.187, -394.485)	(-276.844, -855.092)	(-99.87, -881.566)
(0., 0.)	(-72.821, -394.105)	(-281.851, -853.69)	(-105.34, -881.544)
(0., 0.)	(-74.447, -393.723)	(-286.912, -852.233)	(-110.865, -881.543)
(0., 0.)	(-76.057, -393.335)	(-292.023, -850.714)	(-116.475, -881.559)
(0., 0.)	(-77.648, -392.931)	(-297.207, -849.102)	(-122.221, -881.578)
(0., 0.)	(-79.236, -392.514)	(-302.464, -847.407)	(-128.124, -881.588)
(0., 0.)	(-80.827, -392.1)	(-307.758, -845.669)	(-134.129, -881.575)
(0., 0.)	(-82.424, -391.666)	(-313.111, -843.889)	(-140.196, -881.527)
(0., 0.)	(-84.032, -391.169)	(-318.591, -842.004)	(-146.392, -881.441)
(0., 0.)	(-85.668, -390.57)	(-324.204, -839.941)	(-152.77, -881.313)
(0., 0.)	(-87.333, -389.859)	(-329.922, -837.712)	(-159.341, -881.151)
(0., 0.)	(-89.018, -389.052)	(-335.727, -835.373)	(-166.098, -881.003)
(0., 0.)	(-90.689, -388.216)	(-341.612, -832.952)	(-173.003, -880.887)
(0., 0.)	(-92.274, -387.431)	(-347.577, -830.46)	(-180.026, -880.772)
(0., 0.)	(-93.699, -386.682)	(-353.584, -827.86)	(-187.156, -880.645)
(0., 0.)	(-94.927, -385.921)	(-359.571, -825.107)	(-194.37, -880.514)
(0., 0.)	(-95.922, -385.171)	(-365.476, -822.23)	(-201.594, -880.368)
(0., 0.)	(-96.652, -384.503)	(-371.274, -819.287)	(-208.753, -880.25)
(0., 0.)	(-97.083, -383.94)	(-376.934, -816.32)	(-215.842, -880.209)
(0., 0.)	(-97.212, -383.466)	(-382.389, -813.296)	(-222.875, -880.248)
(0., 0.)	(-97.03, -383.088)	(-387.591, -810.189)	(-229.822, -880.37)
(0., 0.)	(-96.503, -382.825)	(-392.532, -807.033)	(-236.634, -880.546)
(0., 0.)	(-95.624, -382.681)	(-397.18, -803.834)	(-243.262, -880.721)
(0., 0.)	(-94.418, -382.647)	(-401.494, -800.561)	(-249.648, -880.878)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-92.907, -382.689)	(-405.468, -797.167)	(-255.793, -880.976)
(0., 0.)	(-91.1, -382.745)	(-409.093, -793.58)	(-261.717, -880.982)
(0., 0.)	(-88.978, -382.802)	(-412.338, -789.749)	(-267.39, -880.858)
(0., 0.)	(-86.489, -382.903)	(-415.155, -785.611)	(-272.772, -880.497)
(0., 0.)	(-83.57, -383.085)	(-417.513, -781.117)	(-277.861, -879.888)
(0., 0.)	(-80.162, -383.362)	(-419.386, -776.282)	(-282.658, -879.044)
(0., 0.)	(-76.239, -383.755)	(-420.769, -771.153)	(-287.193, -877.873)
(0., 0.)	(-71.805, -384.309)	(-421.688, -765.743)	(-291.521, -876.419)
(0., 0.)	(-66.866, -385.034)	(-422.153, -760.04)	(-295.692, -874.799)
(0., 0.)	(-61.43, -385.888)	(-422.149, -754.069)	(-299.71, -873.036)
(0., 0.)	(-55.576, -386.752)	(-421.614, -747.853)	(-303.514, -871.089)
(0., 0.)	(-49.442, -387.556)	(-420.471, -741.424)	(-306.977, -868.931)
(0., 0.)	(-43.143, -388.299)	(-418.668, -734.802)	(-310.01, -866.555)
(0., 0.)	(-36.698, -388.993)	(-416.189, -728.009)	(-312.604, -864.004)
(0., 0.)	(-30.082, -389.659)	(-413.029, -721.109)	(-314.74, -861.328)
(0., 0.)	(-23.266, -390.265)	(-409.184, -714.153)	(-316.429, -858.547)
(0., 0.)	(-16.232, -390.741)	(-404.689, -707.193)	(-317.739, -855.656)
(0., 0.)	(-9.002, -391.028)	(-399.591, -700.322)	(-318.665, -852.663)
(0., 0.)	(-1.661, -391.126)	(-393.959, -693.633)	(-319.129, -849.59)
(0., 0.)	(5.687, -391.085)	(-387.873, -687.214)	(-319.075, -846.53)
(0., 0.)	(12.992, -390.918)	(-381.431, -681.142)	(-318.505, -843.639)
(0., 0.)	(20.286, -390.592)	(-374.71, -675.502)	(-317.492, -841.035)
(0., 0.)	(27.582, -390.064)	(-367.829, -670.426)	(-316.071, -838.658)
(0., 0.)	(34.823, -389.34)	(-361.048, -666.106)	(-313.902, -836.349)
(0., 0.)	(41.895, -388.487)	(-354.733, -662.697)	(-310.252, -833.942)
(0., 0.)	(48.69, -387.546)	(-349.125, -660.326)	(-304.395, -831.505)
(0., 0.)	(55.169, -386.465)	(-344.164, -659.152)	(-296.01, -829.303)
(0., 0.)	(61.403, -385.27)	(-339.516, -659.237)	(-285.293, -827.473)
(0., 0.)	(67.483, -384.049)	(-334.71, -660.425)	(-272.784, -825.972)
(0., 0.)	(73.435, -382.87)	(-329.351, -662.475)	(-259.137, -824.773)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(79.201, -381.732)	(-323.273, -665.252)	(-244.998, -823.96)
(0., 0.)	(84.725, -380.608)	(-316.484, -668.764)	(-230.842, -823.828)
(0., 0.)	(89.985, -379.465)	(-309.065, -673.04)	(-216.884, -824.607)
(0., 0.)	(94.979, -378.296)	(-301.136, -678.06)	(-203.108, -826.168)
(0., 0.)	(99.704, -377.178)	(-292.824, -683.73)	(-189.39, -828.263)
(0., 0.)	(104.171, -376.216)	(-284.165, -689.986)	(-175.539, -830.812)
(0., 0.)	(108.392, -375.449)	(-275.086, -696.824)	(-161.364, -833.86)
(0., 0.)	(112.365, -374.857)	(-265.513, -704.265)	(-146.701, -837.267)
(0., 0.)	(116.057, -374.362)	(-255.484, -712.299)	(-131.463, -840.76)
(0., 0.)	(119.418, -373.88)	(-245.087, -720.841)	(-115.732, -844.125)
(0., 0.)	(122.427, -373.409)	(-234.326, -729.754)	(-99.686, -847.325)
(0., 0.)	(125.069, -372.949)	(-223.132, -738.934)	(-83.428, -850.43)
(0., 0.)	(127.319, -372.43)	(-211.435, -748.304)	(-66.993, -853.477)
(0., 0.)	(129.195, -371.835)	(-199.206, -757.761)	(-50.407, -856.491)
(0., 0.)	(130.78, -371.238)	(-186.451, -767.203)	(-33.676, -859.523)
(0., 0.)	(132.117, -370.708)	(-173.195, -776.612)	(-16.735, -862.439)
(0., 0.)	(133.193, -370.309)	(-159.441, -785.95)	(0.497, -865.17)
(0., 0.)	(134.003, -370.106)	(-145.161, -795.135)	(18.026, -867.708)
(0., 0.)	(134.541, -370.12)	(-130.347, -804.14)	(35.813, -870.074)
(0., 0.)	(134.79, -370.365)	(-115.042, -813.013)	(53.811, -872.308)
(0., 0.)	(134.763, -370.819)	(-99.298, -821.729)	(71.997, -874.384)
(0., 0.)	(134.52, -371.4)	(-83.11, -830.162)	(90.405, -876.137)
(0., 0.)	(134.103, -372.019)	(-66.519, -838.17)	(108.969, -877.428)
(0., 0.)	(133.502, -372.641)	(-49.607, -845.64)	(127.56, -878.25)
(0., 0.)	(132.689, -373.284)	(-32.472, -852.554)	(146.038, -878.67)
(0., 0.)	(131.68, -374.042)	(-15.212, -858.918)	(164.324, -878.694)
(0., 0.)	(130.51, -374.987)	(2.034, -864.674)	(182.399, -878.383)
(0., 0.)	(129.186, -376.093)	(19.13, -869.712)	(200.164, -877.769)
(0., 0.)	(127.737, -377.306)	(35.956, -873.947)	(217.35, -876.611)
(0., 0.)	(126.288, -378.505)	(52.397, -877.355)	(233.859, -874.845)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(125.048, -379.412)	(68.353, -879.947)	(249.649, -872.615)
(0., 0.)	(124.168, -379.804)	(83.719, -881.808)	(264.65, -869.963)
(0., 0.)	(123.701, -379.729)	(98.416, -883.08)	(278.804, -866.815)
(0., 0.)	(123.62, -379.433)	(112.405, -883.851)	(292.087, -863.259)
(0., 0.)	(123.812, -379.075)	(125.633, -884.203)	(304.523, -859.511)
(0., 0.)	(124.134, -378.611)	(138.085, -884.231)	(316.044, -855.594)
(0., 0.)	(124.527, -377.943)	(149.852, -884.071)	(326.6, -851.459)
(0., 0.)	(125.006, -377.068)	(160.966, -883.836)	(336.293, -847.257)
(0., 0.)	(125.58, -376.036)	(171.258, -883.411)	(345.253, -843.233)
(0., 0.)	(126.213, -374.878)	(180.614, -882.741)	(353.485, -839.535)
(0., 0.)	(126.84, -373.646)	(189.022, -881.905)	(360.806, -836.115)
(0., 0.)	(127.419, -372.422)	(196.469, -880.981)	(367.011, -832.715)
(0., 0.)	(127.926, -371.273)	(202.906, -880.034)	(372.203, -829.329)
(0., 0.)	(128.359, -370.288)	(208.287, -879.156)	(376.475, -826.167)
(0., 0.)	(128.731, -369.554)	(212.561, -878.396)	(379.79, -823.461)
(0., 0.)	(129.057, -369.063)	(215.683, -877.804)	(382.129, -821.368)
(0., 0.)	(129.372, -368.744)	(217.689, -877.48)	(383.476, -819.982)
(0., 0.)	(129.711, -368.536)	(218.64, -877.495)	(383.894, -819.331)
(0., 0.)	(130.049, -368.404)	(218.556, -877.843)	(383.497, -819.337)
(0., 0.)	(130.281, -368.364)	(217.434, -878.409)	(382.305, -819.825)
(0., 0.)	(130.255, -368.474)	(215.331, -879.021)	(380.341, -820.644)
(0., 0.)	(129.853, -368.785)	(212.335, -879.517)	(377.705, -821.633)
(0., 0.)	(129.021, -369.312)	(208.525, -879.882)	(374.51, -822.704)
(0., 0.)	(127.721, -370.025)	(204.001, -880.285)	(370.808, -823.922)
(0., 0.)	(125.931, -370.895)	(198.888, -880.887)	(366.6, -825.382)
(0., 0.)	(123.668, -371.917)	(193.327, -881.682)	(361.957, -827.063)
(0., 0.)	(120.982, -373.098)	(187.518, -882.544)	(357.041, -828.813)
(0., 0.)	(117.941, -374.411)	(181.667, -883.274)	(352.129, -830.446)
(0., 0.)	(114.615, -375.821)	(175.863, -883.743)	(347.291, -831.97)
(0., 0.)	(111.093, -377.281)	(170.106, -883.942)	(342.372, -833.635)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(107.482, -378.714)	(164.331, -883.907)	(337.289, -835.622)
(0., 0.)	(103.904, -380.025)	(158.441, -883.701)	(332.087, -837.917)
(0., 0.)	(100.497, -381.137)	(152.403, -883.44)	(326.757, -840.385)
(0., 0.)	(97.347, -382.052)	(146.228, -883.216)	(321.286, -842.957)
(0., 0.)	(94.48, -382.821)	(139.987, -883.098)	(315.741, -845.663)
(0., 0.)	(91.918, -383.521)	(133.731, -883.111)	(310.139, -848.578)
(0., 0.)	(89.699, -384.269)	(127.452, -883.257)	(304.435, -851.609)
(0., 0.)	(87.835, -385.152)	(121.154, -883.571)	(298.628, -854.562)
(0., 0.)	(86.291, -386.176)	(114.849, -884.071)	(292.784, -857.378)
(0., 0.)	(85.03, -387.331)	(108.556, -884.722)	(286.989, -860.166)
(0., 0.)	(84.023, -388.63)	(102.302, -885.499)	(281.272, -863.099)
(0., 0.)	(83.213, -390.041)	(96.084, -886.389)	(275.554, -866.139)
(0., 0.)	(82.467, -391.449)	(89.827, -887.304)	(269.629, -868.949)
(0., 0.)	(81.609, -392.771)	(83.458, -888.132)	(263.409, -871.313)
(0., 0.)	(80.463, -394.005)	(76.946, -888.796)	(257.079, -873.473)
(0., 0.)	(78.879, -395.157)	(70.308, -889.313)	(250.704, -875.508)
(0., 0.)	(76.798, -396.242)	(63.574, -889.729)	(244.221, -877.248)
(0., 0.)	(74.259, -397.243)	(56.74, -890.025)	(237.644, -878.71)
(0., 0.)	(71.371, -398.116)	(49.92, -890.297)	(230.991, -880.035)
(0., 0.)	(68.288, -398.832)	(43.171, -890.555)	(224.338, -881.308)
(0., 0.)	(65.197, -399.406)	(36.476, -890.735)	(217.755, -882.492)
(0., 0.)	(62.238, -399.883)	(29.818, -890.817)	(211.235, -883.493)
(0., 0.)	(59.477, -400.318)	(23.198, -890.814)	(204.804, -884.301)
(0., 0.)	(56.908, -400.752)	(16.636, -890.764)	(198.463, -884.945)
(0., 0.)	(54.488, -401.22)	(10.184, -890.719)	(192.231, -885.496)
(0., 0.)	(52.147, -401.724)	(3.861, -890.692)	(186.12, -886.051)
(0., 0.)	(49.822, -402.244)	(-2.343, -890.663)	(180.102, -886.589)
(0., 0.)	(47.494, -402.774)	(-8.423, -890.607)	(174.161, -887.018)
(0., 0.)	(45.171, -403.299)	(-14.352, -890.518)	(168.343, -887.343)
(0., 0.)	(42.838, -403.742)	(-20.117, -890.386)	(162.713, -887.588)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(40.469, -404.053)	(-25.712, -890.205)	(157.232, -887.73)
(0., 0.)	(38.11, -404.281)	(-31.154, -889.988)	(151.822, -887.784)
(0., 0.)	(35.881, -404.537)	(-36.46, -889.749)	(146.54, -887.838)
(0., 0.)	(33.822, -404.852)	(-41.616, -889.482)	(141.474, -887.938)
(0., 0.)	(31.876, -405.175)	(-46.608, -889.172)	(136.588, -888.067)
(0., 0.)	(29.982, -405.471)	(-51.451, -888.843)	(131.791, -888.178)
(0., 0.)	(28.134, -405.73)	(-56.191, -888.521)	(127.078, -888.29)
(0., 0.)	(26.362, -405.941)	(-60.858, -888.201)	(122.469, -888.421)
(0., 0.)	(24.66, -406.096)	(-65.464, -887.847)	(117.93, -888.467)
(0., 0.)	(23.027, -406.2)	(-69.982, -887.446)	(113.456, -888.396)
(0., 0.)	(21.446, -406.286)	(-74.377, -887.007)	(109.095, -888.312)
(0., 0.)	(19.889, -406.387)	(-78.659, -886.567)	(104.864, -888.257)
(0., 0.)	(18.361, -406.452)	(-82.847, -886.164)	(100.715, -888.206)
(0., 0.)	(16.915, -406.438)	(-86.921, -885.8)	(96.668, -888.233)
(0., 0.)	(15.581, -406.398)	(-90.849, -885.427)	(92.76, -888.29)
(0., 0.)	(14.339, -406.409)	(-94.638, -885.015)	(88.913, -888.147)
(0., 0.)	(13.164, -406.458)	(-98.304, -884.584)	(85.073, -887.781)
(0., 0.)	(12.047, -406.489)	(-101.871, -884.162)	(81.387, -887.485)
(0., 0.)	(10.969, -406.486)	(-105.344, -883.757)	(77.926, -887.382)
(0., 0.)	(9.9, -406.47)	(-108.74, -883.344)	(74.593, -887.378)
(0., 0.)	(8.84, -406.465)	(-112.079, -882.885)	(71.271, -887.333)
(0., 0.)	(7.785, -406.456)	(-115.38, -882.363)	(67.952, -887.15)
(0., 0.)	(6.715, -406.419)	(-118.684, -881.822)	(64.632, -886.86)
(0., 0.)	(5.645, -406.355)	(-122.011, -881.318)	(61.277, -886.566)
(0., 0.)	(4.592, -406.275)	(-125.355, -880.861)	(57.892, -886.322)
(0., 0.)	(3.522, -406.186)	(-128.703, -880.413)	(54.523, -886.153)
(0., 0.)	(2.367, -406.098)	(-132.04, -879.967)	(51.138, -886.02)
(0., 0.)	(1.057, -405.999)	(-135.39, -879.553)	(47.692, -885.855)
(0., 0.)	(-0.434, -405.88)	(-138.799, -879.185)	(44.236, -885.667)
(0., 0.)	(-2.085, -405.744)	(-142.269, -878.85)	(40.752, -885.465)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-3.859, -405.596)	(-145.786, -878.512)	(37.182, -885.3)
(0., 0.)	(-5.725, -405.414)	(-149.342, -878.151)	(33.559, -885.21)
(0., 0.)	(-7.672, -405.193)	(-152.937, -877.755)	(29.904, -885.129)
(0., 0.)	(-9.68, -404.955)	(-156.574, -877.321)	(26.208, -884.983)
(0., 0.)	(-11.698, -404.694)	(-160.246, -876.871)	(22.476, -884.745)
(0., 0.)	(-13.698, -404.385)	(-163.934, -876.426)	(18.728, -884.46)
(0., 0.)	(-15.707, -404.026)	(-167.619, -875.982)	(15.006, -884.211)
(0., 0.)	(-17.756, -403.664)	(-171.31, -875.503)	(11.281, -883.971)
(0., 0.)	(-19.852, -403.316)	(-175.01, -874.973)	(7.486, -883.68)
(0., 0.)	(-21.98, -402.94)	(-178.732, -874.393)	(3.651, -883.39)
(0., 0.)	(-24.132, -402.523)	(-182.496, -873.797)	(-0.177, -883.174)
(0., 0.)	(-26.308, -402.067)	(-186.318, -873.205)	(-4.038, -883.004)
(0., 0.)	(-28.494, -401.592)	(-190.195, -872.608)	(-7.981, -882.833)
(0., 0.)	(-30.676, -401.131)	(-194.119, -871.967)	(-12.014, -882.669)
(0., 0.)	(-32.836, -400.709)	(-198.089, -871.266)	(-16.112, -882.553)
(0., 0.)	(-34.955, -400.328)	(-202.104, -870.55)	(-20.249, -882.517)
(0., 0.)	(-37.03, -399.953)	(-206.171, -869.868)	(-24.455, -882.543)
(0., 0.)	(-39.058, -399.578)	(-210.318, -869.193)	(-28.786, -882.591)
(0., 0.)	(-41.037, -399.229)	(-214.552, -868.501)	(-33.217, -882.688)
(0., 0.)	(-42.975, -398.918)	(-218.852, -867.769)	(-37.69, -882.861)
(0., 0.)	(-44.88, -398.643)	(-223.217, -866.971)	(-42.231, -883.035)
(0., 0.)	(-46.771, -398.385)	(-227.646, -866.101)	(-46.884, -883.143)
(0., 0.)	(-48.663, -398.132)	(-232.135, -865.169)	(-51.632, -883.235)
(0., 0.)	(-50.568, -397.867)	(-236.702, -864.168)	(-56.466, -883.361)
(0., 0.)	(-52.47, -397.575)	(-241.327, -863.125)	(-61.394, -883.505)
(0., 0.)	(-54.338, -397.296)	(-245.976, -862.093)	(-66.4, -883.642)
(0., 0.)	(-56.172, -397.06)	(-250.63, -861.055)	(-71.454, -883.754)
(0., 0.)	(-58.006, -396.808)	(-255.302, -859.943)	(-76.518, -883.864)
(0., 0.)	(-59.847, -396.498)	(-260.001, -858.773)	(-81.581, -883.982)
(0., 0.)	(-61.649, -396.165)	(-264.732, -857.583)	(-86.679, -884.105)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-63.371, -395.845)	(-269.489, -856.344)	(-91.867, -884.24)
(0., 0.)	(-65.023, -395.527)	(-274.259, -855.02)	(-97.142, -884.384)
(0., 0.)	(-66.628, -395.2)	(-279.039, -853.663)	(-102.45, -884.479)
(0., 0.)	(-68.201, -394.839)	(-283.861, -852.341)	(-107.791, -884.488)
(0., 0.)	(-69.777, -394.444)	(-288.782, -851.041)	(-113.238, -884.487)
(0., 0.)	(-71.38, -394.046)	(-293.804, -849.691)	(-118.81, -884.556)
(0., 0.)	(-73.016, -393.64)	(-298.885, -848.271)	(-124.432, -884.674)
(0., 0.)	(-74.698, -393.17)	(-304.013, -846.826)	(-130.093, -884.755)
(0., 0.)	(-76.437, -392.619)	(-309.207, -845.357)	(-135.878, -884.709)
(0., 0.)	(-78.222, -391.989)	(-314.466, -843.739)	(-141.804, -884.576)
(0., 0.)	(-80.016, -391.313)	(-319.793, -841.888)	(-147.852, -884.419)
(0., 0.)	(-81.792, -390.628)	(-325.179, -839.849)	(-154.027, -884.264)
(0., 0.)	(-83.534, -389.933)	(-330.582, -837.687)	(-160.311, -884.132)
(0., 0.)	(-85.217, -389.193)	(-336.018, -835.444)	(-166.704, -884.005)
(0., 0.)	(-86.829, -388.389)	(-341.523, -833.118)	(-173.243, -883.824)
(0., 0.)	(-88.329, -387.566)	(-347.081, -830.658)	(-179.932, -883.648)
(0., 0.)	(-89.652, -386.773)	(-352.651, -828.03)	(-186.717, -883.513)
(0., 0.)	(-90.776, -386.042)	(-358.209, -825.277)	(-193.556, -883.393)
(0., 0.)	(-91.702, -385.398)	(-363.737, -822.483)	(-200.469, -883.316)
(0., 0.)	(-92.413, -384.822)	(-369.218, -819.671)	(-207.468, -883.311)
(0., 0.)	(-92.891, -384.249)	(-374.61, -816.818)	(-214.464, -883.375)
(0., 0.)	(-93.137, -383.671)	(-379.859, -813.896)	(-221.419, -883.485)
(0., 0.)	(-93.144, -383.155)	(-384.892, -810.888)	(-228.325, -883.668)
(0., 0.)	(-92.89, -382.738)	(-389.656, -807.807)	(-235.116, -883.968)
(0., 0.)	(-92.331, -382.42)	(-394.148, -804.697)	(-241.749, -884.339)
(0., 0.)	(-91.448, -382.18)	(-398.372, -801.541)	(-248.219, -884.679)
(0., 0.)	(-90.279, -382.033)	(-402.332, -798.278)	(-254.484, -884.965)
(0., 0.)	(-88.891, -382.)	(-406.031, -794.857)	(-260.531, -885.182)
(0., 0.)	(-87.342, -382.063)	(-409.508, -791.267)	(-266.414, -885.308)
(0., 0.)	(-85.671, -382.168)	(-412.777, -787.533)	(-272.19, -885.296)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-83.891, -382.272)	(-415.795, -783.666)	(-277.849, -885.149)
(0., 0.)	(-81.968, -382.375)	(-418.513, -779.642)	(-283.375, -884.855)
(0., 0.)	(-79.871, -382.495)	(-420.934, -775.453)	(-288.724, -884.413)
(0., 0.)	(-77.55, -382.646)	(-423.045, -771.11)	(-293.806, -883.831)
(0., 0.)	(-74.916, -382.86)	(-424.793, -766.601)	(-298.63, -883.059)
(0., 0.)	(-71.89, -383.181)	(-426.112, -761.906)	(-303.198, -882.058)
(0., 0.)	(-68.417, -383.646)	(-426.96, -757.018)	(-307.469, -880.882)
(0., 0.)	(-64.472, -384.259)	(-427.335, -751.94)	(-311.442, -879.545)
(0., 0.)	(-60.093, -384.973)	(-427.22, -746.637)	(-315.101, -878.038)
(0., 0.)	(-55.364, -385.74)	(-426.57, -741.087)	(-318.439, -876.289)
(0., 0.)	(-50.37, -386.536)	(-425.329, -735.309)	(-321.399, -874.249)
(0., 0.)	(-45.157, -387.347)	(-423.472, -729.378)	(-323.944, -871.945)
(0., 0.)	(-39.721, -388.149)	(-421., -723.336)	(-326.086, -869.56)
(0., 0.)	(-34.034, -388.884)	(-417.947, -717.191)	(-327.9, -867.203)
(0., 0.)	(-28.093, -389.49)	(-414.322, -711.04)	(-329.429, -864.823)
(0., 0.)	(-21.938, -389.915)	(-410.162, -704.987)	(-330.676, -862.351)
(0., 0.)	(-15.611, -390.181)	(-405.604, -699.081)	(-331.644, -859.775)
(0., 0.)	(-9.164, -390.358)	(-400.833, -693.362)	(-332.293, -857.195)
(0., 0.)	(-2.66, -390.504)	(-395.955, -687.863)	(-332.563, -854.76)
(0., 0.)	(3.877, -390.627)	(-390.949, -682.612)	(-332.524, -852.534)
(0., 0.)	(10.484, -390.671)	(-385.766, -677.688)	(-332.151, -850.373)
(0., 0.)	(17.222, -390.551)	(-380.51, -673.226)	(-330.933, -847.924)
(0., 0.)	(24.085, -390.214)	(-375.385, -669.397)	(-328.049, -844.933)
(0., 0.)	(30.965, -389.681)	(-370.417, -666.349)	(-323.006, -841.724)
(0., 0.)	(37.732, -389.012)	(-365.421, -664.197)	(-315.877, -838.87)
(0., 0.)	(44.32, -388.212)	(-360.191, -662.961)	(-307.023, -836.556)
(0., 0.)	(50.754, -387.254)	(-354.641, -662.604)	(-296.737, -834.609)
(0., 0.)	(57.081, -386.164)	(-348.744, -663.046)	(-285.206, -832.932)
(0., 0.)	(63.341, -385.023)	(-342.434, -664.161)	(-272.604, -831.48)
(0., 0.)	(69.516, -383.853)	(-335.654, -665.899)	(-259.227, -830.243)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(75.556, -382.603)	(-328.405, -668.327)	(-245.366, -829.264)
(0., 0.)	(81.454, -381.261)	(-320.706, -671.5)	(-231.268, -828.708)
(0., 0.)	(87.25, -379.922)	(-312.569, -675.396)	(-217.118, -828.771)
(0., 0.)	(92.904, -378.667)	(-304.048, -680.044)	(-202.887, -829.499)
(0., 0.)	(98.273, -377.457)	(-295.193, -685.51)	(-188.473, -830.776)
(0., 0.)	(103.266, -376.261)	(-285.982, -691.776)	(-173.759, -832.502)
(0., 0.)	(107.886, -375.115)	(-276.321, -698.735)	(-158.608, -834.528)
(0., 0.)	(112.185, -374.054)	(-266.114, -706.24)	(-142.901, -836.682)
(0., 0.)	(116.206, -373.083)	(-255.321, -714.165)	(-126.665, -838.87)
(0., 0.)	(119.959, -372.176)	(-243.982, -722.436)	(-110.072, -841.086)
(0., 0.)	(123.432, -371.314)	(-232.173, -731.023)	(-93.281, -843.41)
(0., 0.)	(126.622, -370.524)	(-219.951, -739.908)	(-76.395, -845.868)
(0., 0.)	(129.508, -369.791)	(-207.358, -749.059)	(-59.483, -848.43)
(0., 0.)	(132.103, -369.093)	(-194.384, -758.36)	(-42.55, -851.077)
(0., 0.)	(134.448, -368.454)	(-180.956, -767.694)	(-25.496, -853.782)
(0., 0.)	(136.575, -367.931)	(-167.019, -776.988)	(-8.174, -856.478)
(0., 0.)	(138.478, -367.561)	(-152.576, -786.165)	(9.433, -859.057)
(0., 0.)	(140.126, -367.363)	(-137.668, -795.139)	(27.215, -861.418)
(0., 0.)	(141.494, -367.335)	(-122.386, -803.835)	(45.081, -863.531)
(0., 0.)	(142.615, -367.457)	(-106.822, -812.202)	(62.917, -865.397)
(0., 0.)	(143.538, -367.703)	(-91.022, -820.194)	(80.655, -867.005)
(0., 0.)	(144.304, -368.044)	(-75.01, -827.739)	(98.326, -868.366)
(0., 0.)	(144.918, -368.43)	(-58.82, -834.718)	(115.968, -869.475)
(0., 0.)	(145.355, -368.784)	(-42.512, -841.061)	(133.518, -870.305)
(0., 0.)	(145.633, -369.094)	(-26.154, -846.775)	(150.899, -870.854)
(0., 0.)	(145.804, -369.405)	(-9.806, -851.929)	(168.09, -871.131)
(0., 0.)	(145.877, -369.737)	(6.483, -856.585)	(185.08, -871.027)
(0., 0.)	(145.825, -370.115)	(22.679, -860.728)	(201.833, -870.522)
(0., 0.)	(145.629, -370.566)	(38.713, -864.355)	(218.33, -869.711)
(0., 0.)	(145.297, -371.118)	(54.485, -867.511)	(234.467, -868.481)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(144.829, -371.773)	(69.931, -870.201)	(250.114, -866.707)
(0., 0.)	(144.216, -372.479)	(84.986, -872.479)	(265.134, -864.389)
(0., 0.)	(143.488, -373.143)	(99.552, -874.396)	(279.435, -861.617)
(0., 0.)	(142.757, -373.634)	(113.555, -875.906)	(292.979, -858.474)
(0., 0.)	(142.147, -373.884)	(126.935, -876.926)	(305.759, -855.023)
(0., 0.)	(141.709, -373.973)	(139.646, -877.5)	(317.786, -851.464)
(0., 0.)	(141.39, -373.98)	(151.701, -877.734)	(329.057, -848.07)
(0., 0.)	(141.121, -373.867)	(163.039, -877.621)	(339.601, -845.012)
(0., 0.)	(140.923, -373.568)	(173.562, -877.172)	(349.328, -842.071)
(0., 0.)	(140.816, -373.075)	(183.244, -876.541)	(357.996, -838.818)
(0., 0.)	(140.739, -372.406)	(192.131, -875.917)	(365.623, -835.196)
(0., 0.)	(140.603, -371.562)	(200.256, -875.344)	(372.359, -831.362)
(0., 0.)	(140.336, -370.592)	(207.587, -874.761)	(378.246, -827.49)
(0., 0.)	(139.907, -369.612)	(214.059, -874.119)	(383.307, -823.789)
(0., 0.)	(139.324, -368.759)	(219.587, -873.379)	(387.585, -820.474)
(0., 0.)	(138.611, -368.107)	(224.134, -872.595)	(391.131, -817.766)
(0., 0.)	(137.777, -367.67)	(227.705, -871.92)	(393.931, -815.743)
(0., 0.)	(136.81, -367.432)	(230.298, -871.496)	(395.934, -814.306)
(0., 0.)	(135.716, -367.363)	(231.876, -871.374)	(397.084, -813.288)
(0., 0.)	(134.534, -367.423)	(232.388, -871.55)	(397.324, -812.61)
(0., 0.)	(133.313, -367.59)	(231.779, -871.974)	(396.602, -812.324)
(0., 0.)	(132.11, -367.887)	(230.007, -872.6)	(394.902, -812.592)
(0., 0.)	(130.93, -368.319)	(227.036, -873.406)	(392.213, -813.578)
(0., 0.)	(129.721, -368.872)	(222.873, -874.364)	(388.604, -815.23)
(0., 0.)	(128.403, -369.557)	(217.604, -875.402)	(384.199, -817.315)
(0., 0.)	(126.901, -370.424)	(211.447, -876.476)	(379.074, -819.644)
(0., 0.)	(125.151, -371.489)	(204.849, -877.585)	(373.521, -822.078)
(0., 0.)	(123.11, -372.721)	(198.405, -878.637)	(368.144, -824.307)
(0., 0.)	(120.738, -374.084)	(192.514, -879.444)	(363.28, -826.031)
(0., 0.)	(118.019, -375.498)	(187.124, -879.792)	(358.691, -827.367)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(114.989, -376.842)	(181.926, -879.659)	(354.134, -828.818)
(0., 0.)	(111.777, -378.008)	(176.58, -879.254)	(349.51, -830.745)
(0., 0.)	(108.587, -378.941)	(170.934, -878.857)	(344.662, -833.023)
(0., 0.)	(105.605, -379.67)	(165.009, -878.55)	(339.41, -835.33)
(0., 0.)	(102.94, -380.263)	(158.882, -878.264)	(333.808, -837.515)
(0., 0.)	(100.604, -380.789)	(152.669, -878.)	(328.111, -839.777)
(0., 0.)	(98.533, -381.347)	(146.482, -877.912)	(322.509, -842.27)
(0., 0.)	(96.629, -382.024)	(140.375, -878.109)	(316.968, -844.949)
(0., 0.)	(94.852, -382.866)	(134.334, -878.555)	(311.384, -847.753)
(0., 0.)	(93.251, -383.875)	(128.339, -879.173)	(305.792, -850.634)
(0., 0.)	(91.907, -385.039)	(122.366, -879.936)	(300.231, -853.466)
(0., 0.)	(90.827, -386.328)	(116.398, -880.841)	(294.69, -856.19)
(0., 0.)	(89.914, -387.71)	(110.431, -881.855)	(289.121, -858.819)
(0., 0.)	(89.035, -389.137)	(104.46, -882.908)	(283.481, -861.301)
(0., 0.)	(87.982, -390.525)	(98.464, -883.923)	(277.732, -863.585)
(0., 0.)	(86.509, -391.762)	(92.376, -884.824)	(271.852, -865.703)
(0., 0.)	(84.488, -392.801)	(86.146, -885.563)	(265.907, -867.726)
(0., 0.)	(81.953, -393.669)	(79.809, -886.138)	(259.904, -869.623)
(0., 0.)	(79.068, -394.419)	(73.456, -886.602)	(253.757, -871.224)
(0., 0.)	(76.04, -395.103)	(67.156, -887.024)	(247.477, -872.509)
(0., 0.)	(73.051, -395.77)	(60.922, -887.431)	(241.256, -873.746)
(0., 0.)	(70.236, -396.433)	(54.726, -887.751)	(235.209, -875.021)
(0., 0.)	(67.654, -397.093)	(48.529, -887.874)	(229.312, -876.243)
(0., 0.)	(65.273, -397.703)	(42.387, -887.851)	(223.498, -877.371)
(0., 0.)	(63.027, -398.233)	(36.433, -887.919)	(217.761, -878.461)
(0., 0.)	(60.879, -398.723)	(30.674, -888.136)	(212.095, -879.492)
(0., 0.)	(58.788, -399.248)	(25.01, -888.383)	(206.52, -880.437)
(0., 0.)	(56.681, -399.834)	(19.383, -888.577)	(201.037, -881.273)
(0., 0.)	(54.506, -400.433)	(13.812, -888.709)	(195.647, -881.936)
(0., 0.)	(52.286, -400.99)	(8.339, -888.793)	(190.345, -882.449)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(50.092, -401.496)	(2.985, -888.846)	(185.115, -882.925)
(0., 0.)	(47.943, -401.964)	(-2.269, -888.858)	(179.977, -883.435)
(0., 0.)	(45.812, -402.382)	(-7.436, -888.821)	(174.93, -883.894)
(0., 0.)	(43.694, -402.745)	(-12.51, -888.729)	(169.935, -884.177)
(0., 0.)	(41.593, -403.078)	(-17.481, -888.579)	(165.012, -884.312)
(0., 0.)	(39.491, -403.418)	(-22.35, -888.391)	(160.209, -884.472)
(0., 0.)	(37.358, -403.73)	(-27.116, -888.19)	(155.53, -884.738)
(0., 0.)	(35.218, -403.976)	(-31.76, -888.02)	(150.933, -884.991)
(0., 0.)	(33.135, -404.195)	(-36.275, -887.9)	(146.42, -885.165)
(0., 0.)	(31.201, -404.489)	(-40.685, -887.827)	(142.044, -885.346)
(0., 0.)	(29.428, -404.817)	(-45.015, -887.769)	(137.781, -885.529)
(0., 0.)	(27.758, -405.062)	(-49.266, -887.668)	(133.587, -885.669)
(0., 0.)	(26.123, -405.206)	(-53.431, -887.481)	(129.491, -885.81)
(0., 0.)	(24.501, -405.328)	(-57.511, -887.247)	(125.493, -885.996)
(0., 0.)	(22.912, -405.47)	(-61.519, -886.993)	(121.522, -886.138)
(0., 0.)	(21.374, -405.611)	(-65.487, -886.68)	(117.56, -886.197)
(0., 0.)	(19.879, -405.721)	(-69.442, -886.287)	(113.645, -886.246)
(0., 0.)	(18.405, -405.777)	(-73.384, -885.844)	(109.762, -886.273)
(0., 0.)	(16.955, -405.799)	(-77.283, -885.395)	(105.865, -886.206)
(0., 0.)	(15.532, -405.832)	(-81.131, -884.944)	(101.989, -886.104)
(0., 0.)	(14.101, -405.887)	(-84.956, -884.486)	(98.169, -886.014)
(0., 0.)	(12.631, -405.935)	(-88.791, -884.027)	(94.324, -885.876)
(0., 0.)	(11.146, -405.969)	(-92.643, -883.594)	(90.374, -885.656)
(0., 0.)	(9.699, -406.005)	(-96.502, -883.195)	(86.355, -885.342)
(0., 0.)	(8.314, -406.041)	(-100.356, -882.793)	(82.464, -885.13)
(0., 0.)	(6.959, -406.055)	(-104.187, -882.351)	(78.682, -885.02)
(0., 0.)	(5.59, -406.046)	(-108.005, -881.877)	(74.888, -884.859)
(0., 0.)	(4.186, -406.036)	(-111.841, -881.416)	(71.06, -884.604)
(0., 0.)	(2.748, -406.017)	(-115.709, -880.982)	(67.192, -884.327)
(0., 0.)	(1.288, -405.964)	(-119.586, -880.536)	(63.304, -884.111)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-0.184, -405.866)	(-123.445, -880.054)	(59.425, -883.921)
(0., 0.)	(-1.669, -405.756)	(-127.305, -879.552)	(55.517, -883.669)
(0., 0.)	(-3.177, -405.659)	(-131.194, -879.06)	(51.579, -883.387)
(0., 0.)	(-4.764, -405.582)	(-135.123, -878.607)	(47.636, -883.144)
(0., 0.)	(-6.491, -405.491)	(-139.095, -878.189)	(43.669, -882.879)
(0., 0.)	(-8.39, -405.339)	(-143.106, -877.788)	(39.642, -882.586)
(0., 0.)	(-10.454, -405.113)	(-147.142, -877.412)	(35.57, -882.401)
(0., 0.)	(-12.621, -404.831)	(-151.189, -877.055)	(31.478, -882.327)
(0., 0.)	(-14.826, -404.502)	(-155.256, -876.686)	(27.349, -882.197)
(0., 0.)	(-17.049, -404.113)	(-159.347, -876.273)	(23.212, -881.977)
(0., 0.)	(-19.286, -403.666)	(-163.441, -875.787)	(19.101, -881.732)
(0., 0.)	(-21.502, -403.195)	(-167.516, -875.248)	(14.989, -881.456)
(0., 0.)	(-23.652, -402.73)	(-171.581, -874.7)	(10.868, -881.169)
(0., 0.)	(-25.724, -402.242)	(-175.645, -874.191)	(6.755, -880.92)
(0., 0.)	(-27.762, -401.7)	(-179.717, -873.729)	(2.648, -880.715)
(0., 0.)	(-29.815, -401.113)	(-183.815, -873.283)	(-1.47, -880.518)
(0., 0.)	(-31.902, -400.514)	(-187.96, -872.811)	(-5.647, -880.295)
(0., 0.)	(-34.011, -399.912)	(-192.145, -872.288)	(-9.88, -880.067)
(0., 0.)	(-36.124, -399.316)	(-196.368, -871.711)	(-14.124, -879.889)
(0., 0.)	(-38.227, -398.761)	(-200.632, -871.117)	(-18.402, -879.708)
(0., 0.)	(-40.321, -398.273)	(-204.939, -870.534)	(-22.78, -879.455)
(0., 0.)	(-42.419, -397.843)	(-209.277, -869.94)	(-27.237, -879.207)
(0., 0.)	(-44.533, -397.453)	(-213.63, -869.283)	(-31.704, -879.034)
(0., 0.)	(-46.637, -397.097)	(-217.969, -868.547)	(-36.154, -878.891)
(0., 0.)	(-48.686, -396.766)	(-222.281, -867.757)	(-40.581, -878.759)
(0., 0.)	(-50.647, -396.469)	(-226.557, -866.97)	(-44.979, -878.657)
(0., 0.)	(-52.534, -396.209)	(-230.802, -866.205)	(-49.366, -878.632)
(0., 0.)	(-54.372, -395.959)	(-235.045, -865.42)	(-53.753, -878.745)
(0., 0.)	(-56.189, -395.658)	(-239.301, -864.617)	(-58.187, -878.967)
(0., 0.)	(-58.024, -395.304)	(-243.579, -863.815)	(-62.714, -879.212)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-59.907, -394.962)	(-247.891, -863.006)	(-67.285, -879.467)
(0., 0.)	(-61.847, -394.636)	(-252.244, -862.198)	(-71.844, -879.768)
(0., 0.)	(-63.825, -394.309)	(-256.655, -861.386)	(-76.47, -880.073)
(0., 0.)	(-65.799, -394.004)	(-261.148, -860.508)	(-81.264, -880.324)
(0., 0.)	(-67.71, -393.723)	(-265.738, -859.489)	(-86.21, -880.53)
(0., 0.)	(-69.539, -393.426)	(-270.42, -858.321)	(-91.235, -880.714)
(0., 0.)	(-71.319, -393.096)	(-275.178, -857.077)	(-96.349, -880.885)
(0., 0.)	(-73.085, -392.774)	(-280.016, -855.795)	(-101.625, -881.042)
(0., 0.)	(-74.825, -392.47)	(-284.947, -854.416)	(-107.064, -881.173)
(0., 0.)	(-76.531, -392.139)	(-289.972, -852.891)	(-112.638, -881.234)
(0., 0.)	(-78.225, -391.741)	(-295.086, -851.253)	(-118.337, -881.246)
(0., 0.)	(-79.919, -391.288)	(-300.304, -849.568)	(-124.155, -881.266)
(0., 0.)	(-81.621, -390.794)	(-305.613, -847.86)	(-130.067, -881.288)
(0., 0.)	(-83.319, -390.249)	(-310.965, -846.081)	(-136.107, -881.313)
(0., 0.)	(-84.952, -389.668)	(-316.33, -844.199)	(-142.299, -881.38)
(0., 0.)	(-86.499, -389.088)	(-321.739, -842.22)	(-148.617, -881.474)
(0., 0.)	(-87.977, -388.53)	(-327.215, -840.141)	(-155.058, -881.619)
(0., 0.)	(-89.419, -387.97)	(-332.776, -837.969)	(-161.631, -881.823)
(0., 0.)	(-90.814, -387.405)	(-338.426, -835.723)	(-168.307, -882.006)
(0., 0.)	(-92.126, -386.817)	(-344.149, -833.41)	(-175.077, -882.183)
(0., 0.)	(-93.329, -386.186)	(-349.897, -831.014)	(-181.965, -882.381)
(0., 0.)	(-94.412, -385.542)	(-355.633, -828.546)	(-188.981, -882.585)
(0., 0.)	(-95.359, -384.914)	(-361.319, -826.025)	(-196.059, -882.842)
(0., 0.)	(-96.142, -384.298)	(-366.902, -823.436)	(-203.099, -883.194)
(0., 0.)	(-96.726, -383.724)	(-372.337, -820.783)	(-210.067, -883.637)
(0., 0.)	(-97.072, -383.233)	(-377.59, -818.104)	(-216.955, -884.137)
(0., 0.)	(-97.151, -382.811)	(-382.636, -815.404)	(-223.738, -884.67)
(0., 0.)	(-96.966, -382.448)	(-387.442, -812.672)	(-230.375, -885.242)
(0., 0.)	(-96.508, -382.176)	(-391.985, -809.88)	(-236.87, -885.832)
(0., 0.)	(-95.767, -381.989)	(-396.272, -806.996)	(-243.219, -886.419)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-94.736, -381.886)	(-400.304, -803.999)	(-249.385, -886.963)
(0., 0.)	(-93.411, -381.89)	(-404.066, -800.86)	(-255.336, -887.395)
(0., 0.)	(-91.78, -382.011)	(-407.525, -797.565)	(-261.072, -887.648)
(0., 0.)	(-89.818, -382.188)	(-410.667, -794.071)	(-266.613, -887.717)
(0., 0.)	(-87.484, -382.37)	(-413.486, -790.316)	(-271.951, -887.667)
(0., 0.)	(-84.719, -382.602)	(-415.957, -786.261)	(-277.087, -887.421)
(0., 0.)	(-81.49, -382.969)	(-418.059, -781.892)	(-282.043, -886.82)
(0., 0.)	(-77.789, -383.506)	(-419.77, -777.203)	(-286.757, -885.886)
(0., 0.)	(-73.613, -384.18)	(-421.059, -772.175)	(-291.164, -884.754)
(0., 0.)	(-68.932, -384.966)	(-421.892, -766.801)	(-295.339, -883.439)
(0., 0.)	(-63.713, -385.842)	(-422.252, -761.103)	(-299.35, -881.865)
(0., 0.)	(-57.989, -386.787)	(-422.104, -755.137)	(-303.136, -880.095)
(0., 0.)	(-51.871, -387.763)	(-421.383, -748.921)	(-306.587, -878.194)
(0., 0.)	(-45.499, -388.707)	(-420.031, -742.473)	(-309.568, -876.067)
(0., 0.)	(-38.973, -389.565)	(-417.997, -735.791)	(-311.959, -873.647)
(0., 0.)	(-32.302, -390.296)	(-415.226, -728.866)	(-313.72, -870.953)
(0., 0.)	(-25.466, -390.853)	(-411.74, -721.78)	(-314.934, -868.111)
(0., 0.)	(-18.468, -391.194)	(-407.678, -714.683)	(-315.743, -865.219)
(0., 0.)	(-11.317, -391.367)	(-403.232, -707.771)	(-316.189, -862.315)
(0., 0.)	(-4.04, -391.466)	(-398.617, -701.234)	(-316.167, -859.423)
(0., 0.)	(3.293, -391.523)	(-394.04, -695.354)	(-315.373, -856.629)
(0., 0.)	(10.597, -391.46)	(-389.636, -690.483)	(-313.167, -853.777)
(0., 0.)	(17.807, -391.222)	(-385.467, -686.758)	(-308.94, -850.524)
(0., 0.)	(24.826, -390.847)	(-381.425, -684.095)	(-302.599, -846.823)
(0., 0.)	(31.512, -390.364)	(-377.216, -682.367)	(-294.622, -843.127)
(0., 0.)	(37.769, -389.686)	(-372.488, -681.505)	(-285.792, -840.011)
(0., 0.)	(43.62, -388.717)	(-367.045, -681.468)	(-276.549, -837.81)
(0., 0.)	(49.153, -387.499)	(-360.935, -682.178)	(-266.892, -836.293)
(0., 0.)	(54.435, -386.181)	(-354.308, -683.55)	(-256.733, -835.125)
(0., 0.)	(59.496, -385.068)	(-347.294, -685.687)	(-246.09, -834.532)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(64.371, -384.591)	(-339.9, -688.73)	(-234.852, -834.661)
(0., 0.)	(69.12, -384.739)	(-332.06, -692.595)	(-222.918, -835.366)
(0., 0.)	(73.814, -384.715)	(-323.746, -697.137)	(-210.321, -836.349)
(0., 0.)	(78.433, -384.183)	(-314.971, -702.357)	(-197.125, -837.554)
(0., 0.)	(82.906, -383.428)	(-305.748, -708.318)	(-183.45, -839.102)
(0., 0.)	(87.154, -382.732)	(-296.088, -715.)	(-169.286, -840.938)
(0., 0.)	(91.103, -382.157)	(-285.993, -722.308)	(-154.65, -843.03)
(0., 0.)	(94.732, -381.647)	(-275.447, -730.146)	(-139.619, -845.371)
(0., 0.)	(98.095, -381.13)	(-264.392, -738.419)	(-124.213, -847.928)
(0., 0.)	(101.258, -380.57)	(-252.764, -747.067)	(-108.497, -850.74)
(0., 0.)	(104.241, -379.972)	(-240.532, -755.933)	(-92.558, -853.852)
(0., 0.)	(107.048, -379.389)	(-227.721, -764.836)	(-76.333, -857.145)
(0., 0.)	(109.699, -378.906)	(-214.417, -773.753)	(-59.729, -860.374)
(0., 0.)	(112.19, -378.55)	(-200.73, -782.732)	(-42.788, -863.416)
(0., 0.)	(114.467, -378.305)	(-186.665, -791.688)	(-25.608, -866.254)
(0., 0.)	(116.495, -378.16)	(-172.169, -800.433)	(-8.173, -868.663)
(0., 0.)	(118.315, -378.122)	(-157.249, -808.861)	(9.479, -870.571)
(0., 0.)	(120.021, -378.174)	(-141.984, -817.002)	(27.264, -872.217)
(0., 0.)	(121.653, -378.255)	(-126.405, -824.776)	(45.086, -873.732)
(0., 0.)	(123.138, -378.318)	(-110.518, -832.102)	(62.919, -875.084)
(0., 0.)	(124.38, -378.364)	(-94.357, -838.979)	(80.764, -876.239)
(0., 0.)	(125.351, -378.422)	(-77.986, -845.425)	(98.564, -877.177)
(0., 0.)	(126.069, -378.546)	(-61.49, -851.409)	(116.296, -877.903)
(0., 0.)	(126.605, -378.765)	(-44.961, -856.875)	(133.851, -878.302)
(0., 0.)	(127.066, -379.077)	(-28.485, -861.777)	(151.075, -878.227)
(0., 0.)	(127.475, -379.447)	(-12.139, -866.124)	(167.918, -877.636)
(0., 0.)	(127.797, -379.837)	(4.022, -869.923)	(184.483, -876.617)
(0., 0.)	(128.083, -380.22)	(19.937, -873.16)	(200.817, -875.296)
(0., 0.)	(128.463, -380.515)	(35.52, -875.855)	(216.631, -873.555)
(0., 0.)	(128.979, -380.627)	(50.708, -878.041)	(231.782, -871.556)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(129.59, -380.559)	(65.462, -879.753)	(246.297, -869.589)
(0., 0.)	(130.217, -380.405)	(79.732, -881.04)	(260.226, -867.63)
(0., 0.)	(130.781, -380.245)	(93.453, -881.986)	(273.554, -865.515)
(0., 0.)	(131.275, -380.06)	(106.566, -882.654)	(286.213, -863.006)
(0., 0.)	(131.751, -379.768)	(119.067, -883.082)	(298.17, -859.92)
(0., 0.)	(132.257, -379.333)	(131.039, -883.371)	(309.455, -856.365)
(0., 0.)	(132.82, -378.785)	(142.517, -883.569)	(320.112, -852.677)
(0., 0.)	(133.442, -378.133)	(153.363, -883.485)	(330.075, -849.048)
(0., 0.)	(134.065, -377.384)	(163.458, -882.982)	(339.215, -845.348)
(0., 0.)	(134.582, -376.549)	(172.777, -882.163)	(347.615, -841.738)
(0., 0.)	(134.886, -375.642)	(181.306, -881.169)	(355.339, -838.318)
(0., 0.)	(134.947, -374.685)	(188.996, -880.083)	(362.37, -834.994)
(0., 0.)	(134.806, -373.732)	(195.807, -878.942)	(368.645, -831.786)
(0., 0.)	(134.539, -372.873)	(201.726, -877.778)	(374.099, -828.818)
(0., 0.)	(134.201, -372.147)	(206.746, -876.657)	(378.672, -826.159)
(0., 0.)	(133.776, -371.517)	(210.854, -875.738)	(382.36, -823.863)
(0., 0.)	(133.225, -371.)	(214.025, -875.154)	(385.15, -821.936)
(0., 0.)	(132.524, -370.656)	(216.213, -874.937)	(386.986, -820.41)
(0., 0.)	(131.68, -370.507)	(217.398, -875.056)	(387.859, -819.36)
(0., 0.)	(130.711, -370.543)	(217.56, -875.421)	(387.804, -818.857)
(0., 0.)	(129.613, -370.74)	(216.666, -875.889)	(386.88, -818.961)
(0., 0.)	(128.385, -371.05)	(214.673, -876.417)	(385.085, -819.657)
(0., 0.)	(127.055, -371.425)	(211.598, -877.077)	(382.377, -820.83)
(0., 0.)	(125.658, -371.862)	(207.494, -877.906)	(378.705, -822.387)
(0., 0.)	(124.183, -372.418)	(202.414, -878.886)	(374.097, -824.308)
(0., 0.)	(122.56, -373.163)	(196.463, -880.011)	(368.712, -826.557)
(0., 0.)	(120.709, -374.122)	(189.855, -881.281)	(362.724, -829.075)
(0., 0.)	(118.572, -375.251)	(182.948, -882.553)	(356.478, -831.68)
(0., 0.)	(116.105, -376.481)	(176.257, -883.617)	(350.506, -833.882)
(0., 0.)	(113.26, -377.775)	(170.192, -884.315)	(345.097, -835.306)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(110.038, -379.096)	(164.685, -884.464)	(339.983, -836.309)
(0., 0.)	(106.513, -380.377)	(159.366, -884.01)	(334.961, -837.637)
(0., 0.)	(102.846, -381.55)	(153.937, -883.282)	(330.024, -839.666)
(0., 0.)	(99.254, -382.548)	(148.28, -882.662)	(325.062, -842.146)
(0., 0.)	(95.937, -383.325)	(142.458, -882.271)	(319.89, -844.524)
(0., 0.)	(93.027, -383.93)	(136.627, -882.009)	(314.54, -846.715)
(0., 0.)	(90.575, -384.478)	(130.904, -881.796)	(309.274, -849.059)
(0., 0.)	(88.515, -385.092)	(125.291, -881.715)	(304.201, -851.647)
(0., 0.)	(86.755, -385.836)	(119.753, -881.876)	(299.186, -854.263)
(0., 0.)	(85.273, -386.673)	(114.286, -882.31)	(294.167, -856.833)
(0., 0.)	(84.086, -387.55)	(108.895, -882.961)	(289.225, -859.521)
(0., 0.)	(83.15, -388.539)	(103.543, -883.747)	(284.328, -862.329)
(0., 0.)	(82.383, -389.711)	(98.161, -884.586)	(279.248, -864.874)
(0., 0.)	(81.665, -391.036)	(92.675, -885.372)	(273.869, -866.899)
(0., 0.)	(80.817, -392.391)	(87.026, -886.025)	(268.362, -868.66)
(0., 0.)	(79.625, -393.631)	(81.243, -886.587)	(262.814, -870.35)
(0., 0.)	(77.89, -394.662)	(75.42, -887.192)	(257.191, -871.933)
(0., 0.)	(75.546, -395.488)	(69.561, -887.796)	(251.453, -873.36)
(0., 0.)	(72.686, -396.154)	(63.633, -888.288)	(245.601, -874.626)
(0., 0.)	(69.549, -396.703)	(57.664, -888.651)	(239.709, -875.812)
(0., 0.)	(66.431, -397.192)	(51.707, -888.937)	(233.872, -877.017)
(0., 0.)	(63.537, -397.661)	(45.792, -889.172)	(228.088, -878.237)
(0., 0.)	(60.91, -398.096)	(39.909, -889.363)	(222.348, -879.406)
(0., 0.)	(58.519, -398.516)	(34.03, -889.503)	(216.631, -880.419)
(0., 0.)	(56.311, -398.953)	(28.153, -889.577)	(210.925, -881.215)
(0., 0.)	(54.192, -399.405)	(22.287, -889.587)	(205.226, -881.849)
(0., 0.)	(52.048, -399.843)	(16.434, -889.557)	(199.503, -882.344)
(0., 0.)	(49.832, -400.285)	(10.601, -889.511)	(193.766, -882.714)
(0., 0.)	(47.593, -400.781)	(4.796, -889.456)	(188.062, -883.039)
(0., 0.)	(45.357, -401.312)	(-0.954, -889.397)	(182.429, -883.409)

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Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(43.128, -401.834)	(-6.629, -889.338)	(176.871, -883.801)
(0., 0.)	(40.926, -402.325)	(-12.214, -889.282)	(171.349, -884.141)
(0., 0.)	(38.764, -402.75)	(-17.682, -889.24)	(165.899, -884.41)
(0., 0.)	(36.62, -403.09)	(-23.018, -889.199)	(160.629, -884.637)
(0., 0.)	(34.481, -403.379)	(-28.22, -889.141)	(155.532, -884.803)
(0., 0.)	(32.369, -403.656)	(-33.275, -889.075)	(150.517, -884.905)
(0., 0.)	(30.318, -403.905)	(-38.171, -888.995)	(145.581, -885.03)
(0., 0.)	(28.365, -404.121)	(-42.908, -888.895)	(140.839, -885.232)
(0., 0.)	(26.532, -404.315)	(-47.48, -888.79)	(136.337, -885.433)
(0., 0.)	(24.812, -404.473)	(-51.901, -888.656)	(132.006, -885.543)
(0., 0.)	(23.171, -404.603)	(-56.213, -888.444)	(127.744, -885.534)
(0., 0.)	(21.581, -404.731)	(-60.433, -888.168)	(123.551, -885.482)
(0., 0.)	(20.023, -404.846)	(-64.531, -887.853)	(119.508, -885.486)
(0., 0.)	(18.482, -404.924)	(-68.493, -887.486)	(115.609, -885.483)
(0., 0.)	(16.969, -404.967)	(-72.335, -887.055)	(111.761, -885.354)
(0., 0.)	(15.515, -404.997)	(-76.098, -886.597)	(107.877, -885.045)
(0., 0.)	(14.154, -405.038)	(-79.819, -886.157)	(104.018, -884.69)
(0., 0.)	(12.882, -405.097)	(-83.521, -885.735)	(100.347, -884.538)
(0., 0.)	(11.682, -405.16)	(-87.194, -885.311)	(96.833, -884.517)
(0., 0.)	(10.526, -405.193)	(-90.832, -884.879)	(93.33, -884.449)
(0., 0.)	(9.387, -405.216)	(-94.439, -884.452)	(89.78, -884.334)
(0., 0.)	(8.262, -405.25)	(-98.028, -884.023)	(86.193, -884.195)
(0., 0.)	(7.14, -405.29)	(-101.63, -883.576)	(82.608, -884.036)
(0., 0.)	(6.002, -405.341)	(-105.249, -883.128)	(79.035, -883.871)
(0., 0.)	(4.835, -405.387)	(-108.854, -882.723)	(75.425, -883.693)
(0., 0.)	(3.637, -405.417)	(-112.427, -882.353)	(71.796, -883.529)
(0., 0.)	(2.417, -405.431)	(-115.972, -881.968)	(68.235, -883.41)
(0., 0.)	(1.167, -405.425)	(-119.487, -881.536)	(64.757, -883.284)
(0., 0.)	(-0.144, -405.399)	(-122.97, -881.059)	(61.311, -883.112)
(0., 0.)	(-1.533, -405.342)	(-126.409, -880.593)	(57.882, -882.911)

Continued on next page

Table A.1 – *Continued from previous page*

Hip	Knee	Ankle	Toe
(0., 0.)	(-2.968, -405.23)	(-129.777, -880.19)	(54.469, -882.687)
(0., 0.)	(-4.36, -405.05)	(-133.048, -879.81)	(51.135, -882.465)
(0., 0.)	(-5.651, -404.831)	(-136.216, -879.384)	(47.967, -882.289)
(0., 0.)	(-6.833, -404.586)	(-139.264, -878.924)	(44.962, -882.119)
(0., 0.)	(-7.915, -404.309)	(-142.191, -878.474)	(42.06, -881.931)
(0., 0.)	(-8.901, -404.015)	(-145.02, -878.058)	(39.223, -881.769)
(0., 0.)	(-9.794, -403.728)	(-147.773, -877.714)	(36.439, -881.67)

Appendix B

Linkage Data

B.1 Randomized Starting Positions

Table B.1: 50 Adjusted Starting Linkages randomized About a Tolerance of 10mm

	A	B	C	D	F	G	H
1	178.33, -202.44	-6.61, -8.23	-153.88, 28.39	105.98, -161.15	32.43, -396.59	-111.48, -28.27	119.82, -338.67
2	160.83, -196.88	6.43, -9.73	-149.61, 32.17	103.72, -171.17	28.93, -401.24	-110.98, -32.2	132.33, -333.97
3	161.48, -204.87	-2.89, 6.6	-159.35, 30.04	113.61, -164.26	37.16, -393.19	-40.63, -96.61	122.54, -335.39
4	169.16, -211.83	-2.89, -3.28	-158.15, 31.22	-159.57, 96.37	37.14, -394.2	-110.41, -41.7	130.31, -328.72
5	176.69, -211.82	3.71, -4.65	-146.94, 43.06	100.92, -158.63	-398.74, 45.92	-100.21, -31.81	113.66, -324.97
6	177.51, -203.48	1.45, 1.63	-149.06, 42.72	107.91, -168.94	32.39, -395.33	-101.52, -30.19	117.09, -336.06
7	167.18, -211.82	1.16, -9.19	-144.75, 28.36	-166.4, 95.6	-405.66, 47.38	-101.88, -41.06	118.77, -335.28
8	168.71, -199.58	-1.57, 8.21	-154.54, 32.64	108.88, -164.	37.06, -401.53	-42.4, -95.47	128.94, -330.12
9	176.24, -202.86	1.43, -2.15	-160.14, 34.37	103.45, -171.96	-386.27, 45.1	-103.45, -36.52	124.77, -335.01
10	172.89, -211.36	0.69, 3.36	-151.63, 36.77	-155.52, 95.87	39.6, -402.78	-103.93, -42.36	130.7, -327.2
11	176.1, -204.56	-1.55, -5.58	-153.67, 38.46	-161.79, 95.52	39.29, -404.85	-101.91, -37.73	121.36, -332.43
12	160.85, -200.01	0.4, 5.23	-154.02, 42.19	-159.15, 94.58	-404.28, 43.69	-34.05, -96.78	131.91, -322.01
13	164.92, -200.9	0.67, 7.19	-148.37, 38.04	112.34, -166.58	35.17, -390.77	-39.57, -93.74	122.31, -330.55
14	175.8, -204.8	1.09, 1.28	-154.09, 45.73	100.36, -157.22	-398.67, 44.06	-29.77, -99.52	133.32, -330.54
15	166.61, -198.89	-4.26, -6.1	-155.92, 29.95	-158.57, 96.51	30.48, -393.99	-103.56, -35.13	119.08, -330.51
16	162.28, -211.36	6.36, -8.98	-145.31, 37.24	103.28, -161.02	-399.13, 43.56	-25.06, -98.41	116.39, -340.98
17	172.62, -208.66	7.38, 7.45	-159.59, 28.47	-156.34, 97.58	-386.81, 42.92	-107.09, -41.8	124.85, -326.12
18	174.68, -212.54	-4.31, 6.45	-159.12, 29.06	-172.77, 99.19	-395.74, 43.08	-106.75, -29.3	127.95, -331.81

Continued on next page

Table B.1 – *Continued from previous page*

	A	B	C	D	F	G	H
19	174.02, -209.49	3.61, 6.78	-143.79, 30.72	107.71, -154.67	-389.38, 43.25	-111.99, -42.13	117.9, -330.44
20	180.23, -197.23	0.14, 9.81	-154.67, 34.46	102.81, -159.49	31.26, -389.83	-106.36, -30.69	117.04, -323.5
21	164.82, -206.76	6.82, -9.01	-149.39, 34.21	101.66, -166.14	30.95, -396.99	-25.32, -92.75	121.21, -333.49
22	173.68, -210.89	-3.87, -5.98	-152.41, 29.35	-157.4, 97.34	35.76, -386.61	-107.08, -33.47	129.07, -325.07
23	166.4, -202.22	4.19, -6.25	-161.16, 39.05	107.97, -168.68	-405.48, 45.61	-111.62, -25.91	123.46, -324.67
24	174.87, -205.88	-8.19, -9.99	-159.9, 43.82	-159.39, 99.74	29.52, -402.19	-105.06, -39.06	121.98, -338.9
25	175.89, -209.3	-0.66, 7.99	-161.01, 32.79	102.37, -171.98	-400.78, 40.54	-40.3, -93.3	122.75, -328.52
26	165.34, -198.01	-5.3, 7.62	-153.2, 41.21	-155.59, 99.38	31.6, -387.74	-105.41, -26.76	128.05, -331.6
27	175.93, -196.23	2.86, -3.54	-145.61, 36.93	-156.53, 97.67	35.25, -390.23	-34.07, -94.01	114.1, -338.31
28	160.83, -196.5	-3.27, 7.4	-154.17, 39.95	111.69, -158.47	-398.95, 48.22	-104.02, -26.78	122., -337.48
29	175.76, -199.31	4.98, -9.99	-152.16, 38.88	107.43, -161.51	35.63, -395.67	-24., -99.01	127.26, -331.86
30	170.28, -211.56	-1.73, 3.73	-148.12, 40.1	-165.44, 98.36	37.78, -402.22	-108.26, -26.33	131.4, -323.08
31	177.01, -200.22	-5.4, 7.63	-151.72, 39.11	101.53, -170.66	-389.16, 48.42	-34.3, -97.86	119.23, -341.07
32	165.86, -210.61	0.01, -5.64	-146.27, 43.99	109.46, -161.94	33.11, -404.48	-104.25, -39.26	120.33, -326.67
33	168.72, -194.88	0.99, -7.96	-156.13, 41.88	108.34, -161.72	-402.17, 47.08	-112.01, -26.38	129.81, -339.82
34	174.55, -206.	4.17, -5.68	-152.57, 28.33	-170.62, 95.95	33.76, -403.2	-43.44, -98.22	131.08, -338.63
35	164.59, -204.09	-0.51, -1.28	-150.77, 36.95	-170.78, 97.59	-393.57, 43.17	-34.08, -98.3	117.02, -324.11
36	164.82, -213.23	7.52, -8.48	-151.77, 40.	-158.78, 97.87	30.16, -402.12	-28.3, -94.46	131.16, -340.18
37	177.97, -200.64	-1.6, 5.76	-160.73, 41.12	104.83, -166.4	-389.53, 46.08	-38.61, -94.51	113.79, -323.9
38	166.04, -196.21	-0.95, -4.07	-157.25, 29.72	110.38, -163.61	28.64, -399.49	-43.42, -92.89	116.04, -322.43
39	168.42, -201.44	0.73, -1.36	-155.82, 36.49	-158.2, 94.72	30.78, -405.	-103.04, -43.48	130.33, -334.95
40	166.88, -203.77	-2.61, -9.13	-161.39, 41.57	103.38, -164.27	-395.74, 46.29	-110.13, -38.1	128.78, -340.7
41	167.28, -208.93	-6.64, 8.99	-156.81, 40.49	104.13, -160.01	-405.73, 45.59	-43.63, -93.95	132.83, -323.88
42	164.7, -203.17	0.75, -1.69	-154.2, 43.57	-172.72, 96.82	28.83, -403.93	-26.35, -98.79	113.86, -334.94
43	167.03, -200.9	3.1, -6.63	-150.96, 30.07	-157.55, 98.09	-390.27, 46.18	-103.17, -30.98	131.42, -330.02
44	172.2, -211.48	6.64, -8.65	-145.86, 40.26	100.73, -153.27	36.15, -390.89	-109.16, -42.45	130.58, -329.95
45	167.88, -203.22	-5.01, 6.72	-144.9, 34.36	108.92, -165.23	-391.05, 40.89	-103.01, -25.51	130.29, -321.65
46	168.24, -202.66	0.24, 6.34	-149.69, 30.09	-167.16, 97.43	31.46, -399.27	-103.43, -34.13	121.02, -330.99
47	174.04, -209.38	-4.84, 8.96	-148.99, 38.65	101.01, -164.41	-388.27, 39.27	-30.35, -97.12	133.18, -328.7
48	165.69, -195.86	7.05, -8.12	-143.44, 42.86	106.07, -159.64	28.95, -394.5	-109.42, -36.29	117.53, -332.73
49	175.22, -209.81	2.01, -9.3	-144., 32.86	-159.12, 95.33	-399.56, 44.58	-30.94, -98.43	129.07, -335.44
50	171.44, -193.94	4.48, -8.1	-154.76, 34.92	112.61, -170.06	-396.62, 48.3	-108.92, -28.99	118.62, -322.09

B.2 Minimization Error Results

Table B.2: Error Values for Various Optimization Algorithms

	Fletcher-Reeves	Newton	Gradient	Conjugate-Gradient	Interior Point	Quasi-Newton
1	18.99	219.94	262.41	35.87	1214.95	8.12
2	19.13	101.97	17.09	19.32	529.58	13.07
3	77.81	29.55	77.30	766.17	4216.59	69.61
4	23.59	197.63	20.18	151.41	281.29	20.12
5	125.38	75.84	40.20	1484.71	9367.12	36.12
6	6.64	52.29	6.51	40.91	9415.58	6.28
7	148.70	354.27	63.05	104.25	163.90	2.45
8	234.58	2138.35	10.87	13.76	29.58	1.36
9	45.05	3931.66	39.15	40.40	335.71	12.71
10	279.85	293.62	31.36	1003.22	102.95	31.27
11	109.44	2067504.68	115.35	119.19	66278.66	10876.56
12	58.69	83.02	8.17	156.58	8982.19	5.86
13	83.34	1491.39	59.14	529.46	8047.15	57.05
14	261.34	3508.77	28.20	546.57	4797.54	25.40
15	36.61	4060.40	54.36	4721.15	215.23	5.96
16	2421.05	20.33	61.43	25.76	556.39	18.39
17	6.40	5072.34	23.70	880.50	308.79	2.24
18	134.93	92.62	134.42	173.53	610.62	5.60
19	277.27	37.47	16.78	22.08	77.73	2.48
20	51.24	2550.60	50.59	13025.75	3165.33	11.01
21	26.94	16333.49	8.11	7589.32	107.66	1.29
22	4740.59	1822.06	70.92	70.87	87.59	70.44
23	2472.50	3579.50	20.46	20.92	11688.67	1.53
24	1161.40	82.43	9.27	10.13	36.93	1.59
25	199.92	13060.70	19.46	21.43	161.37	2.24
26	4092.65	2866.16	5.24	56.27	15428.39	9.50
27	154.97	1469.19	93.12	272.56	3138.68	6.91
28	182.67	22101.86	65.94	75.35	155.87	13.67
29	8925.79	29.17	82.54	11807.48	33.75	10.66

Continued on next page

Table B.2 – *Continued from previous page*

	Fletcher-Reeves	Newton	Gradient	Conjugate-Gradient	Interior Point	Quasi-Newton
30	19.17	164.77	20.95	23.20	1828.16	3.49
31	1174.77	6161.89	30.66	29.02	144.30	13.46
32	18.77	79676.27	60.95	165.94	10716.17	7210.23
33	418.97	17.32	26.98	36.96	69.16	1.54
34	2204.74	29.07	5.79	450.74	238.32	6.47
35	4.39	15739.27	3.97	706.47	1624.73	3.65
36	68.24	1716.53	30.15	50.05	55.64	2.13
37	25.11	80.70	19.17	98.51	185.72	3.19
38	58.64	7345.71	45.49	45.76	102.03	26.69
39	169.04	2305.88	7.24	16.09	252.54	6.94
40	29.15	2640.01	33.80	29.28	19450.31	1.87
41	26.29	1583.76	23.55	59.11	280.75	23.49
42	7.71	5036.96	5.50	13.51	4208.58	5.28
43	30.57	1550.96	22.53	23.73	49.61	2.00
44	46.83	8.56	32.63	4933.97	647.27	11.58
45	7.21	15.07	6.93	35.72	4893.05	2.04
46	5010.51	13486.78	19.19	19.71	121.20	3.90
47	4962.56	899.11	26.80	856.22	6611.16	26.72
48	281.25	690.72	85.23	363.71	290.29	17.99
49	369.96	179.49	186.18	199.67	235.94	4.99
50	376.30	2077.59	52.22	244.62	197.07	1.45

B.3 Stephenson III Six-Bar Solutions

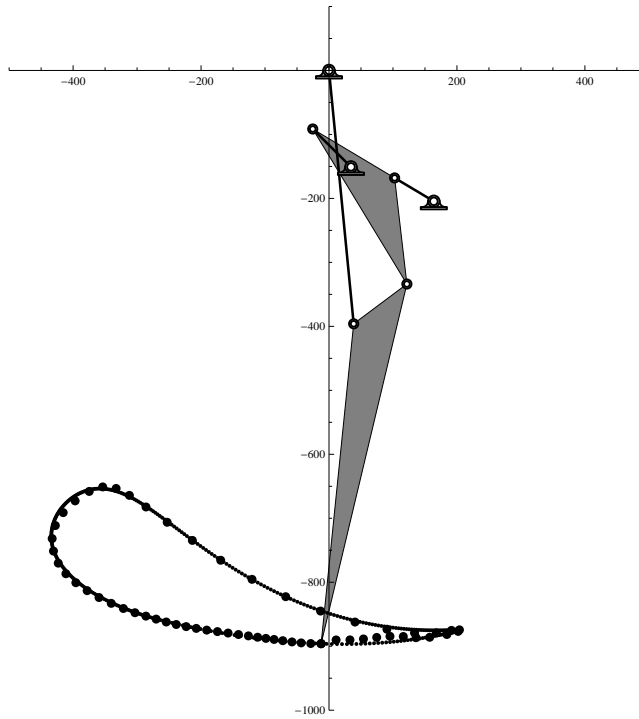


Figure B.1: Stephenson III Six-Bar Walking Linkage Solution No. 1

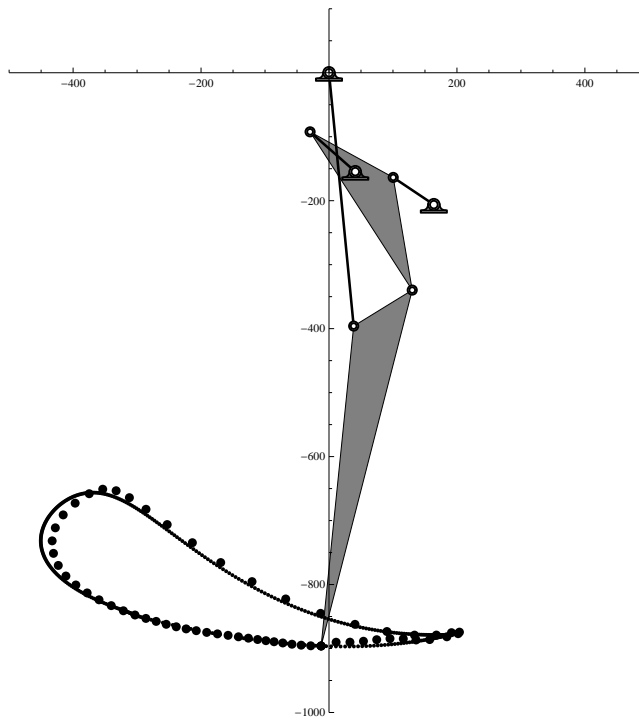


Figure B.2: Stephenson III Six-Bar Walking Linkage Solution No. 2

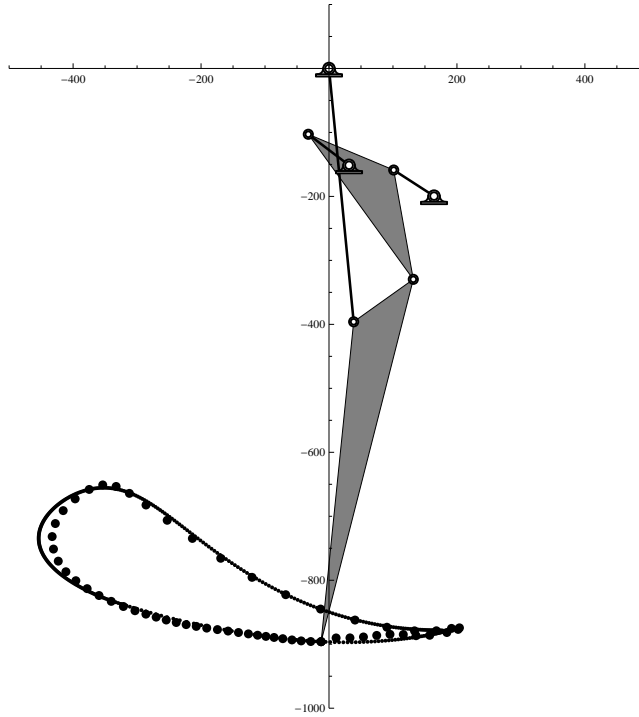


Figure B.3: Stephenson III Six-Bar Walking Linkage Solution No. 3

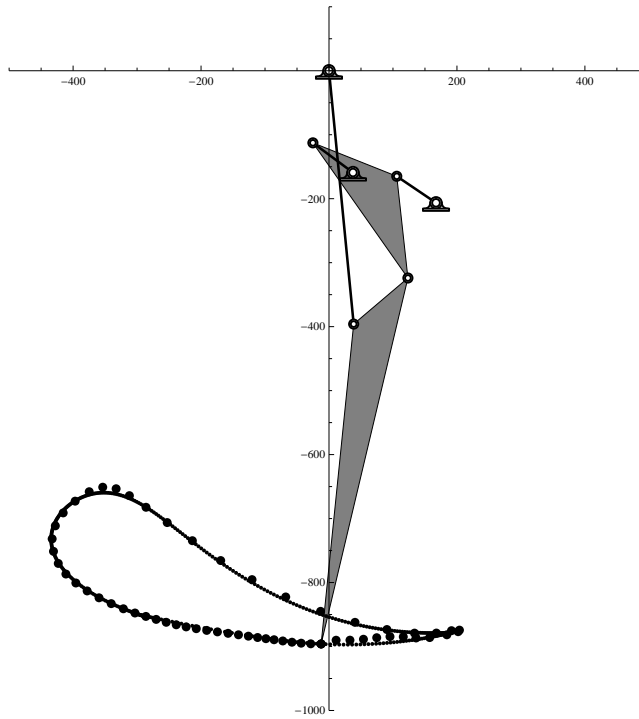


Figure B.4: Stephenson III Six-Bar Walking Linkage Solution No. 4

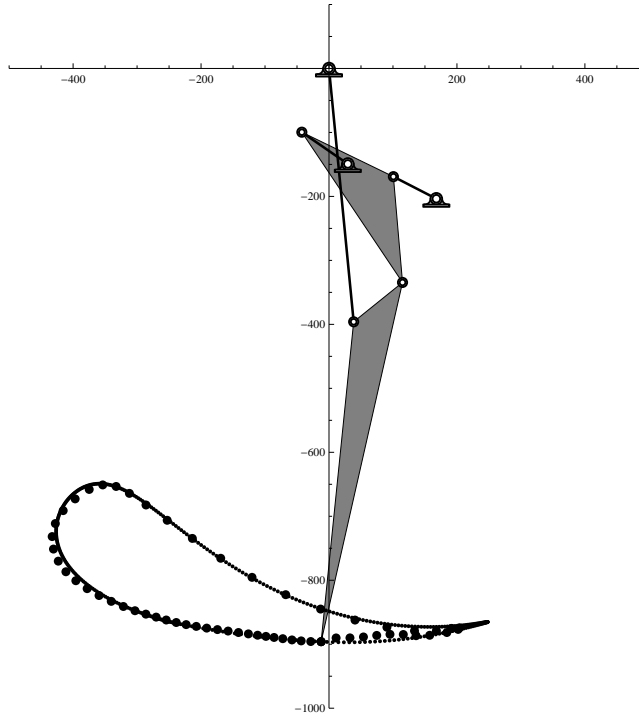


Figure B.5: Stephenson III Six-Bar Walking Linkage Solution No. 5

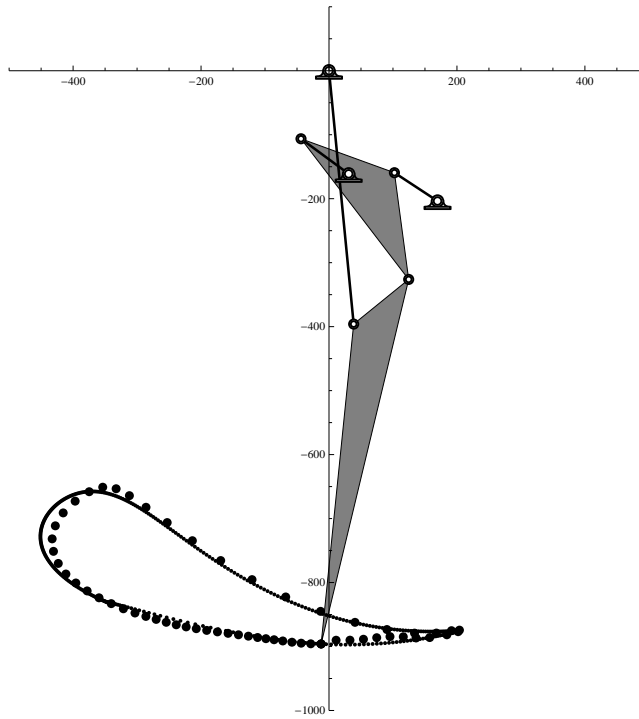


Figure B.6: Stephenson III Six-Bar Walking Linkage Solution No. 6

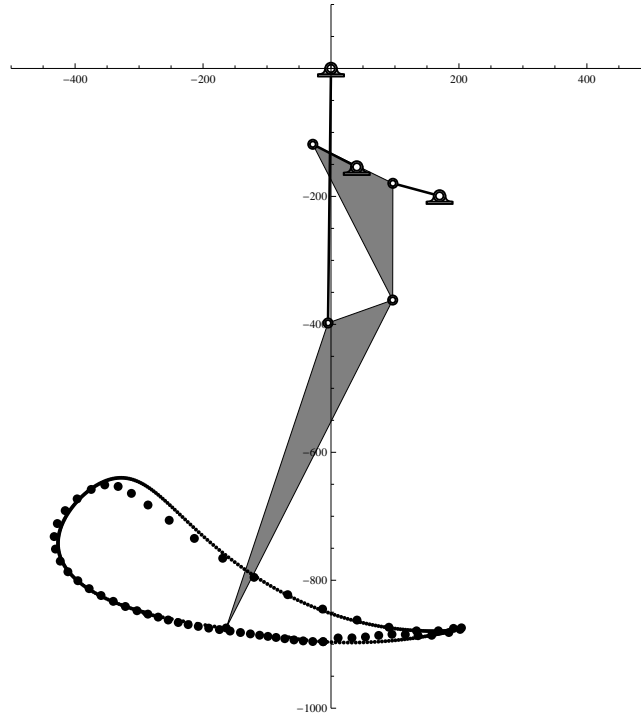


Figure B.7: Stephenson III Six-Bar Walking Linkage Solution No. 7

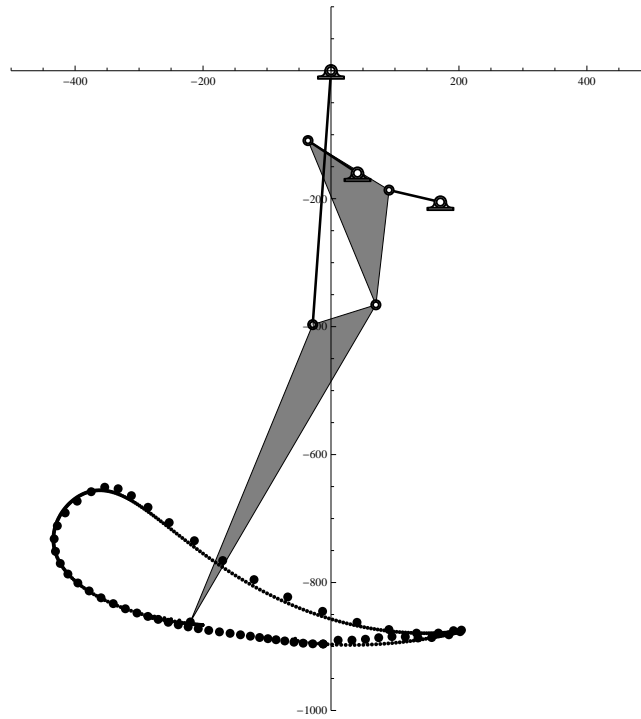


Figure B.8: Stephenson III Six-Bar Walking Linkage Solution No. 8

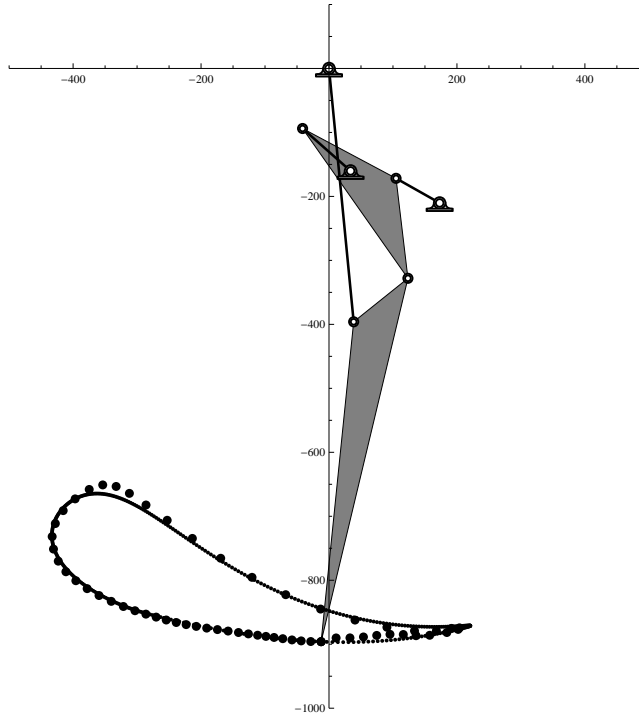


Figure B.9: Stephenson III Six-Bar Walking Linkage Solution No. 9

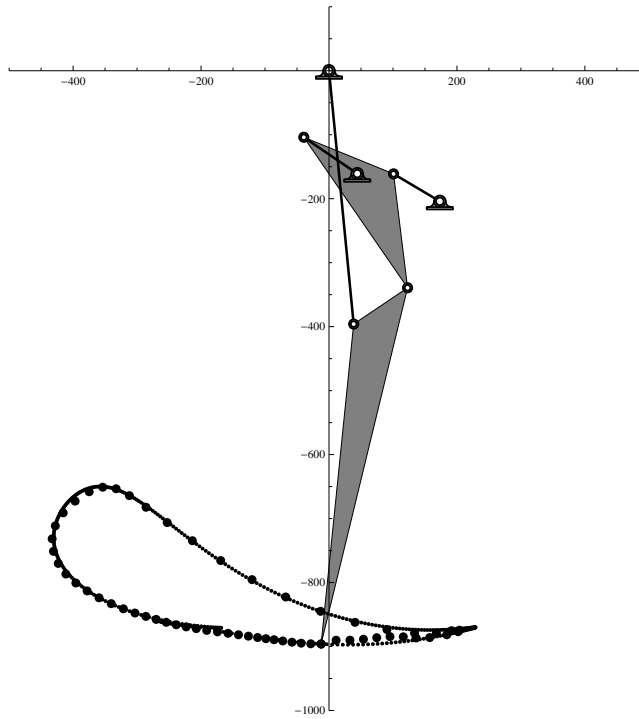


Figure B.10: Stephenson III Six-Bar Walking Linkage Solution No. 10

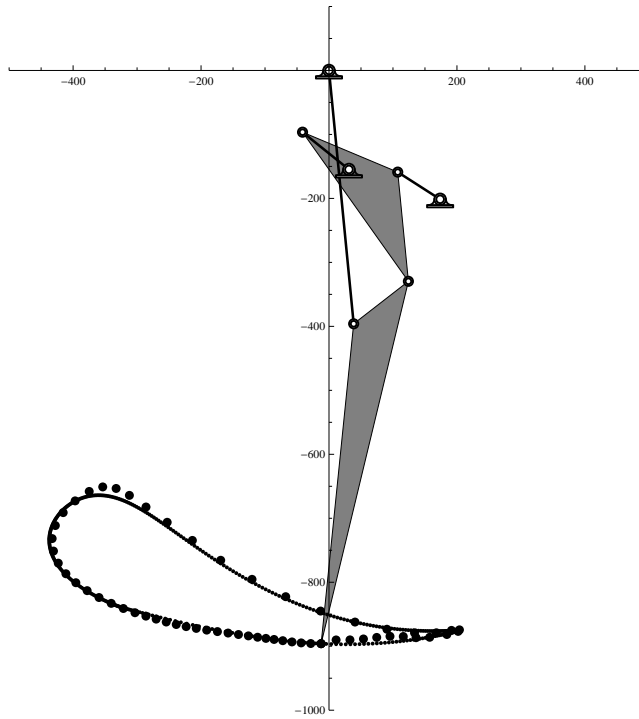


Figure B.11: Stephenson III Six-Bar Walking Linkage Solution No. 11

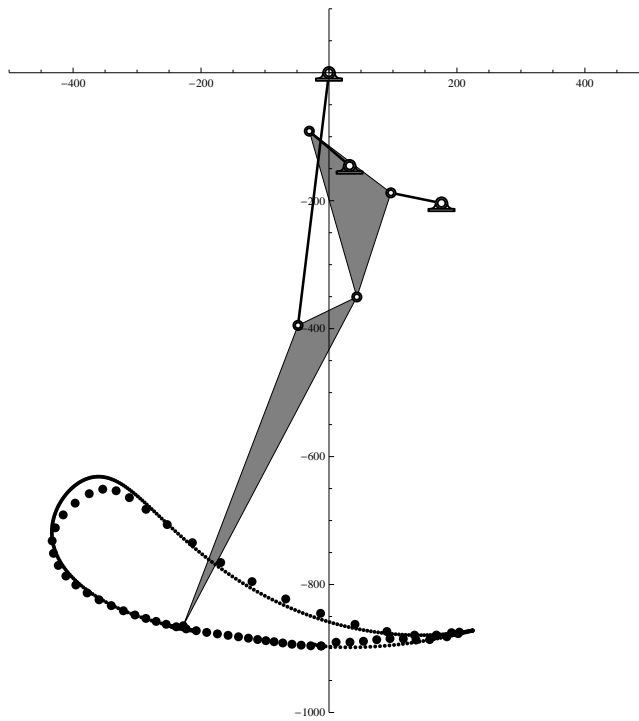


Figure B.12: Stephenson III Six-Bar Walking Linkage Solution No. 12

Appendix C

Mathematica Code

C.1 Hybrid Six Bar Synthesis Mathematica Code

Below is the Mathematica code for the computation of the hybrid six bar linkage procedure.

In[232]:=

```
DateString[]
```

Out[232]=

```
Fri 12 Jun 2015 01:22:06
```

Useful Functions

In[233]:=

```
LinkLength[a_, b_] := N[Sqrt[Dot[b - a, b - a]]];
```

In[234]:=

```
JointAngle[b_, c_] := ArcTan[Dot[b, c], Det[{b, c}]];
```

In[235]:=

```
Zmat[θ_] := {{Cos[θ], -Sin[θ], 0}, {Sin[θ], Cos[θ], 0}, {0, 0, 1}};
```

In[236]:=

```
Xmat[a_] := {{1, 0, a}, {0, 1, 0}, {0, 0, 1}};
```

In[237]:=

```
Disp[x_] := {{Cos[x[[1]]], -Sin[x[[1]]], x[[2]]},  
             {Sin[x[[1]]], Cos[x[[1]]], x[[3]]}, {0, 0, 1}};
```

Formulation of 3R with Task Positions

In[238]:=

```
rem = {{1, 0, 0}, {0, 1, 0}};
```

In[239]:=

```
data = {{16.0439 Degree, 0.5293, 1.3346},  
        {18.1263 Degree, -0.0668, 1.0855}, {26.8706 Degree, -0.3286, 0.5434},  
        {40.4033 Degree, -0.134, 0.1014}, {49.1602 Degree, 0.3804, 0.0741},  
        {40.5539 Degree, 0.9439, 0.495}, {23.1445 Degree, 1.1025, 1.0206}};
```

In[240]:=

```
npos = Length[data];
```

In[241]:=

```
dataRand = Table[{data[[i, 1]] + RandomReal[{-1 Degree, 1 Degree}],  
                 data[[i, 2]] + RandomReal[{-0.1, 0.1}],  
                 data[[i, 3]] + RandomReal[{-0.1, 0.1}]}, {i, Length[data]}];
```

In[242]:=

```
Imat = Table[IdentityMatrix[3], {i, npos}];
```

In[243]:=

```
position = Table[Disp[data[[i]]], {i, npos}];
```

In[244]:=

```
sc = 0.25;
```

```
In[245]:= orig = Table[rem.position[[i]].{0, 0, 1}, {i, npos}];
```

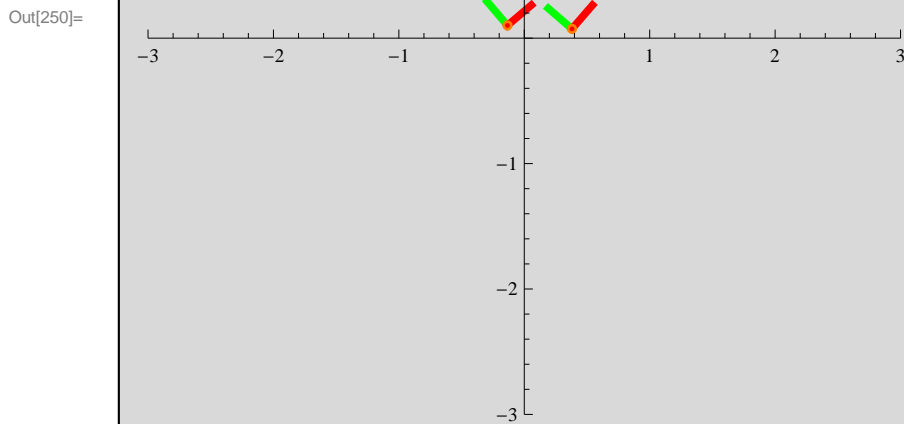
```
In[246]:= ex = Table[rem.position[[i]].{sc, 0, 1}, {i, npos}];
```

```
In[247]:= ey = Table[rem.position[[i]].{0, sc, 1}, {i, npos}];
```

```
In[248]:= frames = Table[{Thickness[0.01], Green, Line[{orig[[i]], ey[[i]]}], Red,
  Line[{orig[[i]], ex[[i]]}], Orange, Circle[orig[[i]], 0.01]}, {i, npos}];
```

```
In[249]:= range = {{-3, 3}, {-3, 3}};
```

```
In[250]:= task = Graphics[frames, Axes → True,
  AspectRatio → Automatic, PlotRange → range]
```



```
In[251]:= a1 = 1.25; a2 = 1.25; pt0 = {-1.25, -1.25};
```

```
In[252]:= gFrame = Disp[Flatten[{0 Degree, pt0}]]
```

```
Out[252]:= {{1, 0, -1.25}, {0, 1, -1.25}, {0, 0, 1}}
```

In[253]:=

```
hFrame = Disp[{0 Degree, 1.25, 0}]
```

Out[253]=

```
{{1, 0, 1.25}, {0, 1, 0}, {0, 0, 1}}
```

In[254]:=

```
 $\theta_1 = .; \theta_2 = .; \theta_3 = .;$ 
```

In[255]:=

```
KinEqns = Simplify[Zmat[ $\theta_1$ ].Xmat[a1].Zmat[ $\theta_2$ ].Xmat[a2].Zmat[ $\theta_3$ ]];
```

In[256]:=

```
Modposition =  
Table[Inverse[gFrame].position[[i]].Inverse[hFrame], {i, npos}];
```

In[257]:=

```
RRRInverseKinematics[Modposition_, a1_, a2_, sgn_] :=  
Module[{npos, dvec, s2,  $\theta_1$ ,  $\theta_2$ ,  $\theta_3$ ,  $\psi$ ,  $\alpha$ }, npos = Length[Modposition];  
dvec = Table[{Modposition[[i, 1, 3]], Modposition[[i, 2, 3]]}, {i, npos};  
s2 = Table[Norm[dvec[[i]]]^2, {i, npos};  
 $\theta_2$  = sgn * Table[1 * ArcCos[(s2[[i]] - a1^2 - a2^2) / (2 * a1 * a2)], {i, npos};  
 $\psi$  = Table[ArcTan[a1 + a2 * Cos[ $\theta_2$ [[i]]], a2 * Sin[ $\theta_2$ [[i]]], {i, npos};  
 $\theta_1$  = Table[ArcTan[dvec[[i, 1]], dvec[[i, 2]]] -  $\psi$ [[i]], {i, npos};  $\alpha$  =  
Table[ArcTan[Modposition[[i, 1, 1]], Modposition[[i, 2, 1]]], {i, npos};  
 $\theta_3$  = Table[ $\alpha$ [[i]] -  $\theta_1$ [[i]] -  $\theta_2$ [[i]], {i, npos}; { $\theta_1$ ,  $\theta_2$ ,  $\theta_3$ };
```

In[258]:=

```
{ $\theta_1$ ,  $\theta_2$ ,  $\theta_3$ } = RRRInverseKinematics[Modposition, a1, a2, -1];
```

In[259]:=

```
Chop [  
Table[MatrixForm[Chop[gFrame.Zmat[ $\theta_1$ [[i]]].Xmat[a1].Zmat[ $\theta_2$ [[i]]].Xmat[a2].  
Zmat[ $\theta_3$ [[i]]].hFrame] - position[[i]], {i, Length[data]}]]
```

Out[259]=

```
{ $\left(\begin{smallmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{smallmatrix}\right), \left(\begin{smallmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{smallmatrix}\right), \left(\begin{smallmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{smallmatrix}\right), \left(\begin{smallmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{smallmatrix}\right), \left(\begin{smallmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{smallmatrix}\right), \left(\begin{smallmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{smallmatrix}\right), \left(\begin{smallmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{smallmatrix}\right)}$ 
```

In[260]:=

```
ptA = Table[rem.gFrame.Zmat[ $\theta_1$ [[i]]].Xmat[a1].{0, 0, 1}, {i, npos}];
```

In[261]:=

```
ptD = Table[rem.gFrame.Zmat[ $\theta_1$ [[i]].  
Xmat[a1].Zmat[ $\theta_2$ [[i]]].Xmat[a2].{0, 0, 1}, {i, npos}];
```

3R Animation

```

In[262]:= count = 5;

In[263]:=  $\theta_{1m}$  = Append[ $\theta_1$ ,  $\theta_1[[1]]$ ];  $\theta_{2m}$  = Append[ $\theta_2$ ,  $\theta_2[[1]]$ ];
 $\theta_{3m}$  = Append[ $\theta_3$ ,  $\theta_3[[1]]$ ];

In[265]:=  $\theta_{1traj}$  = Flatten[Table[Table[
     $\theta_{1m}[[i]] + j * (\theta_{1m}[[i+1]] - \theta_{1m}[[i]]) / \text{count}$ , {j, 0, count}], {i, npos}]];

In[266]:=  $\theta_{2traj}$  = Flatten[Table[Table[
     $\theta_{2m}[[i]] + j * (\theta_{2m}[[i+1]] - \theta_{2m}[[i]]) / \text{count}$ , {j, 0, count}], {i, npos}]];

In[267]:=  $\theta_{3traj}$  = Flatten[Table[Table[
     $\theta_{3m}[[i]] + j * (\theta_{3m}[[i+1]] - \theta_{3m}[[i]]) / \text{count}$ , {j, 0, count}], {i, npos}]];

In[268]:= ntraj = Length[ $\theta_{1traj}$ ];

In[269]:= pE = Table[rem.gFrame.Zmat[ $\theta_{1traj}[[i]]$ ].Xmat[a1].{0, 0, 1}, {i, ntraj}];

In[270]:= pA = Table[rem.gFrame.Zmat[ $\theta_{1traj}[[i]]$ ].
    Xmat[a1].Zmat[ $\theta_{2traj}[[i]]$ ].Xmat[a2].{0, 0, 1}, {i, ntraj}];

In[271]:= eFrames = Table[gFrame.Zmat[ $\theta_{1traj}[[i]]$ ].Xmat[a1].
    Zmat[ $\theta_{2traj}[[i]]$ ].Xmat[a2].Zmat[ $\theta_{3traj}[[i]]$ ].hFrame, {i, ntraj}];

In[272]:= origin = Table[rem.eFrames[[i]].{0, 0, 1}, {i, ntraj}];

In[273]:= extraj = Table[rem.eFrames[[i]].{sc, 0, 1}, {i, ntraj}];

In[274]:= eytraj = Table[rem.eFrames[[i]].{0, sc, 1}, {i, ntraj}];

In[275]:= eframeDisplay =
    Table[{Line[{extraj[[i]], origin[[i]], eytraj[[i]]}], {i, ntraj}}];

```

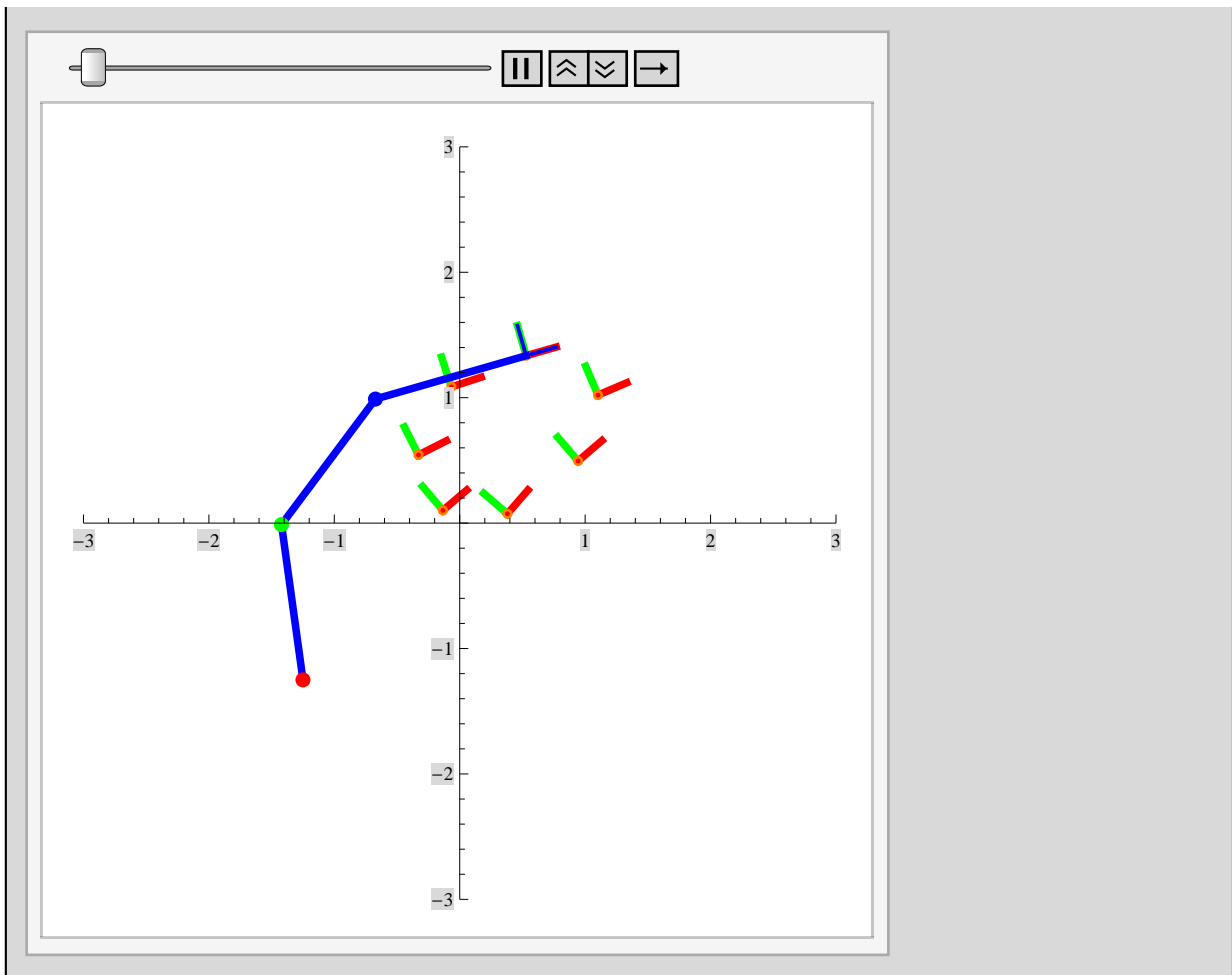
In[276]:=

```
RRRrobot = Table[Graphics[
  {frames, Blue, Thickness[0.01], Line[{ptO, pE[[i]], pA[[i]], origin[[i]]},
  Red, PointSize[0.02], Point[ptO], Green, PointSize[0.02], Point[pE[[i]]],
  Blue, Point[pA[[i]]], Thickness[0.005], Blue, eframeDisplay[[i]]},
  Axes → True, AspectRatio → Automatic, PlotRange → range], {i, ntraj}];
```

In[277]:=

```
ListAnimate[RRRrobot]
```

Out[277]=



Starting Positions

In[278]:=

```
StartSet = Subsets[Table[i, {i, npos}], {5}];
```

In[279]:=

```

θ1start = Table[
  {θ1[[StartSet[[i, 1]]]], θ1[[StartSet[[i, 2]]]], θ1[[StartSet[[i, 3]]]],
  θ1[[StartSet[[i, 4]]]], θ1[[StartSet[[i, 5]]]]}, {i, Length[StartSet]};

```

In[280]:=

```

θ2start = Table[
  {θ2[[StartSet[[i, 1]]]], θ2[[StartSet[[i, 2]]]], θ2[[StartSet[[i, 3]]]],
  θ2[[StartSet[[i, 4]]]], θ2[[StartSet[[i, 5]]]]}, {i, Length[StartSet]};

```

In[281]:=

```

θ3start = Table[
  {θ3[[StartSet[[i, 1]]]], θ3[[StartSet[[i, 2]]]], θ3[[StartSet[[i, 3]]]],
  θ3[[StartSet[[i, 4]]]], θ3[[StartSet[[i, 5]]]]}, {i, Length[StartSet]};

```

In[282]:=

```

SixBarSynthesis[θ1start_, θ2start_, θ3start_] :=
Module[{Out1, Final1, Out2, Final2},

FirstFourBar[θ1_, θ2_, θ3_] :=
Module[{B1, B2, B3, G1, W1, Sdisp1, ConstraintEqn,
  DesignEqn, sol1, sol, RemoveComplex1, Cranks1, OACB},
  B1 = Table[gFrame.Zmat[θ1[[i]]], {i, 5}];
  B2 = Table[gFrame.Zmat[θ1[[i]].Xmat[a1].Zmat[θ2[[i]]], {i, 5}];
  B3 = Table[gFrame.Zmat[θ1[[i]].
    Xmat[a1].Zmat[θ2[[i]].Xmat[a2].Zmat[θ3[[i]]], {i, 5}];
  G1 = {u, v, 1};
  W1 = {x, y, 1};
  Sdisp1 = Table[Chop[B2[[i]].Inverse[B2[[1]]]], {i, 5}];
  ConstraintEqn =
  Table[Expand[Dot[Sdisp1[[i]].W1 - G1, Sdisp1[[i]].W1 - G1]], {i, 5}];
  DesignEqn = Table[Chop[ConstraintEqn[[i + 1]] - ConstraintEqn[[1]]],
    {i, 5 - 1}];
  sol1 = NSolve[DesignEqn == {0, 0, 0, 0}];
  sol = Sort[{u, v, x, y} /. sol1];
  RemoveComplex1 = Chop[DeleteCases[
    Table[DeleteCases[sol[[i]], _Complex], {i, Length[sol]}], {}];
  Cranks1 = DeleteCases[RemoveComplex1, a_ /; {a[[1]], a[[2]], a[[3]],
    a[[4]]} == {ptO[[1]], ptO[[2]], ptA[[1, 1]], ptA[[1, 2]]}];
  OACB = Table[{ptO[[1]], ptO[[2]], ptA[[1, 1]], ptA[[1, 2]],
    Cranks1[[i, 1]], Cranks1[[i, 2]], Cranks1[[i, 3]],
    Cranks1[[i, 4]]}, {i, Length[Cranks1]};
  {OACB}];
Out1 = FirstFourBar[θ1start, θ2start, θ3start];
Final1 = Out1[[1]];

SecondFourBar[OACB_] :=
Module[{ptA1, ptC, ptB1, Apoints, B2, B3, Sdisp1, Bpoints,
  ψpos, B4, Sdisp2, Rdisp, G2, W2, ConstraintEqn2, DesignEqn2},

```



```

secondsol, sol2, RemoveComplex2, Cranks2, ptG, OABCDEFG},
ptA1 = ptA[[1]];
ptC = {OACB[[5]], OACB[[6]]};
ptB1 = {OACB[[7]], OACB[[8]]};
Apoints = ptA;
B2 = Table[gFrame.Zmat[θ1[[i]]].Xmat[a1].Zmat[θ2[[i]]], {i, 5}];
B3 = Table[gFrame.Zmat[θ1[[i]]].
  Xmat[a1].Zmat[θ2[[i]]].Xmat[a2].Zmat[θ3[[i]]], {i, 5}];
Sdisp1 = Table[Chop[B2[[i]].Inverse[B2[[1]]]], {i, 5}];
Bpoints =
  Table[rem.Sdisp1[[i]].{ptB1[[1]], ptB1[[2]], 1}, {i, Length[Sdisp1]}];
ψpos = Table[JointAngle[{1, 0}, Bpoints[[i]] - ptC], {i, 5}];
B4 = Table[Disp[{0, ptC[[1]], ptC[[2]]}.Zmat[ψpos[[i]]], {i, 5}];
Sdisp2 = Table[Chop[B3[[i]].Inverse[B3[[1]]]], {i, 5}];
Rdisp = Table[Chop[B4[[i]].Inverse[B4[[1]]]], {i, 5}];
G2 = {u, v, 1};
W2 = {x, y, 1};
ConstraintEqn2 = Table[Expand[Dot[Sdisp2[[i]].W2 - Rdisp[[i]].G2,
  Sdisp2[[i]].W2 - Rdisp[[i]].G2]], {i, 5}];
DesignEqn2 = Table[Chop[ConstraintEqn2[[i + 1]] - ConstraintEqn2[[1]]],
  {i, 5 - 1}];
secondsol = NSolve[DesignEqn2 == {0, 0, 0, 0}];
sol2 = Sort[{u, v, x, y} /. secondsol];
RemoveComplex2 = Chop[DeleteCases[
  Table[DeleteCases[sol2[[i]], _Complex], {i, Length[sol2]}], {}];
Cranks2 = DeleteCases[RemoveComplex2, a_ /; {a[[1]], a[[2]], a[[3]],
  a[[4]]} == {ptB1[[1]], ptB1[[2]], ptD[[1, 1]], ptD[[1, 2]]}];
ptG = {data[[1, 2]], data[[1, 3]]};
OABCDEFG = Table[
  Flatten[{ptO, ptA1, ptB1, ptC, ptD[[1]], Cranks2[[i, 3]], Cranks2[[i, 4]],
    Cranks2[[i, 1]], Cranks2[[i, 2]], ptG}], {i, Length[Cranks2]}];
{OABCDEFG}];
Out2 = Flatten[Table[SecondFourBar[Final1[[i]]], {i, Length[Final1]}];
Final2 = Table[{Out2[[i]], Out2[[i + 1]], Out2[[i + 2]], Out2[[i + 3]],
  Out2[[i + 4]], Out2[[i + 5]], Out2[[i + 6]], Out2[[i + 7]], Out2[[i + 8]],
  Out2[[i + 9]], Out2[[i + 10]], Out2[[i + 11]], Out2[[i + 12]],
  Out2[[i + 13]], Out2[[i + 14]], Out2[[i + 15]]}, {i, 1, Length[Out2], 16}];
{Final2}] (*OABCDEFG*)

```

In[283]:=

```

Initial = Flatten[Table[SixBarSynthesis[θ1start[[i]],
  θ2start[[i]], θ3start[[i]]], {i, Length[StartSet]}];

```

In[284]:=

```
ReOrg = Table[{Initial[[i]], Initial[[i + 1]], Initial[[i + 2]],
  Initial[[i + 3]], Initial[[i + 4]], Initial[[i + 5]], Initial[[i + 6]],
  Initial[[i + 7]], Initial[[i + 8]], Initial[[i + 9]], Initial[[i + 10]],
  Initial[[i + 11]], Initial[[i + 12]], Initial[[i + 13]],
  Initial[[i + 14]], Initial[[i + 15]]}, {i, 1, Length[Initial], 16}];
```

Linkage Synthesis

In[285]:=

```
FirstFourBar[θ1_, θ2_, θ3_, start_] :=
Module[{B1, B2, B3, G1, W1, G2, W2, Sdisp1, ConstraintEqn1,
  DesignEqn1, ConstraintEqn2, DesignEqn2, Error, OACB, sol, sort},
  B1 = Table[gFrame.Zmat[θ1[[i]]], {i, npos}];
  B2 = Table[gFrame.Zmat[θ1[[i]].Xmat[a1].Zmat[θ2[[i]]], {i, npos}];
  B3 = Table[gFrame.Zmat[θ1[[i]].Xmat[a1].
    Zmat[θ2[[i]].Xmat[a2].Zmat[θ3[[i]]], {i, npos}];
  G1 = {ptO[[1]], ptO[[2]], 1};
  W1 = {ptA[[1, 1]], ptA[[1, 2]], 1};
  G2 = {Cx, Cy, 1};
  W2 = {Bx, By, 1};
  Sdisp1 = Table[Chop[B2[[i]].Inverse[B2[[1]]]], {i, npos}];
  ConstraintEqn1 =
  Table[Expand[Dot[Sdisp1[[i]].W1 - G1, Sdisp1[[i]].W1 - G1]], {i, npos}];
  DesignEqn1 = Table[Chop[ConstraintEqn1[[i + 1]] - ConstraintEqn1[[1]]],
    {i, npos - 1}];
  ConstraintEqn2 = Table[Expand[Dot[Sdisp1[[i]].W2 - G2, Sdisp1[[i]].W2 - G2]],
    {i, npos}];
  DesignEqn2 = Table[Chop[ConstraintEqn2[[i + 1]] - ConstraintEqn2[[1]]],
    {i, npos - 1}];
  Error = Total[Table[(DesignEqn1[[i]])^2, {i, Length[DesignEqn1]}] +
    Total[Table[(DesignEqn2[[i]])^2, {i, Length[DesignEqn2]}]];
  OACB = FindMinimum[Error, {{Cx, start[[7]]}, {Cy, start[[8]]},
    {Bx, start[[5]]}, {By, start[[6]]}}, Method → "LevenbergMarquardt"];
  sol = Chop[{ptO[[1]], ptO[[2]], ptA[[1, 1]], ptA[[1, 2]], Cx /. OACB[[2]],
    Cy /. OACB[[2]], Bx /. OACB[[2]], By /. OACB[[2]], OACB[[1]]}];
  {sol}]
```

In[286]:=

```
Out1 = Flatten[Table[FirstFourBar[θ1, θ2, θ3, ReOrg[[i]]], {i, Length[ReOrg]}];
```

In[287]:=

```
OACB = Table[{Out1[[i]], Out1[[i + 1]], Out1[[i + 2]], Out1[[i + 3]],
  Out1[[i + 4]], Out1[[i + 5]], Out1[[i + 6]], Out1[[i + 7]], Out1[[i + 8]]},
  {i, 1, Length[Out1], 9} ; (*OACB, Error*)
```

In[288]:=

```

FirstSort[OACB_] :=
Module[{sort1, sort2, sort3},
  sort1 = DeleteCases[OACB, a_ /; Norm[{a[[1]], a[[2]], a[[3]], a[[4]]} -
    {a[[5]], a[[6]], a[[7]], a[[8]]}] < 0.1];
  sort2 = Union[sort1, SameTest -> (Norm[#1 - #2] < 0.1 &)];
  sort3 =
    Union[sort2, SameTest -> (Norm[{#1[[1]], #1[[2]] #1[[3]] #1[[4]], #1[[5]],
      #1[[6]], #1[[7]], #1[[8]]} - {#1[[5]], #1[[6]] #1[[7]] #1[[8]],
      #1[[1]], #1[[2]], #1[[3]], #1[[4]]}] < 0.1 &)];
  {sort3}];

```

In[289]:=

```

Out2 = Flatten[FirstSort[OACB]];

```

In[290]:=

```

SortOACB = Table[{Out2[[i]], Out2[[i + 1]], Out2[[i + 2]],
  Out2[[i + 3]], Out2[[i + 4]], Out2[[i + 5]], Out2[[i + 6]],
  Out2[[i + 7]], Out2[[i + 8]]}, {i, 1, Length[Out2], 9}];

```

In[291]:=

```

SecondFourBar[OACB_,  $\theta 1$ _,  $\theta 2$ _,  $\theta 3$ _, start_] :=
Module[{FirstError, ptA1, ptC, ptB1, B2, B3, Apoints, Sdisp1, Bpoints,  $\psi$ pos,
  B4, Sdisp2, Rdisp, Bx, By, G1, W1, G2, W2, ConstraintEqn1, DesignEqn1,
  ConstraintEqn2, DesignEqn2, Error, BDFE, SecondError, sol},
FirstError = OACB[[9]];
ptA1 = ptA[[1]];
ptC = {OACB[[5]], OACB[[6]]};
ptB1 = {OACB[[7]], OACB[[8]]};
B2 = Table[gFrame.Zmat[ $\theta 1$ [[i]].Xmat[a1].Zmat[ $\theta 2$ [[i]]], {i, npos}];
B3 = Table[gFrame.Zmat[ $\theta 1$ [[i]].Xmat[a1].
  Zmat[ $\theta 2$ [[i]].Xmat[a2].Zmat[ $\theta 3$ [[i]]], {i, npos}];
Apoints = ptA;
Sdisp1 = Table[Chop[B2[[i]].Inverse[B2[[1]]]], {i, npos}];
Bpoints =
  Table[rem.Sdisp1[[i]].{ptB1[[1]], ptB1[[2]], 1}, {i, Length[Sdisp1]}];
 $\psi$ pos = Table[JointAngle[{1, 0}, Bpoints[[i]] - ptC], {i, npos}];
B4 = Table[Disp[{0, ptC[[1]], ptC[[2]]}.Zmat[ $\psi$ pos[[i]]], {i, npos}];
Sdisp2 = Table[Chop[B3[[i]].Inverse[B3[[1]]]], {i, npos}];
Rdisp = Table[Chop[B4[[i]].Inverse[B4[[1]]]], {i, npos}];
Bx = OACB[[7]];
By = OACB[[8]];
G1 = {Bx, By, 1};
W1 = {Dx, Dy, 1};
G2 = {Fx, Fy, 1};
W2 = {Ex, Ey, 1};
ConstraintEqn1 = Table[Expand[Dot[Sdisp2[[i]].W1 - Rdisp[[i]].G1,
  Sdisp2[[i]].W1 - Rdisp[[i]].G1], {i, npos}];
DesignEqn1 = Table[Chop[ConstraintEqn1[[i + 1]] - ConstraintEqn1[[1]]],
  {i, npos - 1}];
ConstraintEqn2 = Table[Expand[Dot[Sdisp2[[i]].W2 - Rdisp[[i]].G2,
  Sdisp2[[i]].W2 - Rdisp[[i]].G2], {i, npos}];
DesignEqn2 = Table[Chop[ConstraintEqn2[[i + 1]] - ConstraintEqn2[[1]]],
  {i, npos - 1}];
Error = Total[Table[(DesignEqn1[[i]])^2, {i, Length[DesignEqn1]}]] +
  Total[Table[(DesignEqn2[[i]])^2, {i, Length[DesignEqn2]}]];
BDFE = FindMinimum[Error, {{Dx, start[[9]]}, {Dy, start[[10]]},
  {Fx, start[[13]]}, {Fy, start[[14]]}, {Ex, start[[11]]},
  {Ey, start[[12]]}}, Method -> "LevenbergMarquardt"];
SecondError = BDFE[[1]];
sol = Flatten[Chop[{ptO, ptA1, ptB1, ptC,
  Dx /. BDFE[[2]], Dy /. BDFE[[2]], Ex /. BDFE[[2]], Ey /. BDFE[[2]],
  Fx /. BDFE[[2]], Fy /. BDFE[[2]], FirstError, SecondError}]];
{sol}]

```

In[292]:=

```

Out3 = Flatten[Table[Table[SecondFourBar[SortOACB[[j]],  $\theta 1$ ,  $\theta 2$ ,  $\theta 3$ , ReOrg[[i]]],
  {i, Length[ReOrg]}], {j, Length[SortOACB]}];

```

In[293]:=

```
OABCDE = Table[{Out3[[i]], Out3[[i + 1]], Out3[[i + 2]], Out3[[i + 3]],
  Out3[[i + 4]], Out3[[i + 5]], Out3[[i + 6]], Out3[[i + 7]], Out3[[i + 8]],
  Out3[[i + 9]], Out3[[i + 10]], Out3[[i + 11]], Out3[[i + 12]],
  Out3[[i + 13]], Out3[[i + 14]], Out3[[i + 15]]}, {i, 1, Length[Out3], 16};
```

In[294]:=

```
SecondSort[OABCDE_] :=
Module[{sort1, sort2, sort3},
  sort1 = DeleteCases[OABCDE, a_ /; Norm[{a[[5]], a[[6]], a[[9]], a[[10]]} -
    {a[[11]], a[[12]], a[[13]], a[[14]]}] < 0.1];
  sort2 = Union[sort1, SameTest -> (Norm[#1 - #2] < 0.1 &)];
  sort3 = Union[sort2,
    SameTest -> (Norm[{#1[[5]], #1[[6]] #1[[9]] #1[[10]], #1[[13]], #1[[14]],
      #1[[11]], #1[[12]]} - {#1[[13]], #1[[14]] #1[[11]] #1[[12]],
      #1[[5]], #1[[6]], #1[[9]], #1[[10]]}] < 0.1 &)];
  {sort3}]
```

In[295]:=

```
Out4 = SecondSort[OABCDE];
```

In[296]:=

```
FinalSolutions = Out4[[1]]
```

Out[296]=

```
{{-1.25, -1.25, -1.42086, -0.0117321, -0.93629,
  0.830396, -0.973341, 0.0682094, -0.652326, 0.981527,
  -1.0133, 0.800191, -0.7957, 1.09761, 0.00498724, 0.00240411},
{-1.25, -1.25, -1.42086, -0.0117321, -0.93629, 0.830396,
  -0.973341, 0.0682094, -0.652326, 0.981527, -0.912196,
  1.12621, -0.831084, 0.970743, 0.00498724, 0.000740283}}
```

In[297]:=

```
FinalSolutions // MatrixForm
```

Out[297]//MatrixForm=

```
( -1.25 -1.25 -1.42086 -0.0117321 -0.93629 0.830396 -0.973341 0.0682094 -0.6
 -1.25 -1.25 -1.42086 -0.0117321 -0.93629 0.830396 -0.973341 0.0682094 -0.6
```

In[298]:=

```
(*Export["solutions.xls", FinalSolutions]*)
```

In[299]:=

```
i = 2;
```

In[300]:=

```
pointO = {FinalSolutions[[i, 1]], FinalSolutions[[i, 2]]}
```

Out[300]=

```
{-1.25, -1.25}
```

```
In[301]:= pointA = {FinalSolutions[[i, 3]], FinalSolutions[[i, 4]]}
```

```
Out[301]= {-1.42086, -0.0117321}
```

```
In[302]:= pointB = {FinalSolutions[[i, 5]], FinalSolutions[[i, 6]]}
```

```
Out[302]= {-0.93629, 0.830396}
```

```
In[303]:= pointC = {FinalSolutions[[i, 7]], FinalSolutions[[i, 8]]}
```

```
Out[303]= {-0.973341, 0.0682094}
```

```
In[304]:= pointD = {FinalSolutions[[i, 9]], FinalSolutions[[i, 10]]}
```

```
Out[304]= {-0.652326, 0.981527}
```

```
In[305]:= pointE = {FinalSolutions[[i, 11]], FinalSolutions[[i, 12]]}
```

```
Out[305]= {-0.912196, 1.12621}
```

```
In[306]:= pointF = {FinalSolutions[[i, 13]], FinalSolutions[[i, 14]]}
```

```
Out[306]= {-0.831084, 0.970743}
```

```
In[307]:= Jointsizes = 0.025;
```

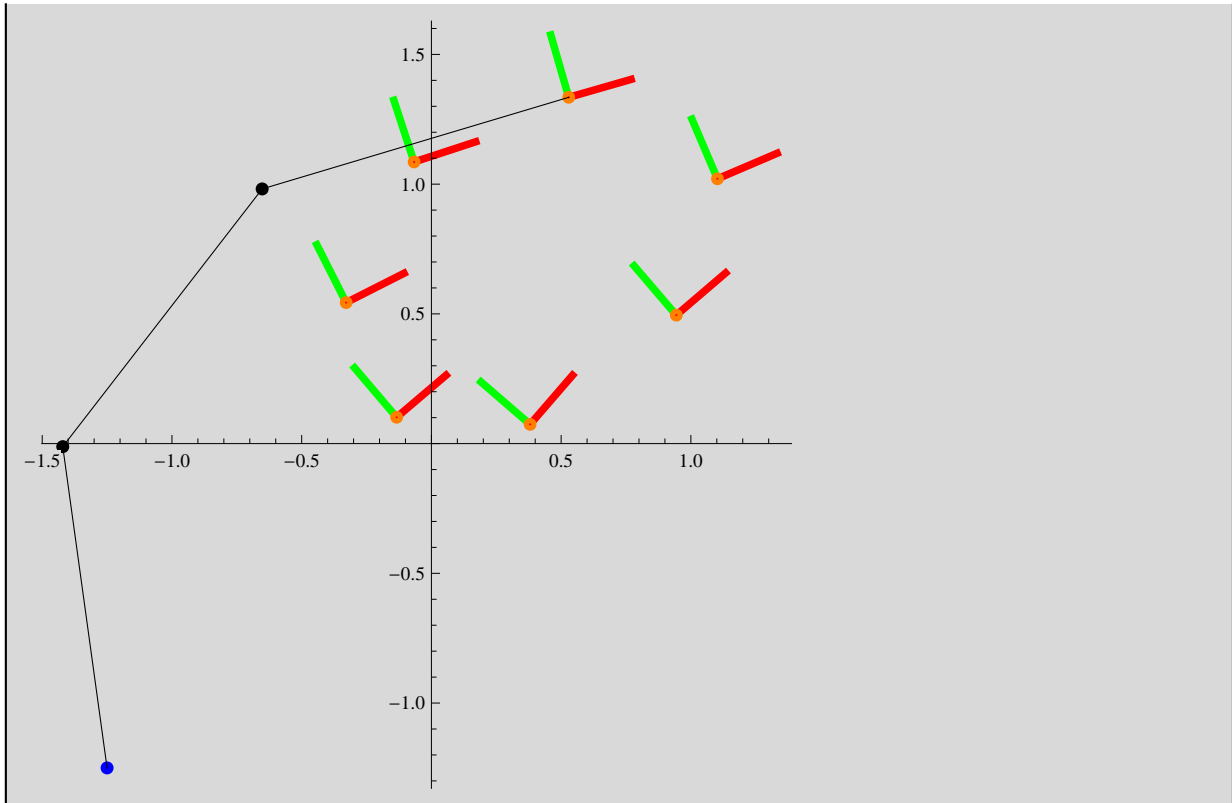
```
In[308]:= data[[1, 2]]
```

```
Out[308]= 0.5293
```

In[309]:=

```
RRR = Graphics[{frames, Blue, Disk[pointO, Jointsize],
  Black, Disk[pointA, Jointsize], Black, Disk[pointD, Jointsize],
  Line[{pointO, pointA, pointD, {data[[1, 2]], data[[1, 3]]}}]},
  Axes → Automatic, AspectRatio → Automatic]
```

Out[309]=



In[310]:=

```
(*Export["RRR_2.pdf",RRR]*)
```

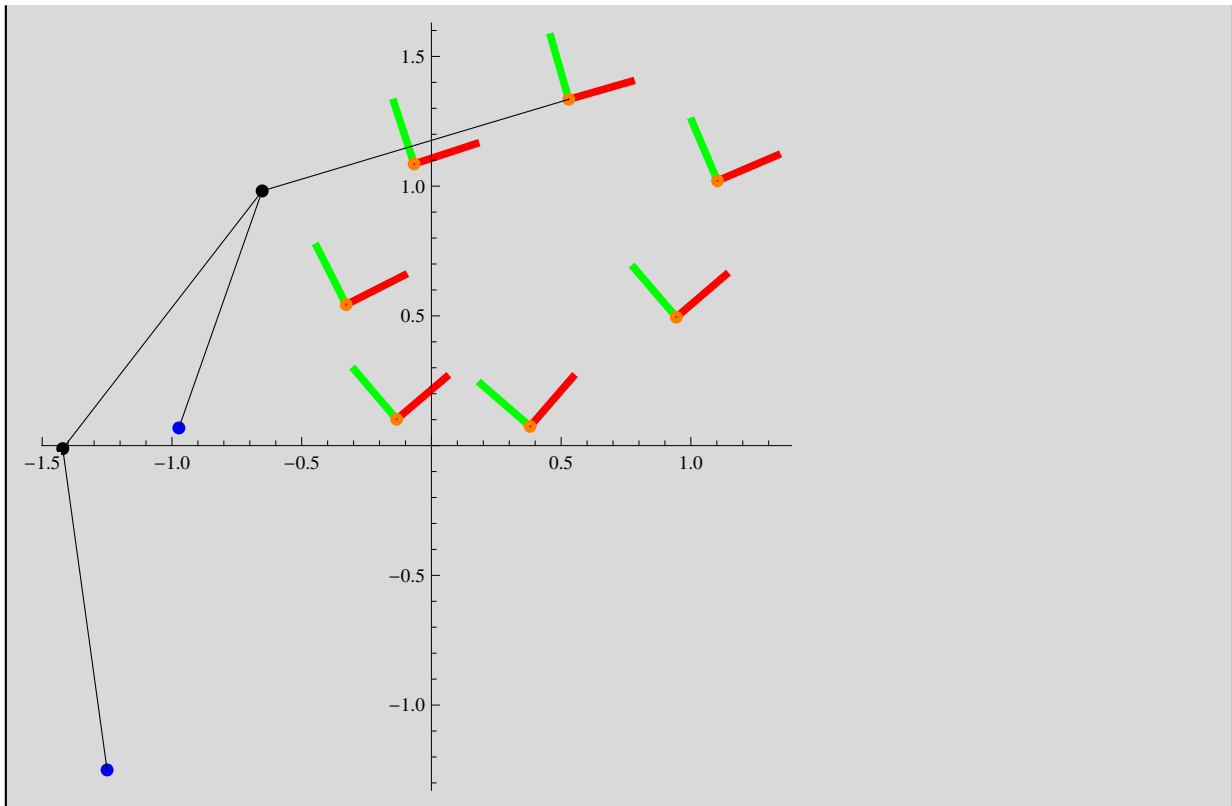
In[311]:=

```

first4R = Graphics[
  {frames, Blue, Disk[pointO, Jointsizesize], Black, Disk[pointA, Jointsizesize],
    Disk[pointD, Jointsizesize], Blue, Disk[pointC, Jointsizesize], Black,
    Line[{pointO, pointA, pointD, {data[[1, 2]], data[[1, 3]]}},
    Line[{pointD, pointC}], Axes → Automatic, AspectRatio → Automatic]

```

Out[311]=



In[312]:=

```

(*Export["first4R_2.pdf",first4R]*)

```


C.2 Hybrid Six Bar Synthesis Mathematica Code with Randomized Task Positions

Below is the Mathematica code for the computation of the hybrid six bar linkage procedure with randomized task positions.

In[315]:=

```
DateString[]
```

Out[315]=

```
Fri 12 Jun 2015 01:23:40
```

Useful Functions

Formulation of 3R with Task Positions

In[321]:=

```
rem = {{1, 0, 0}, {0, 1, 0}};
```

In[322]:=

```
data = {{16.0439 Degree, 0.5293, 1.3346},  
        {18.1263 Degree, -0.0668, 1.0855}, {26.8706 Degree, -0.3286, 0.5434},  
        {40.4033 Degree, -0.134, 0.1014}, {49.1602 Degree, 0.3804, 0.0741},  
        {40.5539 Degree, 0.9439, 0.495}, {23.1445 Degree, 1.1025, 1.0206}};
```

In[323]:=

```
npos = Length[data];
```

In[324]:=

```
loops = 100;
```

In[325]:=

```
dataRand = Table[Table[{data[[i, 1]] + RandomReal[{-1 Degree, 1 Degree}],  
                        data[[i, 2]] + RandomReal[{-0.1, 0.1}],  
                        data[[i, 3]] + RandomReal[{-0.1, 0.1}]], {i, Length[data]}, {j, loops}];
```

In[326]:=

```
SixBarFunction[data_] :=  
Module[{Imat, position, sc, orig, ex, ey, frames, range, task,  
        a1, a2, pt0, gFrame, hFrame, KinEqns, Modposition, check, ptA, ptD,  
        count,  $\theta$ 1m,  $\theta$ 1traj,  $\theta$ 2traj,  $\theta$ 3traj, ntraj, pE, pA, eFrames,  
        origin, extraj, eytraj, eframeDisplay, RRRrobot, animateRRR,  
        StartSet,  $\theta$ 1start,  $\theta$ 2start,  $\theta$ 3start, Initial, ReOrg, Out1, OACD,  
        Out2, SortOACB, Out3, OABCDEF, Out4, FinalSolutions, OACB},  
        Imat = Table[IdentityMatrix[3], {i, npos}];  
        position = Table[Disp[data[[i]]], {i, npos}];  
        sc = 0.25;  
        orig = Table[rem.position[[i]].{0, 0, 1}, {i, npos}];  
        ex = Table[rem.position[[i]].{sc, 0, 1}, {i, npos}];  
        ey = Table[rem.position[[i]].{0, sc, 1}, {i, npos}];  
        frames =  
        Table[{Thickness[0.01], Green, Line[{orig[[i]], ey[[i]]}], Red, Line[  
            {orig[[i]], ex[[i]]}], Orange, Circle[orig[[i]], 0.01]}, {i, npos}];  
        range = {{-3, 3}, {-3, 3}};  
        task =
```

```

Graphics[frames, Axes → True, AspectRatio → Automatic, PlotRange → range];
a1 = 1.25; a2 = 1.25; ptO = {-1.25, -1.25};
gFrame = Disp[Flatten[{0 Degree, ptO}]];
hFrame = Disp[{0 Degree, 1.25, 0}];
θ1 = .; θ2 = .; θ3 = .;
KinEqns = Simplify[Zmat[θ1].Xmat[a1].Zmat[θ2].Xmat[a2].Zmat[θ3]];
Modposition =
  Table [Inverse[gFrame].position[[i]].Inverse[hFrame], {i, npos}];

RRRInverseKinematics[Modposition_, a1_, a2_, sgn_] :=
Module[{npos, dvec, s2, θ1, θ2, θ3, ψ, α, npos = Length [Modposition];
  dvec = Table [{Modposition[[i, 1, 3]], Modposition[[i, 2, 3]]}, {i, npos}];
  s2 = Table [Norm[dvec[[i]]]^2, {i, npos}];
  θ2 = sgn * Table [1 * ArcCos[(s2[[i]] - a1^2 - a2^2) / (2 * a1 * a2)], {i, npos}];
  ψ = Table [ArcTan[a1 + a2 * Cos[θ2[[i]]], a2 * Sin[θ2[[i]]], {i, npos}];
  θ1 = Table [ArcTan[dvec[[i, 1]], dvec[[i, 2]]] - ψ[[i]], {i, npos}]; α =
  Table [ArcTan[Modposition[[i, 1, 1]], Modposition[[i, 2, 1]]], {i, npos}];
  θ3 = Table [α[[i]] - θ1[[i]] - θ2[[i]], {i, npos}]; {θ1, θ2, θ3}];

{θ1, θ2, θ3} = RRRInverseKinematics[Modposition, a1, a2, -1];
check = Chop [ Table [
  MatrixForm[Chop[gFrame.Zmat[θ1[[i]]].Xmat[a1].Zmat[θ2[[i]]].Xmat[a2].
  Zmat[θ3[[i]]].hFrame] - position[[i]], {i, Length[data]}]];
ptA = Table[rem.gFrame.Zmat[θ1[[i]]].Xmat[a1].{0, 0, 1}, {i, npos}];
ptD = Table[rem.gFrame.Zmat[θ1[[i]]].
  Xmat[a1].Zmat[θ2[[i]]].Xmat[a2].{0, 0, 1}, {i, npos}];
count = 5;
θ1m = Append[θ1, θ1[[1]]];
θ2m = Append[θ2, θ2[[1]]]; θ3m = Append[θ3, θ3[[1]]];
θ1traj = Flatten[Table[Table[θ1m[[i]] + j * (θ1m[[i + 1]] - θ1m[[i]]) / count,
  {j, 0, count}], {i, npos}]];
θ2traj = Flatten[Table[Table[θ2m[[i]] + j * (θ2m[[i + 1]] - θ2m[[i]]) / count,
  {j, 0, count}], {i, npos}]];
θ3traj = Flatten[Table[Table[θ3m[[i]] + j * (θ3m[[i + 1]] - θ3m[[i]]) / count,
  {j, 0, count}], {i, npos}]];
ntraj = Length[θ1traj];
pE = Table[rem.gFrame.Zmat[θ1traj[[i]]].Xmat[a1].{0, 0, 1}, {i, ntraj}];
pA = Table[rem.gFrame.Zmat[θ1traj[[i]]].
  Xmat[a1].Zmat[θ2traj[[i]]].Xmat[a2].{0, 0, 1}, {i, ntraj}];
eFrames = Table[gFrame.Zmat[θ1traj[[i]]].Xmat[a1].Zmat[θ2traj[[i]]].
  Xmat[a2].Zmat[θ3traj[[i]]].hFrame, {i, ntraj}];
origin = Table[rem.eFrames[[i]].{0, 0, 1}, {i, ntraj}];
extraj = Table[rem.eFrames[[i]].{sc, 0, 1}, {i, ntraj}];
eytraj = Table[rem.eFrames[[i]].{0, sc, 1}, {i, ntraj}];
eframeDisplay =
  Table[{Line[{extraj[[i]], origin[[i]], eytraj[[i]]}], {i, ntraj}];
RRRrobot = Table[Graphics[{frames, Blue, Thickness[0.01],

```

```

Line[{ptO, pE[[i]], pA[[i]], origin[[i]]}, Red, PointSize[0.02],
Point[ptO], Green, PointSize[0.02], Point[pE[[i]]], Blue,
Point[pA[[i]]], Thickness[0.005], Blue, eframeDisplay[[i]]},
Axes → True, AspectRatio → Automatic, PlotRange → range], {i, ntraj}];
animateRRR = ListAnimate[RRRrobot];
StartSet = Subsets[Table[i, {i, npos}], {5}];
θ1start = Table[
  {θ1[[StartSet[[i, 1]]]], θ1[[StartSet[[i, 2]]]], θ1[[StartSet[[i, 3]]]],
  θ1[[StartSet[[i, 4]]]], θ1[[StartSet[[i, 5]]]]}, {i, Length[StartSet]};
θ2start = Table[{θ2[[StartSet[[i, 1]]]], θ2[[StartSet[[i, 2]]]],
  θ2[[StartSet[[i, 3]]]], θ2[[StartSet[[i, 4]]]],
  θ2[[StartSet[[i, 5]]]]}, {i, Length[StartSet]};
θ3start = Table[{θ3[[StartSet[[i, 1]]]], θ3[[StartSet[[i, 2]]]],
  θ3[[StartSet[[i, 3]]]], θ3[[StartSet[[i, 4]]]],
  θ3[[StartSet[[i, 5]]]]}, {i, Length[StartSet]};

SixBarSynthesis[θ1start_, θ2start_, θ3start_] :=
Module[{Out1, Final1, Out2, Final2},

FirstFourBar[θ1_, θ2_, θ3_] :=
Module[{B1, B2, B3, G1, W1, Sdisp1, ConstraintEqn,
  DesignEqn, soll, sol, RemoveComplex1, Cranks1, OACB},
  B1 = Table[gFrame.Zmat[θ1[[i]]], {i, 5}];
  B2 = Table[gFrame.Zmat[θ1[[i]].Xmat[a1].Zmat[θ2[[i]]], {i, 5}];
  B3 = Table[gFrame.Zmat[θ1[[i]].
    Xmat[a1].Zmat[θ2[[i]].Xmat[a2].Zmat[θ3[[i]]], {i, 5}];
  G1 = {u, v, 1};
  W1 = {x, y, 1};
  Sdisp1 = Table[Chop[B2[[i]].Inverse[B2[[1]]]], {i, 5}];
  ConstraintEqn =
  Table[Expand[Dot[Sdisp1[[i]].W1 - G1, Sdisp1[[i]].W1 - G1]], {i, 5}];
  DesignEqn = Table[Chop[ConstraintEqn[[i + 1]] - ConstraintEqn[[1]]],
  {i, 5 - 1}];
  soll = NSolve[DesignEqn == {0, 0, 0, 0}];
  sol = Sort[{u, v, x, y} /. soll];
  RemoveComplex1 = Chop[DeleteCases[
  Table[DeleteCases[sol[[i]], _Complex], {i, Length[sol]}], {}];
  Cranks1 = DeleteCases[RemoveComplex1, a_ /; {a[[1]], a[[2]], a[[3]],
  a[[4]]} == {ptO[[1]], ptO[[2]], ptA[[1, 1]], ptA[[1, 2]]}];
  OACB = Table[{ptO[[1]], ptO[[2]], ptA[[1, 1]], ptA[[1, 2]],
  Cranks1[[i, 1]], Cranks1[[i, 2]], Cranks1[[i, 3]],
  Cranks1[[i, 4]]}, {i, Length[Cranks1]};
  {OACB}];
Out1 = FirstFourBar[θ1start, θ2start, θ3start];
Final1 = Out1[[1]];

SecondFourBar[OACB_] :=

```

```

Module[{ptA1, ptC, ptB1, Apoints, B2, B3, Sdisp1, Bpoints,
  ψpos, B4, Sdisp2, Rdisp, G2, W2, ConstraintEqn2, DesignEqn2,
  secondsol, sol2, RemoveComplex2, Cranks2, ptG, OABCDEFG},
ptA1 = ptA[[1]];
ptC = {OACB[[5]], OACB[[6]]};
ptB1 = {OACB[[7]], OACB[[8]]};
Apoints = ptA;
B2 = Table[gFrame.Zmat[θ1[[i]]].Xmat[a1].Zmat[θ2[[i]]], {i, 5}];
B3 = Table[gFrame.Zmat[θ1[[i]]].
  Xmat[a1].Zmat[θ2[[i]]].Xmat[a2].Zmat[θ3[[i]]], {i, 5}];
Sdisp1 = Table[Chop[B2[[i]].Inverse[B2[[1]]]], {i, 5}];
Bpoints =
  Table[rem.Sdisp1[[i]].{ptB1[[1]], ptB1[[2]], 1}, {i, Length[Sdisp1]}];
ψpos = Table[JointAngle[{1, 0}, Bpoints[[i]] - ptC], {i, 5}];
B4 = Table[Disp[{0, ptC[[1]], ptC[[2]]}.Zmat[ψpos[[i]]], {i, 5}];
Sdisp2 = Table[Chop[B3[[i]].Inverse[B3[[1]]]], {i, 5}];
Rdisp = Table[Chop[B4[[i]].Inverse[B4[[1]]]], {i, 5}];
G2 = {u, v, 1};
W2 = {x, y, 1};
ConstraintEqn2 = Table[Expand[Dot[Sdisp2[[i]].W2 - Rdisp[[i]].G2,
  Sdisp2[[i]].W2 - Rdisp[[i]].G2]], {i, 5}];
DesignEqn2 = Table[Chop[ConstraintEqn2[[i + 1]] - ConstraintEqn2[[1]]],
  {i, 5 - 1}];
secondsol = NSolve[DesignEqn2 == {0, 0, 0, 0}];
sol2 = Sort[{u, v, x, y} /. secondsol];
RemoveComplex2 = Chop[DeleteCases[
  Table[DeleteCases[sol2[[i]], _Complex], {i, Length[sol2]}], {}];
Cranks2 = DeleteCases[RemoveComplex2, a_ /; {a[[1]], a[[2]], a[[3]],
  a[[4]]} == {ptB1[[1]], ptB1[[2]], ptD[[1, 1]], ptD[[1, 2]]}];
ptG = {data[[1, 2]], data[[1, 3]]};
OABCDEFG = Table[Flatten[
  {ptO, ptA1, ptB1, ptC, ptD[[1]], Cranks2[[i, 3]], Cranks2[[i, 4]],
  Cranks2[[i, 1]], Cranks2[[i, 2]], ptG}], {i, Length[Cranks2]}];
{OABCDEFG};
Out2 = Flatten[Table[SecondFourBar[Final1[[i]]], {i, Length[Final1]}];
Final2 = Table[{Out2[[i]], Out2[[i + 1]], Out2[[i + 2]], Out2[[i + 3]],
  Out2[[i + 4]], Out2[[i + 5]], Out2[[i + 6]], Out2[[i + 7]], Out2[[i + 8]],
  Out2[[i + 9]], Out2[[i + 10]], Out2[[i + 11]], Out2[[i + 12]],
  Out2[[i + 13]], Out2[[i + 14]], Out2[[i + 15]]}, {i, 1, Length[Out2], 16}];
{Final2} (*OABCDEFG*);

Initial = Flatten[Table[SixBarSynthesis[θ1start[[i]],
  θ2start[[i]], θ3start[[i]]], {i, Length[StartSet]}];
ReOrg = Table[{Initial[[i]], Initial[[i + 1]], Initial[[i + 2]],
  Initial[[i + 3]], Initial[[i + 4]], Initial[[i + 5]], Initial[[i + 6]],
  Initial[[i + 7]], Initial[[i + 8]], Initial[[i + 9]], Initial[[i + 10]],
  Initial[[i + 11]], Initial[[i + 12]], Initial[[i + 13]],

```

```

Initial[[i+14]], Initial[[i+15]]}, {i, 1, Length[Initial], 16}];

FirstFourBar[θ1_, θ2_, θ3_, start_] :=
Module[{B1, B2, B3, G1, W1, G2, W2, Sdisp1, ConstraintEqn1,
  DesignEqn1, ConstraintEqn2, DesignEqn2, Error, OACB, sol, sort},
  B1 = Table[gFrame.Zmat[θ1[[i]]], {i, npos}];
  B2 = Table[gFrame.Zmat[θ1[[i]].Xmat[a1].Zmat[θ2[[i]]], {i, npos}];
  B3 = Table[gFrame.Zmat[θ1[[i]].Xmat[a1].
    Zmat[θ2[[i]].Xmat[a2].Zmat[θ3[[i]]], {i, npos}];
  G1 = {ptO[[1]], ptO[[2]], 1};
  W1 = {ptA[[1, 1]], ptA[[1, 2]], 1};
  G2 = {Cx, Cy, 1};
  W2 = {Bx, By, 1};
  Sdisp1 = Table[Chop[B2[[i]].Inverse[B2[[1]]]], {i, npos}];
  ConstraintEqn1 =
  Table[Expand[Dot[Sdisp1[[i]].W1 - G1, Sdisp1[[i]].W1 - G1]], {i, npos}];
  DesignEqn1 = Table[Chop[ConstraintEqn1[[i+1]] - ConstraintEqn1[[1]]],
    {i, npos - 1}];
  ConstraintEqn2 = Table[Expand[Dot[Sdisp1[[i]].W2 - G2,
    Sdisp1[[i]].W2 - G2]], {i, npos}];
  DesignEqn2 = Table[Chop[ConstraintEqn2[[i+1]] - ConstraintEqn2[[1]]],
    {i, npos - 1}];
  Error = Total[Table[(DesignEqn1[[i]])^2, {i, Length[DesignEqn1]}]] +
    Total[Table[(DesignEqn2[[i]])^2, {i, Length[DesignEqn2]}]];
  OACB = FindMinimum[Error, {{Cx, start[[7]]}, {Cy, start[[8]]},
    {Bx, start[[5]]}, {By, start[[6]]}}, Method → "LevenbergMarquardt"];
  sol = Chop[{ptO[[1]], ptO[[2]], ptA[[1, 1]], ptA[[1, 2]], Cx /. OACB[[2]],
    Cy /. OACB[[2]], Bx /. OACB[[2]], By /. OACB[[2]], OACB[[1]]}];
  {sol}];

Out1 =
Flatten[Table[FirstFourBar[θ1, θ2, θ3, ReOrg[[i]]], {i, Length[ReOrg]}]];
OACB = Table[{Out1[[i]], Out1[[i+1]], Out1[[i+2]],
  Out1[[i+3]], Out1[[i+4]], Out1[[i+5]], Out1[[i+6]],
  Out1[[i+7]], Out1[[i+8]]}, {i, 1, Length[Out1], 9}];

FirstSort[OACB_] :=
Module[{sort1, sort2, sort3},
  sort1 = DeleteCases[OACB, a_ /; Norm[{a[[1]], a[[2]], a[[3]], a[[4]]} -
    {a[[5]], a[[6]], a[[7]], a[[8]]}] < 0.1];
  sort2 = Union[sort1, SameTest → (Norm[#1 - #2] < 0.1 &)];
  sort3 =
  Union[sort2, SameTest → (Norm[{#1[[1]], #1[[2]] #1[[3]] #1[[4]], #1[[5]],
    #1[[6]], #1[[7]], #1[[8]]} - {#1[[5]], #1[[6]] #1[[7]] #1[[8]],
    #1[[1]], #1[[2]], #1[[3]], #1[[4]]}] < 0.1 &)];
  {sort3}];

```

```

Out2 = Flatten[FirstSort[OACB]];
SortOACB = Table[{Out2[[i]], Out2[[i + 1]], Out2[[i + 2]],
  Out2[[i + 3]], Out2[[i + 4]], Out2[[i + 5]], Out2[[i + 6]],
  Out2[[i + 7]], Out2[[i + 8]]}, {i, 1, Length[Out2], 9}];

SecondFourBar[OACB_,  $\theta$ 1_,  $\theta$ 2_,  $\theta$ 3_, start_] :=
Module[{FirstError, ptA1, ptC, ptB1, B2, B3, Apoints, Sdisp1, Bpoints,  $\psi$ pos,
  B4, Sdisp2, Rdisp, Bx, By, G1, W1, G2, W2, ConstraintEqn1, DesignEqn1,
  ConstraintEqn2, DesignEqn2, Error, BDFE, SecondError, sol},
  FirstError = OACB[[9]];
  ptA1 = ptA[[1]];
  ptC = {OACB[[5]], OACB[[6]]};
  ptB1 = {OACB[[7]], OACB[[8]]};
  B2 = Table[gFrame.Zmat[ $\theta$ 1[[i]]].Xmat[a1].Zmat[ $\theta$ 2[[i]]], {i, npos}];
  B3 = Table[gFrame.Zmat[ $\theta$ 1[[i]]].Xmat[a1].
    Zmat[ $\theta$ 2[[i]]].Xmat[a2].Zmat[ $\theta$ 3[[i]]], {i, npos}];
  Apoints = ptA;
  Sdisp1 = Table[Chop[B2[[i]].Inverse[B2[[1]]]], {i, npos}];
  Bpoints =
    Table[rem.Sdisp1[[i]].{ptB1[[1]], ptB1[[2]], 1}, {i, Length[Sdisp1]}];
   $\psi$ pos = Table[JointAngle[{1, 0}, Bpoints[[i]] - ptC], {i, npos}];
  B4 = Table[Disp[{0, ptC[[1]], ptC[[2]]}.Zmat[ $\psi$ pos[[i]]], {i, npos}];
  Sdisp2 = Table[Chop[B3[[i]].Inverse[B3[[1]]]], {i, npos}];
  Rdisp = Table[Chop[B4[[i]].Inverse[B4[[1]]]], {i, npos}];
  Bx = OACB[[7]];
  By = OACB[[8]];
  G1 = {Bx, By, 1};
  W1 = {Dx, Dy, 1};
  G2 = {Fx, Fy, 1};
  W2 = {Ex, Ey, 1};
  ConstraintEqn1 = Table[Expand[Dot[Sdisp2[[i]].W1 - Rdisp[[i]].G1,
    Sdisp2[[i]].W1 - Rdisp[[i]].G1]], {i, npos}];
  DesignEqn1 = Table[Chop[ConstraintEqn1[[i + 1]] - ConstraintEqn1[[1]]],
    {i, npos - 1}];
  ConstraintEqn2 = Table[Expand[Dot[Sdisp2[[i]].W2 - Rdisp[[i]].G2,
    Sdisp2[[i]].W2 - Rdisp[[i]].G2]], {i, npos}];
  DesignEqn2 = Table[Chop[ConstraintEqn2[[i + 1]] - ConstraintEqn2[[1]]],
    {i, npos - 1}];
  Error = Total[Table[(DesignEqn1[[i]])^2, {i, Length[DesignEqn1]}]] +
    Total[Table[(DesignEqn2[[i]])^2, {i, Length[DesignEqn2]}]];
  BDFE = FindMinimum[Error, {{Dx, start[[9]]}, {Dy, start[[10]]},
    {Fx, start[[13]]}, {Fy, start[[14]]}, {Ex, start[[11]]},
    {Ey, start[[12]]}}, Method  $\rightarrow$  "LevenbergMarquardt"];
  SecondError = BDFE[[1]];
  sol = Flatten[Chop[{ptO, ptA1, ptB1, ptC,
    Dx /. BDFE[[2]], Dy /. BDFE[[2]], Ex /. BDFE[[2]], Ey /. BDFE[[2]],
    Fx /. BDFE[[2]], Fy /. BDFE[[2]], FirstError, SecondError}]];

```



```

{sol}];

Out3 =
  Flatten[Table[Table[SecondFourBar[SortOACB[[j]],  $\theta_1$ ,  $\theta_2$ ,  $\theta_3$ , ReOrg[[i]]],
    {i, Length[ReOrg]}], {j, Length[SortOACB]}]];
OABCDEF = Table[{Out3[[i]], Out3[[i + 1]], Out3[[i + 2]], Out3[[i + 3]],
  Out3[[i + 4]], Out3[[i + 5]], Out3[[i + 6]], Out3[[i + 7]], Out3[[i + 8]],
  Out3[[i + 9]], Out3[[i + 10]], Out3[[i + 11]], Out3[[i + 12]],
  Out3[[i + 13]], Out3[[i + 14]], Out3[[i + 15]]}, {i, 1, Length[Out3], 16}];

SecondSort[OABCDEF_] :=
  Module[{sort1, sort2, sort3},
    sort1 = DeleteCases[OABCDEF, a_ /; Norm[{a[[5]], a[[6]], a[[9]], a[[10]]} -
      {a[[11]], a[[12]], a[[13]], a[[14]]}] < 0.1];
    sort2 = Union[sort1, SameTest  $\rightarrow$  (Norm[#1 - #2] < 0.1 &)];
    sort3 = Union[sort2,
      SameTest  $\rightarrow$  (Norm[{#1[[5]], #1[[6]] #1[[9]] #1[[10]], #1[[13]], #1[[14]],
        #1[[11]], #1[[12]]} - {#1[[13]], #1[[14]] #1[[11]] #1[[12]],
        #1[[5]], #1[[6]], #1[[9]], #1[[10]]}] < 0.1 &)];
    {sort3}];

Out4 = SecondSort[OABCDEF];
FinalSolutions = Out4[[1]];
{FinalSolutions}]

```

```
In[327]:= SolutionSet = ParallelTable[Quiet[SixBarFunction[dataRand[[i]]]], {i, loops}];
```

```
In[328]:= OrganizedSolutions = Partition[Flatten[SolutionSet], 16];
```

```
In[329]:= samp = SecondSort[OrganizedSolutions] (*Final Set of Solutions*)
```

```
Out[329]= {{{-1.25, -1.25, -1.5885, -0.0467045,
  -1.61185, -0.93843, -2.3427, -0.839179, -0.801992, 0.872323,
  -0.774207, 1.01093, -1.61151, -0.814323, 0.214721, 1.48347}},
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  -2.3427, -0.839179, -0.801992, 0.872323, -2.7212,
  0.549575, -2.68064, -0.6255, 0.214721, 0.991682}},
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  {-1.25, -1.25, -1.57623, -0.0433212, -1.5061, -0.548028, -2.15156,
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  -0.61159, 0.134818, 1.46452}, {-1.25, -1.25, -1.57623, -0.0433212,
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```

```

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```

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Out[330]=

Fri 12 Jun 2015 01:25:15

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Length[samp[[1]]]

Out[331]=

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C.3 Mathematica Code for the Path Synthesis Problem with 9 Precision Points

Below is the Mathematica code that solves the four-bar synthesis problem of a secondary trajectory. The secondary trajectory is derived after defining a serial 2R chain, with an additional point attached to the distal link of the chain. An output is exported to be used with Bertini. After the Bertini solutions are calculated, this set of code imports the file and sorts the solutions.

```
P = {{65.6392042023875`, 11.812623423698192`}, {65.17439671232057`, 6.981248412229576`},
{72.03375494759447`, 6.784489939276774`}, {91.44536293172996`, 16.001871100877864`},
{112.23151688506823`, 34.18783110873217`}, {118.02547732475063`, 43.163497933852575`},
{110.66160469210344`, 45.92207971284618`}, {97.16530131108352`, 29.34550394106784`},
{85.97773661215078`, 20.582280478300987`}} (*Leg*)
```

```
P = {{0.25, 0}, {0.52, 0.10}, {0.80, 0.70}, {1.20, 1.00}, {1.40, 1.30},
{1.10, 1.48}, {0.70, 1.40}, {0.20, 1.00}, {0.02, 0.40}} (*WMP*)
```

```
P = {{3.0814675410938257`, 2.8863654088546733`},
{3.427651686007086`, 2.6578930718150167`}, {3.7791769371713837`, 2.233161636295617`},
{3.8155635719182897`, 1.6453147634695704`},
{3.8731524689319983`, 1.7237660992925268`}, {3.350371633577403`, 1.8353047586669011`},
{2.677738281437578`, 2.2558838507821273`}, {2.1785468373132573`, 2.2541470852261916`},
{1.9368705626334186`, 2.484635213779639`}} (*Sample*)
```

```
Pj = Table[P[[i + 1]] - P[[1]], {i, Length[P] - 1}]
```

```
 $\delta$  = Table[Pj[[i, 1]] + Pj[[i, 2]] * I, {i, Length[Pj]}]
```

```
 $\hat{\delta}$  = Conjugate[ $\delta$ ]
```

```
TempOut1 = Flatten[Table[StringJoin["d0", ToString[i],
" = ", ToString[InputForm[ $\delta$ [[i]]], ";"], {i, Length[ $\delta$ ]}]]
```

```
TempOut2 = Flatten[Table[StringJoin["d0Hat", ToString[i],
" = ", ToString[InputForm[ $\hat{\delta}$ [[i]]], ";"], {i, Length[ $\delta$ ]}]]
```

```
TempOut3 = Flatten[Table[{TempOut1[[i]], TempOut2[[i]]}, {i, Length[ $\delta$ ]}]]
```

```
Export["B:\\Dropbox\\Current Research\\Four Bar Trajectory\\TempOut3.txt", TempOut3]
```

```
vars = 12;
```

```
solns1 =
Import["B:\\Dropbox\\Current Research\\Four Bar Trajectory\\real_solutions", "Text"];
```

```
solns2 = StringSplit[solns1]
```

A very large output was generated. Here is a sample of it:

```
{240,
 -0.301439468560966396879799365181475949975949294151264220492319304139885880286165 \
 83745582781417546199165189108 e0, <<5757>>,
 0.7154184632744073406508497759900281939552161312105229286092301946686686425633275 \
 8387212703105212700899060884 e0,
 0.2110264439370128550489533970851342148480319494882220743410159244238564776959797 \
 5357369935062786938340430153 e-259}
```

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```
solns3 = ToExpression[StringReplace[solns2, "e" -> "*10^"]]
```

A very large output was generated. Here is a sample of it:

```
{240,
 -0.301439468560966396879799365181475949975949294151264220492319304139885880286165 \
 83745582781417546199165189108, <<5757>>,
 0.7154184632744073406508497759900281939552161312105229286092301946686686425633275 \
 838721270310521270089906088,
 2.1102644393701285504895339708513421484803194948822207434101592442385647769597975 \
 35736993506278693834043015 × 10-260}
```

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```
solns4 = Chop[Partition[Rest[solns3], 2 * vars]]
```

A very large output was generated. Here is a sample of it:

```
{{-0.30143946856096639687979936518147594997594929415126422049231930413988588028616 \
  583745582781417546199165189108 , 0, \
  -0.90825170510245824797928296369768230778543896409714708689154638441197325521417 \
  371095351566462736618525836164 , <<18>> , 0, \
  -0.29248712546153108327116794646198024949976227643949117255892740957157116507632 \
  207252511732129903219573413246 , 0}, <<239>>}
```

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```
S = Table[Delete[solns4[[i]], {{2}, {4}, {6}, {8}, {10}, \
  {12}, {14}, {16}, {18}, {20}, {22}, {24}}], {i, Length[solns4]}]
```

```
x = Table[{S[[i, 1]], S[[i, 2]]}, {i, Length[S]}];
```

```
a = Table[{S[[i, 3]], S[[i, 4]]}, {i, Length[S]}];
```

```
n = Table[{S[[i, 5]], S[[i, 6]]}, {i, Length[S]}];
```

```
y = Table[{S[[i, 7]], S[[i, 8]]}, {i, Length[S]}];
```

```
b = Table[{S[[i, 9]], S[[i, 10]]}, {i, Length[S]}];
```

```
m = Table[{S[[i, 11]], S[[i, 12]]}, {i, Length[S]}];
```

```
ptA = Table[{P[[1, 1]] + a[[i, 1]], P[[1, 2]] + a[[i, 2]]}, {i, Length[S]}];
```

```
ptB = Table[{P[[1, 1]] + b[[i, 1]], P[[1, 2]] + b[[i, 2]]}, {i, Length[S]}];
```

```
u = Table[{x[[i, 1]] - a[[i, 1]], x[[i, 2]] - a[[i, 2]]}, {i, Length[S]}];
```

```
v = Table[{y[[i, 1]] - b[[i, 1]], y[[i, 2]] - b[[i, 2]]}, {i, Length[S]}];
```

```
ptD = ptA + u;
```

```
ptC = ptB + v;
```

```
i = 1;
```

```
xI = Table[S[[i, 1]] + I * S[[i, 2]], {i, Length[S]}];
```

```
xIhat = Table[Conjugate[xI[[i]]], {i, Length[S]}];
```

```
aI = Table[S[[i, 3]] + I * S[[i, 4]], {i, Length[S]}];
```

```
aIhat = Table[Conjugate[aI[[i]]], {i, Length[S]}];
```

```
nI = Table[S[[i, 5]] + I * S[[i, 6]], {i, Length[S]}];
```

```
nIhat = Table[Conjugate[nI[[i]]], {i, Length[S]}];
```

```
yI = Table[S[[i, 7]] + I * S[[i, 8]], {i, Length[S]}];
```

```
yIhat = Table[Conjugate[yI[[i]]], {i, Length[S]}];
```

```
bI = Table[S[[i, 9]] + I * S[[i, 10]], {i, Length[S]}];
```

```
bIhat = Table[Conjugate[bI[[i]]], {i, Length[S]}];
```

```
mI = Table[S[[i, 11]] + I * S[[i, 12]], {i, Length[S]}];
```

```
mIhat = Table[Conjugate[mI[[i]]], {i, Length[S]}];
```

```
Table[Chop[nI[[i]] - aI[[i]] * xIhat[[i]]], {i, Length[S]}]
```

```
Table[Chop[nIhat[[i]] - aIhat[[i]] * xI[[i]]], {i, Length[S]}]
```

```
Table[Chop[mI[[i]] - bI[[i]] * yIhat[[i]]], {i, Length[S]}]
```

```
Table[Chop[mIhat[[i]] - bIhat[[i]] * yI[[i]]], {i, Length[S]}]
```

```

γj = Table[
  Table[Det[{{nI[[i]] - δ[[j]] * xIhat[[i]], δ[[j]] * (aIhat[[i]] - xIhat[[i]]) + δhat[[j]] *
    (aI[[i]] - xI[[i]]) - δ[[j]] * δhat[[j]]}, {mI[[i]] - δ[[j]] * yIhat[[i]],
    δ[[j]] * (bIhat[[i]] - yIhat[[i]]) + δhat[[j]] * (bI[[i]] - yI[[i]]) -
    δ[[j]] * δhat[[j]]}}, {j, Length[δ]}, {i, Length[S]}]

```

```

γhatj =
  Table[Table[Det[{{δ[[j]] * (aIhat[[i]] - xIhat[[i]]) + δhat[[j]] * (aI[[i]] - xI[[i]]) -
    δ[[j]] * δhat[[j]], nIhat[[i]] - δhat[[j]] * xI[[i]]},
    {δ[[j]] * (bIhat[[i]] - yIhat[[i]]) + δhat[[j]] * (bI[[i]] - yI[[i]]) - δ[[j]] *
    δhat[[j]], mIhat[[i]] - δhat[[j]] * yI[[i]]}}, {j, Length[δ]}, {i, Length[S]}]

```

```

γ0j = Table[Table[Det[{{nIhat[[i]] - δhat[[j]] * xI[[i]], nI[[i]] - δ[[j]] * xIhat[[i]]},
  {mIhat[[i]] - δhat[[j]] * yI[[i]], mI[[i]] - δ[[j]] * yIhat[[i]]}},
  {j, Length[δ]}, {i, Length[S]}]

```

```

ABCD = Table[Flatten[{ptA[[i]], ptB[[i]], ptC[[i]], ptD[[i]]}], {i, Length[S]}]

```

```

{{1.46067, 3.84306, 2.85721, 2.06413, 3.33579, 2.5146, 2.78003, 1.97811},
 {2.61359, 1.18634, 1.96585, 2.59265, 2.84301, 1.92257, 2.68745, 2.61534},
 {3.42226, 1.61045, 2.34363, 1.40959, 2.67305, 2.23365, 3.81125, 2.31597},
 {2.82585, 2.06813, 3.67012, 2.31529, 2.77396, 2.08703, 2.59369, 2.58736},
 {2.99999, 2.05281, 2.57739, 2.8411, 2.99529, 2.0342, 3.68151, 2.4952},
 {3.99757, 2.67594, 2.83917, 2.06597, 2.5801, 2.45393, 2.79045, 2.08919},
 {3.49386, 2.16279, 2.72387, 1.14548, 3.10155, 2.39654, 3.70506, 3.08055},
 {3.40046, 2.09458, 2.79323, 3.00981, 3.49868, 2.29847, 2.45988, 2.23344},
 {2.58844, 1.28989, 3.54068, 2.04028, 3.77075, 2.98611, 2.97832, 2.40933},
 {1.47849, 0.501288, 1.60442, 2.65039, 2.29654, 3.74021, 2.50183, 2.38197},
 {1.87133, 0.763483, 2.76572, 1.18225, 3.08743, 1.53809, 2.01469, 1.32258},
 {2.35624, 1.41926, 3.4351, 1.63402, 3.82067, 2.35787, 2.69086, 2.25479},
 {2.64449, 1.82655, 3.49386, 2.16279, 2.87027, 1.9686, 3.3407, 2.45167},
 {2.17274, -0.437851, 1.23678, 1.40626, 0.895395, 2.41659, 1.21644, 0.251928},
 {3.36299, 2.23503, 2.91047, 0.460928, 3.33467, 2.25218, 3.59273, 3.10727},
 {2.84339, 2.06752, 3.97742, 2.65649, 2.79577, 2.09603, 2.58468, 2.45305},
 {2.79323, 3.00981, 3.40046, 2.09458, 2.45988, 2.23344, 3.49868, 2.29847},
 {2.9811, 2.74479, 2.45361, 2.24899, 3.08159, 2.02737, 2.51815, 2.34601},
 {1.5555, 3.67541, 2.83917, 2.06597, 3.34054, 2.49841, 2.81767, 1.98387},
 {3.23206, 1.20919, 3.2751, 2.51487, 3.51269, 3.25171, 3.59532, 2.45643},
 {2.66376, 2.07707, 3.42226, 1.61045, 2.69248, 2.18085, 3.31083, 2.39354},
 {4.70657, -3.8455, 3.65307, 1.94213, 2.65726, 1.72341, 2.29394, 2.06448},

```



```

{2.46366, 1.99443, 5.6441, -1.40201, 2.69212, 2.00396, 3.05041, 2.02302},
{-8.53748, -6.11648, 3.65307, 1.94213, 4.07727, 3.10509, 2.60516, 5.16598},
{2.63444, 0.41201, 2.49813, 1.62743, 2.54735, 2.05614, 2.70022, 0.86952},
{3.62884, 1.99582, 47.1529, 43.258, 2.51189, 4.68754, 3.98552, 3.09067},
{3.99757, 2.67594, 1.5555, 3.67541, 1.81929, 4.57791, 4.28859, 3.47312},
{2.38138, 2.90365, 3.67012, 2.31529, 3.97763, 3.11463, 2.64558, 3.78068},
{-3.26072, 5.26061, -0.342974, 4.33943, 2.64296, 1.88082, 2.7025, 1.85697},
{1.23678, 1.40626, 2.17274, -0.437851, 1.21644, 0.251928, 0.895395, 2.41659},
{3.97742, 2.65649, 2.84339, 2.06752, 2.58468, 2.45305, 2.79577, 2.09603},
{2.61359, 1.18634, 1.89702, 0.428666, 2.09583, 1.14506, 3.00761, 1.45736},
{3.2076, 1.60636, 3.54849, 2.37762, 3.90215, 3.10282, 3.84244, 2.28371},
{-17.5954, -45.0619, -3.26072, 5.26061, -2.88176, 6.29001, -58.1781, -97.294},
{2.85721, 2.06413, 1.46067, 3.84306, 2.78003, 1.97811, 3.33579, 2.5146},
{2.91047, 0.460928, 3.36299, 2.23503, 3.59273, 3.10727, 3.33467, 2.25218},
{2.6529, 1.83418, 3.50249, 2.14382, 2.86913, 1.96207, 3.33837, 2.45336},
{3.04319, 2.092, 3.48264, 3.00288, 3.03288, 2.06248, 2.47238, 2.27922},
{3.01468, 1.2357, 1.9626, 1.00966, 2.16234, 1.64241, 3.36249, 1.67554},
{3.10659, 2.58266, 2.49562, 1.76756, 3.14716, 2.43698, 2.85593, 2.20012},
{3.97742, 2.65649, 1.59445, 3.66914, 1.86328, 4.57065, 4.26311, 3.44683},
{2.16149, 2.39488, 2.6977, 2.59884, 2.77262, 2.00034, 2.99788, 1.94945},
{47.1529, 43.258, 3.62884, 1.99582, 3.98552, 3.09067, 2.51189, 4.68754},
{2.10717, 3.19592, 3.04319, 2.092, 3.65227, 2.69915, 3.07582, 2.06138},
{2.47587, 2.31844, 2.79323, 3.00981, 2.37602, 3.59771, 2.21453, 2.92288},
{1.59445, 3.66914, 3.97742, 2.65649, 4.26311, 3.44683, 1.86328, 4.57065},
{1.46067, 3.84306, 4.01596, 2.69382, 4.28216, 3.46331, 1.76211, 4.75131},
{2.38138, 2.90365, 2.82585, 2.06813, 3.31363, 2.36714, 2.81726, 2.00934},
{3.37095, 1.9637, 2.9811, 2.74479, 3.54442, 3.28515, 3.84458, 2.61222},
{3.67012, 2.31529, 2.38138, 2.90365, 2.64558, 3.78068, 3.97763, 3.11463},
{2.76572, 1.18225, 1.87133, 0.763483, 2.01469, 1.32258, 3.08743, 1.53809},
{2.17274, -0.437851, 3.05554, 2.48194, 3.72188, 3.90683, 4.03777, 2.19659},
{47.1529, 43.258, -2.3451, 26.8704, -1.65984, 27.6002, 47.7225, 41.4568},
{1.65956, 4.07533, 6.14252, 1.28652, 2.78871, 1.83226, 2.49675, 2.02908},
{6.14252, 1.28652, 9.9505, 17.2425, 4.74366, 12.7618, 6.43528, 2.34063},
{2.9811, 2.74479, 3.37095, 1.9637, 3.84458, 2.61222, 3.54442, 3.28515},
{3.08855, 2.70774, 3.31173, 2.04204, 3.80622, 2.44852, 3.69261, 3.05475},
{4.01596, 2.69382, 1.46067, 3.84306, 1.76211, 4.75131, 4.28216, 3.46331},
{-8.53748, -6.11648, 4.70657, -3.8455, 5.4941, -3.02361, -8.06117, -8.3961},
{2.46209, 1.89273, 3.24769, 2.4519, 2.83887, 2.13177, 3.31062, 2.33499},
{3.2751, 2.51487, 2.49586, 2.01936, 3.36868, 2.30466, 2.84387, 2.14953},
{3.42226, 1.61045, 2.66376, 2.07707, 3.31083, 2.39354, 2.69248, 2.18085},
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{-3.26072, 5.26061, -17.5954, -45.0619, -58.1781, -97.294, -2.88176, 6.29001},
{3.10009, 0.97161, 3.24802, 2.45188, 3.49059, 3.20654, 3.44717, 2.40636},
{3.2076, 1.60636, 2.68022, 2.45206, 2.20637, 3.27965, 2.44662, 2.20901},
{4.01596, 2.69382, 2.85721, 2.06413, 2.60289, 2.43589, 2.81527, 2.11688},

```

```

{2.83917, 2.06597, 1.5555, 3.67541, 2.81767, 1.98387, 3.34054, 2.49841},
{2.4886, 1.65489, 3.06654, 2.48648, 2.7995, 2.20196, 3.06352, 2.44773},
{1.89702, 0.428666, 1.96585, 2.59265, 2.2043, 3.55644, 2.88265, 2.16997},
{2.45361, 2.24899, 2.9811, 2.74479, 2.51815, 2.34601, 3.08159, 2.02737},
{1.42403, 0.508549, 2.49037, 1.06777, 2.97914, 1.24551, 1.86006, 0.795238},
{2.49037, 1.06777, 1.42403, 0.508549, 1.86006, 0.795238, 2.97914, 1.24551},
{3.31173, 2.04204, 2.4259, 2.42203, 2.62272, 3.35793, 2.58698, 2.47989},
{3.19388, 2.73396, 2.59169, 2.47439, 3.2564, 2.15806, 2.73595, 2.31442},
{2.6934, 1.88441, 2.58844, 1.28989, 2.69159, 1.76693, 2.46525, 2.31209},
{3.31173, 2.04204, 3.08855, 2.70774, 3.69261, 3.05475, 3.80622, 2.44852},
{3.27641, 2.98983, 2.37086, 2.40698, 2.35804, 3.252, 3.12799, 3.6892},
{3.65307, 1.94213, 4.70657, -3.8455, 2.29394, 2.06448, 2.65726, 1.72341},
{2.68022, 2.45206, 3.54849, 2.37762, 2.7278, 2.16117, 3.55532, 2.05878},
{3.40046, 2.09458, 2.47587, 2.31844, 3.34281, 2.28192, 4.02205, 2.74751},
{1.65956, 4.07533, 9.9505, 17.2425, 8.2883, 7.36707, 2.24429, 4.93262},
{2.56845, 2.25653, 3.01468, 1.2357, 2.73366, 2.44653, 3.25161, 2.18432},
{2.53398, 1.65274, 3.10589, 2.59592, 2.76415, 2.25574, 3.04172, 2.49823},
{2.70069, 0.440775, 3.06654, 2.48648, 3.34851, 3.17089, 3.09409, 2.41163},
{2.92575, 1.26682, 1.83311, 0.932131, 1.97196, 1.44133, 3.11241, 1.70289},
{2.96411, 0.627649, 2.49562, 1.76756, 2.42992, 2.21694, 2.72189, 1.12514},
{2.33559, 1.73721, 2.91047, 0.460928, 2.65727, 1.09511, 2.05728, 2.36814},
{2.49037, 1.06777, 2.42774, 2.70764, 2.52473, 2.00306, 2.5927, 2.70862},
{3.05801, 2.46704, 2.49813, 1.62743, 3.03225, 2.45766, 2.77335, 2.21321},
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{2.77234, 0.509663, 2.53398, 1.65274, 2.57373, 2.04087, 2.79124, 1.01976},
{2.77234, 0.509663, 3.10589, 2.59592, 3.42321, 3.22654, 3.06257, 2.37627},
{2.57739, 2.8411, 3.48556, 2.6568, 3.58348, 3.49291, 2.66356, 3.69327},
{1.23678, 1.40626, 3.05554, 2.48194, 2.41513, 1.46147, 3.42285, 1.87603},
{3.48556, 2.6568, 2.99999, 2.05281, 2.39995, 2.44398, 2.98355, 2.05025},
{3.27641, 2.98983, 3.27405, 2.01173, 2.62336, 2.4189, 3.22989, 2.187},
{4.70657, -3.8455, -8.53748, -6.11648, -8.06117, -8.3961, 5.4941, -3.02361},
{9.9505, 17.2425, 6.14252, 1.28652, 6.43528, 2.34063, 4.74366, 12.7618},
{2.46366, 1.99443, -6.36312, -4.90512, 2.43756, 1.44452, 2.49472, 2.85778},
{5.6441, -1.40201, 2.46366, 1.99443, 3.05041, 2.02302, 2.69212, 2.00396},
{1.96585, 2.59265, 1.89702, 0.428666, 2.88265, 2.16997, 2.2043, 3.55644},
{3.04319, 2.092, 2.10717, 3.19592, 3.07582, 2.06138, 3.65227, 2.69915},
{2.53086, 1.08657, 1.47849, 0.501288, 2.05813, 1.00568, 3.25301, 1.08678},
{4.04378, 2.72067, 2.83811, 2.06226, 2.58001, 2.44875, 2.7903, 2.08721},
{3.05554, 2.48194, 1.23678, 1.40626, 3.42285, 1.87603, 2.41513, 1.46147},
{1.42403, 0.508549, 2.42774, 2.70764, 2.98448, 3.59094, 2.64544, 2.59968},
{1.9626, 1.00966, 2.56845, 2.25653, 2.39831, 2.95858, 2.88172, 2.25361},
{-2.3451, 26.8704, 3.62884, 1.99582, 2.72479, 1.79151, 2.39621, 2.15659},
{1.83311, 0.932131, 2.8127, 2.41752, 2.60427, 3.12607, 2.94263, 2.37717},
{2.6529, 1.83418, 2.70419, 1.16601, 2.70098, 1.65432, 2.396, 2.26718},

```

```

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```

C.4 Bertini Input Code for the Four-Bar Path Synthesis Problem

Below is the code for the input file for the four-bar path synthesis problem for 9 precision points. This code requires that the precision points be entered in complex form.

CONFIG

```
USERHOMOTOPY: 1;  
SHARPENDIGITS: 100;  
DEGREEBOUND: 4;  
COEFFBOUND: 10;  
TRACKTOLBEFOREEG: 1e-7;  
TRACKTOLDURINGEG: 1e-7;  
FINALTOL: 1e-10;  
SECURITYLEVEL: 1;  
MAXNORM: 1e20;  
CONDNUMTHRESHOLD: 1e100;
```

END;

INPUT

```
variable x1,x2,a1,a2,n1,n2;  
variable y1,y2,b1,b2,m1,m2;  
function f1, f2, f3, f4, f5, f6, f7, f8, f9, f10, f11, f12;  
constant d11, d1Hat1, d12, d1Hat2, d13, d1Hat3, d14, d1Hat4, d15, d1Hat5,  
d16, d1Hat6, d17, d1Hat7, d18, d1Hat8;  
constant d01, d0Hat1, d02, d0Hat2, d03, d0Hat3, d04, d0Hat4, d05, d0Hat5,  
d06, d0Hat6, d07, d0Hat7, d08, d0Hat8;  
pathvariable t;  
parameter s;
```

s = t;

```
x = x1 + I*x2;  
xHat = x1 - I*x2;  
a = a1 + I*a2;  
aHat = a1 - I*a2;  
n = n1 + I*n2;  
nHat = n1 - I*n2;
```

```
y = y1 + I*y2;  
yHat = y1 - I*y2;  
b = b1 + I*b2;  
bHat = b1 - I*b2;  
m = m1 + I*m2;  
mHat = m1 - I*m2;
```

d11=-

```
0.23539396401261169226150250493556498070655561139044104892741717677338288  
4389107398930478333374240150915678896167611799421490952743974500858319999  
2006191439040832707031089941603354831198418151102209787112000716795905943  
2688165834126744038097861348274862925248256576840107963956677074628194768  
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6614472552902907560998241602486100154793389271957660659333328725890848932  
4483656799794986098982948130308823719155410382273819729434763986110487224  
407235856381673744059*I;
```

d1Hat1=-
0.59434073961690778123805682165523322265066592313929577860150430564069731
3448864500157006412473974307906897741273962638977699463741494667606750846
3969188925735651126388825822021092086689483866352543251887344461949323359
7217699068282393580911188661320762311846567561644524414535255329090096000
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8501802470129683105469801794765856514073114680568490602726067596420829116
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4509694068583883569554441222357696782580136921525151886816068509790771223
687327382547206489833*I;
d12=0.9201320101216329526796523132934598284245084017396318162978037819121
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1566463014854358450398623652674794544361984925767222846017318783394639893
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0574599410660961592532027432547224310736140154087394643637461700070394382
4088535036904824832334174*I;
d1Hat2=0.9012555526595120487179764161142290210991900137319139066796197625
2747409463847240728488410015497538721098646207399781599517496975899261421
1503588074504311943450249636491564871772348577564314796829336981901136967
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9178641662057699967641721423*I;
d13=-
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0433205962299524809307633855550762367901556136280165517709873491603700692
7189770857298761376742264585875688750907506072052416494532348166416892714
742539106480115716564*I;
d1Hat3=-
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1885589005+0.277526016013559442494987170121976941523191855374972053172299
1434215426740446435193433094465371419416226340845156528888796491900218716
7009855173379454339384556933952832802140138522999774267233351715803083666
2087614680277982640235089821153904045412606171471378792681662350638550879
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2521908301400668089430214326664465760137563461117467734103245911999602876
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9510878981154487956112560051329883741353601794598116975815521118369537725

1471804386050892246706340367529425157922273247487100861967104022084954337
1637380761939156024645568136807582107197291545311240463502419306906638849
5679894097006595747643653*I;
dlHat4=0.1628922237549922541578095215966666133559424608220965582541756031
7742160007546267530204305340233739645551427261218236596754164911791470672
2908624719370947036941703091690544755045328313682660908634267552756480538
9737290013836918395367736509638676698114256010796923702886219957960930459
57218362660890991+0.98664386859705033955495298159200125398502613525598214
3171990850106270082601504296343865576085552420662694336944375236045987543
8744262024408509779574843454848705778794031317486092805532570163682924152
0235498994917675133087370538399155929979891373059309770938987652285804738
5798255438986525860879725993*I;
dl5=0.3228809072163522001502877687158526269827361369717040223176278531040
6802555802663942318494672694613359994530028075275949093523315608561733067
4687048077249761981531000165580592970012889021915882603036632452553912614
9071558530589941451223330440928882261815373095013056122776921417425881360
11015610741378+0.94643960174706624631355786166070351958108102760967279296
1831626888835484345157137383025919765434502304165352074966873676978177345
4156117219890815282655499088387297459417110256712798040035637584955578170
9138680377500823291725597682110445876796555524303661384435438798402030091
0367549293352402043585001*I;
dlHat5=-
0.43197565421867011239846197300881407613932338667479757416096419652828467
1157647578033079891119713407948199812409136555016535554344414017837760363
7540297400943649395977688000319392259012921313215040968376799428194822223
7579858999398758576162341893975711168817119850671980782183802476718097403
2337654614+0.901885266628938757898203196717864851303381611481192829167535
5799016154963952795854688534979150541860077865862093674181675840057975469
8481141749234957959562975657597566889654876550489253330065321067399192024
0171509372615639725838712171623826691829146784719346945761429688380499964
778602452974011786629*I;
dl6=-
0.41949632478018033588485141322772517054495353503981889193779987910478521
4958118889192871155788488627751228492257330151832226339174175065742678692
1326193643159687692854355079788596664375907958867726652045647705625713432
261320138023238291148535805904282656130555229027048625638626660817676350
5151049916+0.907757034396275806392001595052634937859161442779788439408177
7468853949342003536580781451441355016746273805084073213726958957795200246
3397400519095693593120900847088006167778187438535083859754252713756041259
5790418407456491852011143995810777019869132013369870097748054911365312718
823743308198121764286*I;
dlHat6=0.8718196781358299180595817526081622479653236683593637952529736864
2397920166348975724737783336480368602977543228606725440335792046604238180
0164497722612638798309965973180733534980630693405088977097256805631870662
2846845485600072237503823746498371775857656672814556645480474585191379958
26407916622378837+0.48982695803226053671954861494520542493133333245049904
7872273312153103837964889012888846436200670851377852609337809197766683782
7436804359126194716028157704514950278445050758446919625913111016873340436
9944042579569583345221637828248516585803675120918043274153564483809961424
3180558878367484971533502840*I;
dl7=0.1584817159282295941971113963097386861718149567184329728457770668631
6222277322545806305401330293870603893019258564123884799387612499154291615
0066265558505495412721082657282552645624801861512286968415250612644553302
6224351999571806614935549130981911888896678329277860814609346764540164786

```

40515469857916e-
1+0.999874409842138343832812638176256123117007626394474535228471743473983
0468300063282344473551280628604774486482947343720072225475835346313339327
7621861397486325470297976950415838837474141902428859297616977146483337353
8059998893262554134768722257624649608718229867384274281221751180564843307
553811128975*I;
dlHat7=-
0.19436319255687899778866936549792148808195931523757358869353637570114079
6942848092450532946909760944277877285345065454774609937377023959023593349
2791214594445508538179309284528786693378833320077792217860936653860055212
7391242300968139403110840822530763850040395459397392643017731790172914046
5339331449+0.980929635284354928003115441670109616970736896022917657470545
1961085441809204488547043477463583943122849539100169186676082611250332655
5392032955487566022495954157257911076974319629392659039140008872372533183
6887114248441874986187532440846228829061454235134851821626427205388664228
131221365572718955818*I;
dl8=0.3714073147187741912183270638103310116694963400877128759703870489485
4646886399996349902249240637960900501373397804538006942242940159108077894
3844024936256242627673491262883209140652398109471930211184954250975126322
9932555525294144212507915385633622618929775143234868032707470669607453710
86703790154356+0.92847003536645673486017814178970978147832323496516396825
8457583042295840815344340538473497309699145978137056173181635564616843815
5353886337128160248991011290020182084730369212114821053494715603287244410
7101668677408994811082582602189599328750488378032718616906176233674863405
3810937744085071584584073*I;
dlHat8=0.7303944917668737400372786230990268989558520056969255101839345107
7336725997101541994817107617520097577485623365424193016373463611577211196
7985013879415757172845305196563266275799188788822223261281089736902928113
4831437411842953864445084307300347464330364750425185373692617902326425190
39929524591752039+0.68302553861229098874880980661886472511958163615340714
7121180691142272509967459252112643742087394187358076668513147588514508595
7751588922603135403462044298860997746920763164604759019672308920465031529
3949613615002928994339371873798322485932092572422560733139367439102444592
1087428607802528737465440893*I;

d01 = 0.3461841449132601 - 0.22847233703965664*I;
d0Hat1 = 0.3461841449132601 + 0.22847233703965664*I;
d02 = 0.697709396077558 - 0.6532037725590563*I;
d0Hat2 = 0.697709396077558 + 0.6532037725590563*I;
d03 = 0.734096030824464 - 1.241050645385103*I;
d0Hat3 = 0.734096030824464 + 1.241050645385103*I;
d04 = 0.7916849278381726 - 1.1625993095621465*I;
d0Hat4 = 0.7916849278381726 + 1.1625993095621465*I;
d05 = 0.2689040924835773 - 1.0510606501877722*I;
d0Hat5 = 0.2689040924835773 + 1.0510606501877722*I;
d06 = -0.40372925965624784 - 0.630481558072546*I;
d0Hat6 = -0.40372925965624784 + 0.630481558072546*I;
d07 = -0.9029207037805684 - 0.6322183236284817*I;
d0Hat7 = -0.9029207037805684 + 0.6322183236284817*I;
d08 = -1.144596978460407 - 0.4017301950750345*I;
d0Hat8 = -1.144596978460407 + 0.4017301950750345*I;

dl = d01*(1-s) + s*d11;
dHat1 = d0Hat1*(1-s) + s*d1Hat1;

```

```

d2 = d02*(1-s) + s*d12;
dHat2 = d0Hat2*(1-s) + s*d1Hat2;
d3 = d03*(1-s) + s*d13;
dHat3 = d0Hat3*(1-s) + s*d1Hat3;
d4 = d04*(1-s) + s*d14;
dHat4 = d0Hat4*(1-s) + s*d1Hat4;
d5 = d05*(1-s) + s*d15;
dHat5 = d0Hat5*(1-s) + s*d1Hat5;
d6 = d06*(1-s) + s*d16;
dHat6 = d0Hat6*(1-s) + s*d1Hat6;
d7 = d07*(1-s) + s*d17;
dHat7 = d0Hat7*(1-s) + s*d1Hat7;
d8 = d08*(1-s) + s*d18;
dHat8 = d0Hat8*(1-s) + s*d1Hat8;

aminusx = a - x;
aHatminusxHat = aHat - xHat;
bminusy = b - y;
bHatminusyHat = bHat - yHat;

pz1 = nHat - x*dHat1;
pw1 = mHat - y*dHat1;
qz1 = n - xHat*d1;
qw1 = m - yHat*d1;
rz1 = d1*aHatminusxHat + dHat1*aminusx - d1*dHat1;
rw1 = d1*bHatminusyHat + dHat1*bminusy - d1*dHat1;
pz2 = nHat - x*dHat2;
pw2 = mHat - y*dHat2;
qz2 = n - xHat*d2;
qw2 = m - yHat*d2;
rz2 = d2*aHatminusxHat + dHat2*aminusx - d2*dHat2;
rw2 = d2*bHatminusyHat + dHat2*bminusy - d2*dHat2;
pz3 = nHat - x*dHat3;
pw3 = mHat - y*dHat3;
qz3 = n - xHat*d3;
qw3 = m - yHat*d3;
rz3 = d3*aHatminusxHat + dHat3*aminusx - d3*dHat3;
rw3 = d3*bHatminusyHat + dHat3*bminusy - d3*dHat3;
pz4 = nHat - x*dHat4;
pw4 = mHat - y*dHat4;
qz4 = n - xHat*d4;
qw4 = m - yHat*d4;
rz4 = d4*aHatminusxHat + dHat4*aminusx - d4*dHat4;
rw4 = d4*bHatminusyHat + dHat4*bminusy - d4*dHat4;
pz5 = nHat - x*dHat5;
pw5 = mHat - y*dHat5;
qz5 = n - xHat*d5;
qw5 = m - yHat*d5;
rz5 = d5*aHatminusxHat + dHat5*aminusx - d5*dHat5;
rw5 = d5*bHatminusyHat + dHat5*bminusy - d5*dHat5;
pz6 = nHat - x*dHat6;
pw6 = mHat - y*dHat6;
qz6 = n - xHat*d6;
qw6 = m - yHat*d6;

```

```

rz6 = d6*aHatminusxHat + dHat6*aminusx - d6*dHat6;
rw6 = d6*bHatminusyHat + dHat6*bminusy - d6*dHat6;
pz7 = nHat - x*dHat7;
pw7 = mHat - y*dHat7;
qz7 = n - xHat*d7;
qw7 = m - yHat*d7;
rz7 = d7*aHatminusxHat + dHat7*aminusx - d7*dHat7;
rw7 = d7*bHatminusyHat + dHat7*bminusy - d7*dHat7;
pz8 = nHat - x*dHat8;
pw8 = mHat - y*dHat8;
qz8 = n - xHat*d8;
qw8 = m - yHat*d8;
rz8 = d8*aHatminusxHat + dHat8*aminusx - d8*dHat8;
rw8 = d8*bHatminusyHat + dHat8*bminusy - d8*dHat8;

```

```

gamma1 = qz1*rw1 - qw1*rz1;
gammaHat1 = pw1*rz1 - pz1*rw1;
gammaZero1 = pz1*qw1 - pw1*qz1;
gamma2 = qz2*rw2 - qw2*rz2;
gammaHat2 = pw2*rz2 - pz2*rw2;
gammaZero2 = pz2*qw2 - pw2*qz2;
gamma3 = qz3*rw3 - qw3*rz3;
gammaHat3 = pw3*rz3 - pz3*rw3;
gammaZero3 = pz3*qw3 - pw3*qz3;
gamma4 = qz4*rw4 - qw4*rz4;
gammaHat4 = pw4*rz4 - pz4*rw4;
gammaZero4 = pz4*qw4 - pw4*qz4;
gamma5 = qz5*rw5 - qw5*rz5;
gammaHat5 = pw5*rz5 - pz5*rw5;
gammaZero5 = pz5*qw5 - pw5*qz5;
gamma6 = qz6*rw6 - qw6*rz6;
gammaHat6 = pw6*rz6 - pz6*rw6;
gammaZero6 = pz6*qw6 - pw6*qz6;
gamma7 = qz7*rw7 - qw7*rz7;
gammaHat7 = pw7*rz7 - pz7*rw7;
gammaZero7 = pz7*qw7 - pw7*qz7;
gamma8 = qz8*rw8 - qw8*rz8;
gammaHat8 = pw8*rz8 - pz8*rw8;
gammaZero8 = pz8*qw8 - pw8*qz8;

```

```

f1 = n - a*xHat;
f2 = nHat - aHat*x;
f3 = m - b*yHat;
f4 = mHat - bHat*y;
f5 = gamma1*gammaHat1 + gammaZero1*(gamma1 + gammaHat1);
f6 = gamma2*gammaHat2 + gammaZero2*(gamma2 + gammaHat2);
f7 = gamma3*gammaHat3 + gammaZero3*(gamma3 + gammaHat3);
f8 = gamma4*gammaHat4 + gammaZero4*(gamma4 + gammaHat4);
f9 = gamma5*gammaHat5 + gammaZero5*(gamma5 + gammaHat5);
f10= gamma6*gammaHat6 + gammaZero6*(gamma6 + gammaHat6);
f11= gamma7*gammaHat7 + gammaZero7*(gamma7 + gammaHat7);
f12= gamma8*gammaHat8 + gammaZero8*(gamma8 + gammaHat8);

```

```

END;

```

C.5 Mathematica Code for 10-Bar Synthesis

Useful Functions

```
LinkLength[a_, b_] := N[Sqrt[Dot[b - a, b - a]]];
```

```
JointAngle[b_, c_] := ArcTan[Dot[b, c], Det[{b, c}]];
```

```
Zmat[θ_] := {{Cos[θ], -Sin[θ], 0}, {Sin[θ], Cos[θ], 0}, {0, 0, 1}};
```

```
Xmat[a_] := {{1, 0, a}, {0, 1, 0}, {0, 0, 1}};
```

```
Ymat[a_] := {{1, 0, 0}, {0, 1, a}, {0, 0, 1}};
```

```
Disp[x_] :=  
  {{Cos[x[[1]]], -Sin[x[[1]]], x[[2]]}, {Sin[x[[1]]], Cos[x[[1]]], x[[3]]}, {0, 0, 1}};
```

```
i = 1;
```

Foot Data

```
DataIn = Import["B:\\Dropbox\\Current Research\\Walk data TAMU\\Herbert1.xls"]
```

```
WalkData = DataIn[[1]]
```

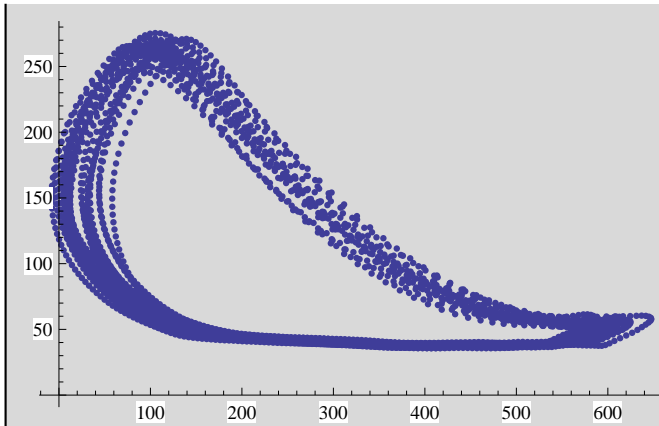
```
Points = Table[Partition[WalkData[[i]], 2], {i, Length[WalkData]}]
```

```
Plots = Table[  
  ListPlot[Points[[i]], PlotRange → {{-200, 1500}, {-200, 1500}}, {i, Length[Points]}];
```

```
(*ListAnimate[Plot]*)
```

```
AnklePoints = Table[Points[[i, 8]], {i, Length[Points]}]
```

```
ListPlot[AnklePoints]
```



```
(*Export["B:\\Dropbox\\Current Research\\Conferences\\ASME 2015\\AnklePoints.pdf",  
ListPlot[AnklePoints]]*)
```

```
MovedPoints = Table[  
Table[Points[[i, j]] - Points[[i, 1]], {j, Length[Points[[1]]]}], {i, Length[Points]}]
```

A very large output was generated. Here is a sample of it:

```
{{{0., 0.}, {57.768, 0.63}, {42.876, -99.406}, {45.587, -249.398}, {86.69, -502.291},  
{35.761, -662.383}, {63.394, -938.598}, {35.445, -995.453}, {214.761, -983.353}},  
<<4701>>, {{0., 0.}, {57.647, -0.23}, <<6>>, {80.045, -981.988}}
```

[Show Less](#)
[Show More](#)
[Show Full Output](#)
[Set Size Limit...](#)

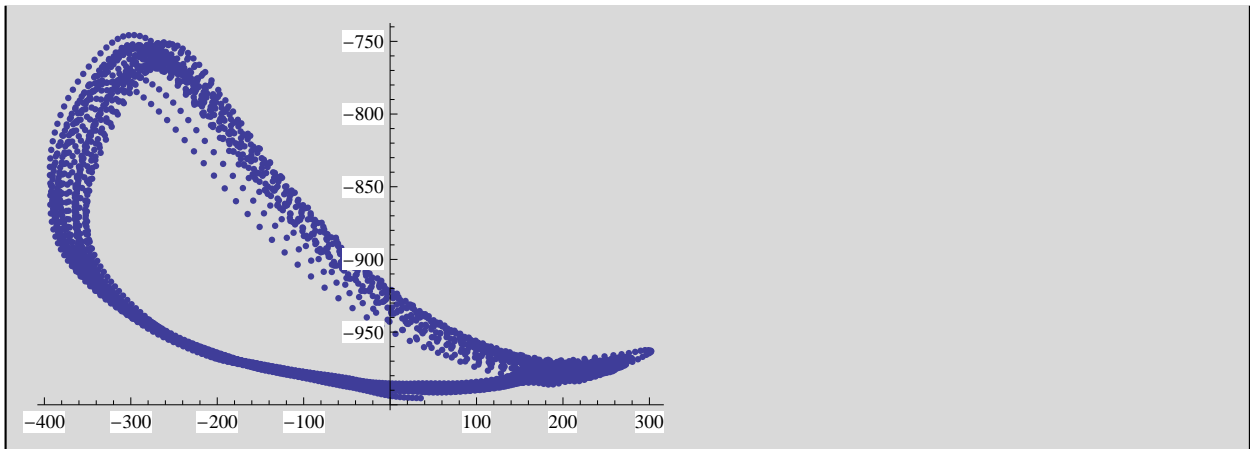
```
MovedAnklePoints = Table[MovedPoints[[i, 8]], {i, Length[MovedPoints]}]
```

A very large output was generated. Here is a sample of it:

```
{{{35.445, -995.453}, {30.465, -995.335}, {25.612, -995.244}, {20.854, -995.126},  
{16.164, -994.936}, {11.546, -994.673}, <<4692>>, {-92.143, -979.574},  
{-95.328, -979.171}, {-98.384, -978.756}, {-101.323, -978.37}, {-104.167, -978.032}}
```

[Show Less](#)
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```
ListPlot[MovedAnklePoints]
```



```
(*Export [
  "B:\\Dropbox\\Current Research\\Conferences\\ASME 2015\\MovedAnklePoints.pdf",
  ListPlot[MovedAnklePoints] *)
```

```
MovedPlot = Table[ListPlot[MovedPoints[[i]], PlotRange -> {{-500, 600}, {5, -1500}},
  {i, Length[MovedPoints]}];
```

```
(*ListAnimate[MovedPlot] *)
```

```
UpperLeg = Max[
  Table[LinkLength[MovedPoints[[i, 1]], MovedPoints[[i, 5]], {i, Length[MovedPoints]}]]
```

```
LowerLeg = Max[
  Table[LinkLength[MovedPoints[[i, 5]], MovedPoints[[i, 8]], {i, Length[MovedPoints]}]]
```

```
Foot = Max[
  Table[LinkLength[MovedPoints[[i, 8]], MovedPoints[[i, 9]], {i, Length[MovedPoints]}]]
```

```
KneetoToe =
  Table[LinkLength[MovedPoints[[i, 5]], MovedPoints[[i, 9]], {i, Length[MovedPoints]}]
```

Data

```
AnkleData = Table[MovedAnklePoints[[i]], {i, 205}]
```

```
FootAngle =
  Table[ArcCos[(LowerLeg^2 + Foot^2 - KneetoToe[[i]]^2) / (2 * LowerLeg * Foot)], {i, 205}]
```



```
AnkleSpline = BSplineFunction[AnkleData, SplineClosed → True][t]
```

```
tvals = Table[i, {i, 0, 0.9999, 1/9}]
```

```
DesiredPoints = Table[AnkleSpline /. t → tvals[[i]], {i, Length[tvals]}]
```

User Defined Values

```
dvec = DesiredPoints
```

```
npos = Length[dvec]
```

```
 $\alpha_1 = -145$  Degree
```

```
q1 = 150
```

```
 $\theta_{3temp} = \text{FootAngle}$ 
```

```
Tempvals = Table[i, {i, 1, 205, 23}]
```

```
 $\theta_3 = \text{Table}[\theta_{3temp}[[\text{Tempvals}[[i]]]], \{i, \text{Length}[\text{Tempvals}]]]$ 
```

```
Foot = Max[
  Table[LinkLength[MovedPoints[[i, 8]], MovedPoints[[i, 9]], {i, Length[MovedPoints]}]]
```

```
 $\alpha_2 = 55$  Degree
```

```
q2 = 60
```

Inverse Kinematics

```
sgn = -1
```

```

Tasks[dvec_] :=
Module[{s2,  $\theta_2$ ,  $\psi$ ,  $\theta_1$ , KneeTrans, KneeJoint, AnkleTrans,
  AnkleJoint, FootTrans, FootPos, FirstTaskTrans, FirstTaskTemp, FirstTask,
  SecondTaskTrans, SecondTask, SecondTaskRelTemp, SecondTaskRel},
s2 = Table[Norm[dvec[[i]]]^2, {i, npos}];
 $\theta_2$  = Table[sgn *
  ArcCos[(s2[[i]] - UpperLeg^2 - LowerLeg^2) / (2 * UpperLeg * LowerLeg)], {i, npos}];
 $\psi$  = Table[ArcTan[UpperLeg + LowerLeg * Cos[ $\theta_2$ [[i]]], LowerLeg * Sin[ $\theta_2$ [[i]]]],
  {i, npos}];
 $\theta_1$  = Table[ArcTan[dvec[[i, 1]], dvec[[i, 2]]] -  $\psi$ [[i]], {i, npos}];
KneeTrans = N[Table[Zmat[ $\theta_1$ [[i]]].Xmat[UpperLeg], {i, npos}]];
KneeJoint = Table[{KneeTrans[[i, 1, 3]], KneeTrans[[i, 2, 3]]}, {i, npos}];
AnkleTrans =
  N[Table[Zmat[ $\theta_1$ [[i]]].Xmat[UpperLeg].Zmat[ $\theta_2$ [[i]]].Xmat[LowerLeg], {i, npos}]];
AnkleJoint = Table[{AnkleTrans[[i, 1, 3]], AnkleTrans[[i, 2, 3]]}, {i, npos}];
FootTrans = N[Table[Zmat[ $\theta_1$ [[i]]].Xmat[UpperLeg].
  Zmat[ $\theta_2$ [[i]]].Xmat[LowerLeg].Zmat[ $\theta_3$ [[i]]].Xmat[Foot], {i, npos}]];
FootPos = Table[{FootTrans[[i, 1, 3]], FootTrans[[i, 2, 3]]}, {i, npos}];
FirstTaskTrans = Table[Zmat[ $\theta_1$ [[i]]].Xmat[UpperLeg].
  Zmat[ $\theta_2$ [[i]]].Xmat[LowerLeg].Zmat[ $\alpha_1$ ].Xmat[q1], {i, npos}];
FirstTaskTemp = Table[{FirstTaskTrans[[i, 1, 3]], FirstTaskTrans[[i, 2, 3]]},
  {i, npos}];
FirstTask = Table[FirstTaskTemp[[i + 1]] - FirstTaskTemp[[1]],
  {i, Length[FirstTaskTemp] - 1}];
SecondTaskTrans = Table[Zmat[ $\theta_1$ [[i]]].Xmat[UpperLeg].Zmat[ $\theta_2$ [[i]].
  Xmat[LowerLeg].Zmat[ $\theta_3$ [[i]] +  $\alpha_2$ ].Xmat[q2], {i, npos}];
SecondTask = Table[{SecondTaskTrans[[i, 1, 3]], SecondTaskTrans[[i, 2, 3]]},
  {i, npos}];
SecondTaskRelTemp = Table[{SecondTaskTrans[[i, 1, 3]], SecondTaskTrans[[i, 2, 3]]},
  {i, npos}] - KneeJoint(*Relative to Knee*);
SecondTaskRel = Table[SecondTaskRelTemp[[i + 1]] - SecondTaskRelTemp[[1]],
  {i, Length[SecondTaskRelTemp] - 1}];
{FirstTask, SecondTaskRel, KneeJoint, AnkleJoint, FootPos,
  SecondTask, FirstTaskTemp, SecondTaskRelTemp}]

```

```
TasksOut = Tasks[dvec]
```

```
FirstTask = TasksOut[[1]]
```

```
SecondTaskRel = TasksOut[[2]]
```

```
KneeJoint = TasksOut[[3]]
```

```
AnkleJoint = TasksOut[[4]]
```

```
FootPos = TasksOut[[5]]
```

```
SecondTask = TasksOut[[6]]
```

```
FirstTaskTemp = TasksOut[[7]]
```

```
SecondTaskRelTemp = TasksOut[[8]]
```

```
diskSize = 5
```

```
FirstTaskPlot =
Graphics[{Disk[FirstTaskTemp[[1]], diskSize], Disk[FirstTaskTemp[[2]], diskSize],
  Disk[FirstTaskTemp[[3]], diskSize], Disk[FirstTaskTemp[[4]], diskSize],
  Disk[FirstTaskTemp[[5]], diskSize], Disk[FirstTaskTemp[[6]], diskSize],
  Disk[FirstTaskTemp[[7]], diskSize], Disk[FirstTaskTemp[[8]], diskSize],
  Disk[FirstTaskTemp[[9]], diskSize]}, Axes → Automatic]
```

```
(*Export["B:\\Dropbox\\Current Research\\Conferences\\ASME 2015\\FirstTaskPlot.pdf",
  FirstTaskPlot]*)
```

```
SecondTaskPlot = Graphics[
  {Disk[SecondTaskRelTemp[[1]], diskSize], Disk[SecondTaskRelTemp[[2]], diskSize],
  Disk[SecondTaskRelTemp[[3]], diskSize], Disk[SecondTaskRelTemp[[4]], diskSize],
  Disk[SecondTaskRelTemp[[5]], diskSize], Disk[SecondTaskRelTemp[[6]], diskSize],
  Disk[SecondTaskRelTemp[[7]], diskSize], Disk[SecondTaskRelTemp[[8]], diskSize],
  Disk[SecondTaskRelTemp[[9]], diskSize]}, Axes → Automatic]
```

```
(*Export["B:\\Dropbox\\Current Research\\Conferences\\ASME 2015\\SecondTaskPlot.pdf",
  SecondTaskPlot]*)
```

Bertini Setup

```
BertiniTask1 = Table[InputForm[FirstTask[[i, 1]] + FirstTask[[i, 2]] * I], {i, npos - 1}]
```

```
BertiniTask1Conj =
  Table[InputForm[Conjugate[FirstTask[[i, 1]] + FirstTask[[i, 2]] * I]], {i, npos - 1}]
```

```
Input1 = Table[
  StringJoin["d0", ToString[i], " = ", ToString[BertiniTask1[[i]]], ";"], {i, npos - 1}]
```

```
Input2 = Table[StringJoin["d0Hat", ToString[i],
  " = ", ToString[BertiniTask1Conj[[i]]], ";"], {i, npos - 1}]
```

```
Output1 = Flatten[Table[{Input1[[i]], Input2[[i]]}, {i, npos - 1}]]
```

```
(*Export["B:\\Dropbox\\Current Research\\Ten Bar\\Output1.txt",Output1]*)
```

```
BertiniTask01 =  
Table[InputForm[SecondTaskRel[[i, 1]] + SecondTaskRel[[i, 2]] * I], {i, npos - 1}]
```

```
BertiniTask01Conj = Table[  
InputForm[Conjugate[SecondTaskRel[[i, 1]] + SecondTaskRel[[i, 2]] * I]], {i, npos - 1}]
```

```
Input01 = Table[  
StringJoin["d0", ToString[i], " = ", ToString[BertiniTask01[[i]]], ";"], {i, npos - 1}]
```

```
Input02 = Table[StringJoin["d0Hat", ToString[i],  
" = ", ToString[BertiniTask01Conj[[i]]], ";"], {i, npos - 1}]
```

```
Output01 = Flatten[Table[{Input01[[i]], Input02[[i]]}, {i, npos - 1}]]
```

```
(*Export["B:\\Dropbox\\Current Research\\Ten Bar\\Output01.txt",Output01]*)
```

Import Bertini Solutions

```
solns1 = Import["B:\\Dropbox\\Current Research\\Ten Bar\\real_solutions"];
```

```
solns2 = Import["B:\\Dropbox\\Current Research\\Ten Bar\\real_solutions2"];
```

```
PFirst = FirstTaskTemp
```

```
PSecond = SecondTaskRelTemp
```

```

FourBarSol[solns1_, P_] :=
Module[
  {vars, solns2, solns3, solns4, S, x, a, n, y, b, m, ptA, ptB, u, v, ptD, ptC, ABCD},
  vars = 12;
  solns2 = StringSplit[solns1];
  solns3 = ToExpression[StringReplace[solns2, "e" -> "*10^"];
  solns4 = Chop[Partition[Rest[solns3], 2 + vars]];
  S = Table[Delete[solns4[[i]], {{2}, {4}, {6}, {8}, {10},
    {12}, {14}, {16}, {18}, {20}, {22}, {24}}], {i, Length[solns4]}];
  x = Table[{S[[i, 1]], S[[i, 2]]}, {i, Length[S]}];
  a = Table[{S[[i, 3]], S[[i, 4]]}, {i, Length[S]}];
  n = Table[{S[[i, 5]], S[[i, 6]]}, {i, Length[S]}];
  y = Table[{S[[i, 7]], S[[i, 8]]}, {i, Length[S]}];
  b = Table[{S[[i, 9]], S[[i, 10]]}, {i, Length[S]}];
  m = Table[{S[[i, 11]], S[[i, 12]]}, {i, Length[S]}];
  ptA = Table[{P[[1, 1]] + a[[i, 1]], P[[1, 2]] + a[[i, 2]]}, {i, Length[S]}];
  ptB = Table[{P[[1, 1]] + b[[i, 1]], P[[1, 2]] + b[[i, 2]]}, {i, Length[S]}];
  u = Table[{x[[i, 1]] - a[[i, 1]], x[[i, 2]] - a[[i, 2]]}, {i, Length[S]}];
  v = Table[{y[[i, 1]] - b[[i, 1]], y[[i, 2]] - b[[i, 2]]}, {i, Length[S]}];
  ptD = ptA + u;
  ptC = ptB + v;
  ABCD = Table[Flatten[{ptA[[i]], ptB[[i]], ptC[[i]], ptD[[i]]}], {i, Length[S]}];
  {ABCD}]

```

```

Sorting[FourBar_] :=
Module[{sort1, sort2, sort3, sort4},
  sort1 = Table[Sort[
    {LinkLength[{FourBar[[i, 1]], FourBar[[i, 2]]}, {FourBar[[i, 3]], FourBar[[i, 4]]}],
    LinkLength[{FourBar[[i, 3]], FourBar[[i, 4]]}, {FourBar[[i, 5]], FourBar[[i, 6]]}],
    LinkLength[{FourBar[[i, 5]], FourBar[[i, 6]]}, {FourBar[[i, 7]], FourBar[[i, 8]]}],
    LinkLength[{FourBar[[i, 7]], FourBar[[i, 8]]},
    {FourBar[[i, 1]], FourBar[[i, 2]]}}], {i, Length[FourBar]}];
  sort2 = DeleteCases[Partition[Flatten[Table[{FourBar[[i]],
    sort1[[i, 4]] + sort1[[i, 1]] ≤ sort1[[i, 2]] + sort1[[i, 3]]},
    {i, Length[sort1]}], 9], a_ /; a[[9]] == False];
  sort3 = Sort[Table[Delete[sort2[[i]], 9], {i, Length[sort2]}];
  sort4 = DeleteCases[sort3, a_ /; LinkLength[{a[[1]], a[[2]]}, {a[[7]], a[[8]]} >
    LinkLength[{a[[3]], a[[4]]}, {a[[5]], a[[6]]}]];
  {sort4}]

```

```
FirstFourBarTemp = FourBarSol[solns1, PFirst];
```

```
FirstFourBar = FirstFourBarTemp[[1]];
```

```
SortedFirstFourBar = Partition[Flatten[Sorting[FirstFourBar]], 8]
```

```

{{-1563.99, 1493.3, 1855.9, 1932.44, 1786.19, 2239.43, -1627.31, 1286.26},
{-516.989, -12.988, 434.746, -90.1208, 693.177, -66.9758, -313.747, -53.6971},
{-508.228, -940.099, 262.858, -1419.17, 488.913, -1363.01, -396.459, -1129.01},
{-428.761, -2361.18, 500.173, -4125.73, 417.652, -4267.76, -509.766, -2494.08},
{-394.7, -1022.66, 68.9769, -1525.13, 288.768, -1535.64, -309.734, -1185.69},
{-380.912, -771.93, -993.686, -2875.07, 117.303, -1227.85, -286.165, -1005.63},
{-380.912, -771.93, 591.96, -1839.77, 46.9287, -648.298, -117.155, -621.277},
{-348.148, -1277.21, 103.443, -2158.58, 177.081, -2347.61, -297.889, -1377.87},
{-342.684, -943.564, -35.1588, -1418.4, 216.572, -1384.14, -260.75, -1125.13},
{-341.438, -804.556, -79.0754, -1414.3, -346.048, -1087.26, -180.845, -612.033},
{-332.074, -807.781, -111.206, -1422.47, -350.918, -1059.16, -175.466, -616.91},
{-319.056, -793.102, -1563.99, 1493.3, 40.9187, -647.936, -122.105, -660.032},
{-319.056, -793.102, 1855.9, 1932.44, 47.3059, -1161.96, -219.358, -988.045},
{-299.422, -771.29, -287.905, -314.017, -240.421, -831.199, -251.02, -1081.92},
{-299.422, -771.29, 110.162, -350.568, -296.082, -879.173, -70.81, -544.341},
{-292.755, -789.709, -516.989, -12.988, -225.65, -814.266, -196.957, -987.4},
{-292.755, -789.709, 434.746, -90.1208, -280.838, -878.12, -118.206, -657.284},
{-287.905, -314.017, 110.162, -350.568, 383.836, -326.37, -69.8911, -337.793},
{-238.062, -769.432, -419.41, 885.383, -141.148, -753.722, -159.76, -976.503},
{-238.062, -769.432, 592.71, 314.491, -171.697, -815.069, -100.71, -647.904},
{-203.342, -746.527, -151.506, 201.024, 34.1046, -728.116, -92.6476, -649.198},
{-203.342, -746.527, 728.087, 274.332, 81.4038, -944.521, -133.102, -952.304},
{-203.145, -716.9, 60.9792, 378.605, -29.7463, -743.898, -151.205, -960.96},
{-203.145, -716.9, 228.949, -96.9373, -101.406, -776.042, -74.3482, -610.915},
{-194.985, -708.685, -0.670677, -187.211, 15.3537, -745.75, -66.9875, -623.252},
{-194.985, -708.685, 416.935, -62.8482, 91.3425, -894.717, -150.405, -940.408},
{-189.319, -1130.83, -104.081, -2023.18, -162.756, -2428.45, -170.844, -1239.92},
{-167.312, -767.683, -1293.54, -2339.78, -182.569, -758.231, 24.6096, -726.509},
{-167.312, -767.683, 377.589, -1906.23, -177.516, -773.436, -214.329, -896.149},
{-104.194, -793.164, -348.148, -1277.21, -72.6668, -754.313, -44.3797, -699.613},
{-104.194, -793.164, 103.443, -2158.58, -96.0458, -665.939, -82.2224, -948.526},
{-103.444, -831.751, -189.319, -1130.83, -40.8827, -745.884, -32.9861, -708.298},
{-103.444, -831.751, -104.081, -2023.18, 36.2663, -449.701, -92.866, -978.427},
{-102.27, -781.283, -795.152, -1542.16, -155.705, -589.926, 86.4449, -781.914},
{-102.27, -781.283, 115.725, -1159.53, -186.498, -778.165, -211.123, -854.343},
{-74.0936, -789.095, -508.228, -940.099, -134.177, -666.068, -24.2186, -682.221},
{-74.0936, -789.095, 262.858, -1419.17, -248.462, -911.133, -72.2827, -961.848},
{-28.4339, -793.513, -394.7, -1022.66, -107.374, -691.947, 3.80268, -658.256},
{-28.4339, -793.513, 68.9769, -1525.13, -242.199, -844.469, -54.6443, -990.232},
{-0.670677, -187.211, 416.935, -62.8482, 303.185, -23.1061, -38.4321, -296.436},
{9.99493, -815.242, -342.684, -943.564, -104.341, -673.408, 25.2194, -647.395},
{9.99493, -815.242, -35.1588, -1418.4, -274.139, -889.243, -37.6322, -1022.82},
{29.1401, -899.973, -341.438, -804.556, -183.001, -1047.5, -214.152, -906.366},
{29.1401, -899.973, -79.0754, -1414.3, 244.565, -1182.02, 220.884, -848.582},

```

```
{41.6829, -913.954, -332.074, -807.781, -179.016, -1045.85, -217.051, -903.987},
{41.6829, -913.954, -111.206, -1422.47, 217.304, -1218.29, 236.326, -864.942},
{52.2368, -726.756, -428.761, -2361.18, 58.5968, -722.067, 187.356, -688.827},
{52.2368, -726.756, 500.173, -4125.73, 60.1133, -712.944, -157.527, -892.905},
{58.0891, -742.095, -896.848, -4994.08, 52.016, -644.458, 30.6757, -1000.41},
{58.0891, -742.095, 413.443, -2600.47, 38.779, -704.266, 5.00571, -596.662},
{60.9792, 378.605, 228.949, -96.9373, 307.947, -175.87, 68.3178, 267.529},
{68.6868, -746.562, -885.997, -4316.46, 88.4875, -645.461, 20.0151, -1008.36},
{68.6868, -746.562, 377.257, -2308.83, 57.1486, -703.692, 26.2641, -593.175},
{115.725, -1159.53, -795.152, -1542.16, -661.854, -1807.21, 279.815, -1236.34},
{377.257, -2308.83, -885.997, -4316.46, -996.892, -4525.97, 297.701, -2460.11},
{377.589, -1906.23, -1293.54, -2339.78, -1133.38, -2436.52, 532.698, -1987.77},
{413.443, -2600.47, -896.848, -4994.08, -971.272, -5204.59, 352.256, -2751.18},
{591.96, -1839.77, -993.686, -2875.07, -1133.4, -2502.2, 522.624, -2046.45},
{592.71, 314.491, -419.41, 885.383, -300.67, 784.131, 742., 274.585},
{728.087, 274.332, -151.506, 201.024, -208.018, 74.1648, 624.276, 363.879}}
```

```
(*LinkVals [SortedFourBar_] :=
Module[{samp,x0,y0,BA,θ0,a,b,g,h,r,α},
  samp=Partition[SortedFourBar,2];
  x0=samp[[1,1]];
  y0=samp[[1,2]];
  BA=samp[[2]]-samp[[1]];
  θ0=ArcTan[BA[[2]],BA[[1]]];
  a=LinkLength[samp[[1]],samp[[4]];
  b=LinkLength[samp[[2]],samp[[3]];
  g=LinkLength[samp[[1]],samp[[2]];
  h=LinkLength[samp[[3]],samp[[4]];
  r=LinkLength[PFIRST[[1]],samp[[4]];
  α=ArcCos[(-LinkLength[PFIRST[[1]],samp[[3]]^2+r^2+h^2)/(2*r*h)];
  {x0,y0,θ0,a,b,g,h,r,α}*)
```

```
(*LinkageLengths =
Table[LinkVals[SortedFirstFourBar[[i]],{i,Length[SortedFirstFourBar]}]*)
```

```
(*vars={x0,y0,θ0,a,b,g,h,r,α}*)
```

```
(*Subs=Table[Table[vars[[i]]→LinkageLengths[[j,i]],{i,Length[vars]}],
{j,Length[LinkageLengths]}]*)
```

```
(*Aθ=2*a*b*cos[θ]-2*g*b;*)
```

```
(*Bθ=2*a*b*sin[θ];*)
```

```
(*Cθ=g^2+b^2+a^2-h^2-2*a*g*cos[θ];*)
```

```
(*ψ=ArcTan[Aθ,Bθ]-ArcCos[Cθ/Sqrt[Aθ^2+Bθ^2]];*)
```

```
(*φ=ArcTan[(b*Sin[ψ]-a*Sin[θ])/(g+b*Cos[ψ]-a*Cos[θ])]-θ;*)
```

```
(*xPos=x0+a Cos[θ+θ0]+r Cos[α+θ+θ0+φ];*)
```

```
(*yPos=y0+a Sin[θ+θ0]+r Sin[α+θ+θ0+φ];*)
```

```
(*eqx=Table[xPos/.Subs[[i]],{i,Length[Subs]}];*)
```

```
(*eqy=Table[yPos/.Subs[[i]],{i,Length[Subs]}];*)
```

```
(*Show[FirstTaskPlot,ParametricPlot[{eqx[[i]],eqy[[i]]},{θ,-π,π}]]*)
```

```
SecondFourBarTemp = FourBarSol[solns2, PSecond];
```

```
SecondFourBar = SecondFourBarTemp[[1]];
```

```
SortedSecondFourBarRel = Partition[Flatten[Sorting[SecondFourBar]], 8]
```

```
{{-2648., -3016.21, 159.172, 1211.37, 73.1541, 600.343, -2592.47, -3062.46},
{-1019.04, -1171.41, -98.1033, -521.055, -139.704, -752.973, -1059.81, -1094.39},
{-471.079, -601.132, -57.9328, -310.446, -114.047, -566.004, -467.184, -488.077},
{-412.29, -523.684, -17.7097, 44.1914, -68.5656, -464.903, -409.843, -342.569},
{-412.29, -523.684, 22.7371, 21.0231, -62.6036, -487.64, -77.2272, -669.651},
{-374.813, -591.826, -15.1724, -831.874, -125.135, -986.765, -320.151, -681.317},
{-315.215, -326.565, -179.84, -51.6078, -151.773, -434.228, -242.867, -511.781},
{-315.215, -326.565, 56.4087, -101.053, -201.908, -579.984, -147.128, -303.321},
{-301.314, -405.973, -112.312, -158.183, -118.543, -453.818, -208.837, -555.709},
{-301.314, -405.973, -6.56904, -230.086, -134.064, -529.77, -167.257, -338.8},
{-294.765, -397.357, -82.7528, -130.408, -51.8463, -467.996, -131.858, -348.509},
{-294.765, -397.357, -19.8103, -167.357, -59.5447, -521.609, -237.687, -537.385},
{-282.934, -393.776, -59.6988, -108.5, -62.0212, -480.298, -126.238, -340.104},
{-282.934, -393.776, -28.7387, -126.232, -67.3356, -503.053, -231.476, -542.209},
{-279.851, -396.424, -59.9718, -108.339, -61.9814, -480.34, -125.529, -341.766},
{-279.851, -396.424, -28.4779, -126.048, -67.2417, -503.014, -229.102, -543.194},
{-274.725, -417.979, -48.3699, -92.0627, -63.8135, -482.668, -131.092, -299.668},
{-274.725, -417.979, -25.7773, -103.481, -66.0351, -496.565, -218.412, -606.848},
```



```
{-254.732, -534.312, -36.0519, -66.2756, -69.1347, -483.577, -299.328, -398.364},
{-254.732, -534.312, -26.6277, -78.9773, -70.4692, -489.314, -30.1838, -624.485},
{-254.347, -429.594, -52.2603, -93.5068, -62.8946, -482.016, -126.501, -327.25},
{-254.347, -429.594, -23.3723, -106.737, -65.3834, -497.905, -202.626, -590.881},
{-242.519, -520.19, -36.108, -78.2264, -69.913, -485.517, -296.229, -342.399},
{-242.519, -520.19, -29.5273, -86.3244, -70.8566, -489.163, -21.071, -666.328},
{-216.942, -445.14, -63.526, -65.144, -94.2861, -475.216, -189.438, -588.652},
{-216.942, -445.14, -0.78479, -83.5205, -97.1309, -495.162, -102.283, -345.025},
{-199.317, -263.466, -374.813, -591.826, -129.442, -399.047, -57.3454, -344.686},
{-199.317, -263.466, -15.1724, -831.874, 35.1827, -333.647, -216.752, -407.317},
{-198.876, -431.555, -45.1907, -93.5015, -66.9479, -486.052, -101.914, -292.81},
{-198.876, -431.555, -30.3397, -98.0705, -68.5036, -491.819, -171.742, -627.281},
{-189.226, -407.084, -45.4966, -93.4893, -68.0345, -485.823, -106.781, -306.304},
{-189.226, -407.084, -32.2975, -96.9982, -70.2956, -491.079, -157.226, -589.317},
{-179.84, -51.6078, 56.4087, -101.053, 183.537, -9.60675, -102.847, -105.917},
{-112.312, -158.183, -6.56904, -230.086, 52.7148, -188.854, -68.5494, -192.902},
{-103.98, -208.309, -1019.04, -1171.41, -34.0125, -565.55, -98.8121, -485.902},
{-103.98, -208.309, -98.1033, -521.055, -33.1791, -256.619, -79.9479, -210.944},
{-100.806, -196.953, -471.079, -601.132, -78.6753, -601.592, -100.841, -480.863},
{-100.806, -196.953, -57.9328, -310.446, -18.6664, -232.978, -74.7448, -204.627},
{-92.9672, -100.883, -54.264, -432.959, -81.3785, -810.309, -122.65, -463.501},
{-92.9672, -100.883, -47.2024, -124.96, -1.41022, -161.392, -45.0978, -125.919},
{-82.7528, -130.408, -19.8103, -167.357, -35.0457, -134.285, -105.687, -150.949},
{-59.9718, -108.339, -28.4779, -126.048, -36.0163, -111.571, -72.7705, -116.537},
{-59.6988, -108.5, -28.7387, -126.232, -36.1832, -111.715, -72.4577, -116.739},
{-54.264, -432.959, -47.2024, -124.96, -120.572, -452.104, -47.6655, -111.187},
{-32.2975, -96.9982, -45.4966, -93.4893, -52.2421, -96.2032, -36.782, -94.4559},
{-30.3397, -98.0705, -45.1907, -93.5015, -53.0228, -95.9865, -36.6162, -94.7891},
{-29.5273, -86.3244, -36.108, -78.2264, -40.9751, -81.247, -33.4508, -85.6989},
{-26.6277, -78.9773, -36.0519, -66.2756, -41.6973, -71.2358, -30.9385, -78.2},
{-25.7773, -103.481, -48.3699, -92.0627, -59.3365, -97.9317, -34.5222, -95.4529},
{-23.3723, -106.737, -52.2603, -93.5068, -64.1457, -100.028, -32.769, -97.3698},
{-0.78479, -83.5205, -63.526, -65.144, -44.02, -78.4652, 21.566, -76.8959},
{22.7371, 21.0231, -17.7097, 44.1914, -23.9242, 20.5569, 10.5606, 20.1259},
{45.9756, -14.4101, -2648., -3016.21, -130.312, -442.281, -91.9606, -485.047},
{45.9756, -14.4101, 159.172, 1211.37, 11.238, 122.487, 63.1561, -17.9006},
{58.9514, 171.972, -91.0814, -490.341, 306.934, 3049.19, 282.401, -560.198},
{121.702, 144.402, -91.0814, -490.341, -472.795, -4028.06, 268.315, -595.866},
{121.702, 144.402, 58.9514, 171.972, -298.229, 243.633, -221.393, 251.731}}
```

```
SecondFourBarFinal = Table[{SortedSecondFourBarRel [[i, 1]] + KneeJoint [[1, 1]],
  SortedSecondFourBarRel [[i, 2]] + KneeJoint [[1, 2]],
  SortedSecondFourBarRel [[i, 3]] + KneeJoint [[1, 1]],
  SortedSecondFourBarRel [[i, 4]] + KneeJoint [[1, 2]], SortedSecondFourBarRel [[i, 5]] +
  KneeJoint [[1, 1]], SortedSecondFourBarRel [[i, 6]] + KneeJoint [[1, 2]],
  SortedSecondFourBarRel [[i, 7]] + KneeJoint [[1, 1]],
  SortedSecondFourBarRel [[i, 8]] + KneeJoint [[1, 2]]},
{i, Length[SortedSecondFourBarRel]}
```

```

{{-2486.9, -3501.05, 320.276, 726.524, 234.258, 115.5, -2431.37, -3547.31},
{-857.941, -1656.25, 63.0002, -1005.9, 21.3993, -1237.82, -898.708, -1579.24},
{-309.975, -1085.98, 103.171, -795.289, 47.057, -1050.85, -306.08, -972.921},
{-251.187, -1008.53, 143.394, -440.652, 92.5379, -949.746, -248.74, -827.413},
{-251.187, -1008.53, 183.841, -463.82, 98.5, -972.483, 83.8764, -1154.49},
{-213.709, -1076.67, 145.931, -1316.72, 35.9684, -1471.61, -159.047, -1166.16},
{-154.111, -811.408, -18.7364, -536.451, 9.33078, -919.071, -81.7637, -996.624},
{-154.111, -811.408, 217.512, -585.897, -40.8045, -1064.83, 13.9757, -788.164},
{-140.211, -890.816, 48.7917, -643.026, 42.561, -938.661, -47.7336, -1040.55},
{-140.211, -890.816, 154.534, -714.93, 27.0396, -1014.61, -6.15377, -823.644},
{-133.661, -882.2, 78.3508, -615.251, 109.257, -952.839, 29.2456, -833.352},
{-133.661, -882.2, 141.293, -652.2, 101.559, -1006.45, -76.5834, -1022.23},
{-121.83, -878.62, 101.405, -593.343, 99.0823, -965.141, 34.8659, -824.947},
{-121.83, -878.62, 132.365, -611.075, 93.7679, -987.897, -70.373, -1027.05},
{-118.747, -881.267, 101.132, -593.183, 99.1221, -965.183, 35.5745, -826.61},
{-118.747, -881.267, 132.626, -610.892, 93.8619, -987.857, -67.9985, -1028.04},
{-113.621, -902.822, 112.734, -576.906, 97.29, -967.511, 30.0111, -784.511},
{-113.621, -902.822, 135.326, -588.324, 95.0684, -981.409, -57.3089, -1091.69},
{-93.6281, -1019.15, 125.052, -551.119, 91.9688, -968.42, -138.224, -883.207},
{-93.6281, -1019.15, 134.476, -563.821, 90.6343, -974.158, 130.92, -1109.33},
{-93.2434, -914.438, 108.843, -578.35, 98.2089, -966.859, 34.6027, -812.094},
{-93.2434, -914.438, 137.731, -591.581, 95.7201, -982.748, -41.5226, -1075.72},
{-81.416, -1005.03, 124.995, -563.07, 91.1905, -970.36, -135.125, -827.242},
{-81.416, -1005.03, 131.576, -571.168, 90.2469, -974.006, 140.032, -1151.17},
{-55.8381, -929.983, 97.5775, -549.987, 66.8174, -960.059, -28.3349, -1073.5},
{-55.8381, -929.983, 160.319, -568.364, 63.9727, -980.005, 58.8202, -829.869},
{-38.2135, -748.309, -213.709, -1076.67, 31.6614, -883.89, 103.758, -829.529},
{-38.2135, -748.309, 145.931, -1316.72, 196.286, -818.49, -55.6482, -892.16},
{-37.7722, -916.398, 115.913, -578.345, 94.1556, -970.896, 59.1893, -777.654},
{-37.7722, -916.398, 130.764, -582.914, 92.5999, -976.662, -10.6381, -1112.12},
{-28.1226, -891.927, 115.607, -578.333, 93.069, -970.667, 54.323, -791.148},
{-28.1226, -891.927, 128.806, -581.842, 90.8079, -975.923, 3.87781, -1074.16},
{-18.7364, -536.451, 217.512, -585.897, 344.64, -494.45, 58.2563, -590.76},
{48.7917, -643.026, 154.534, -714.93, 213.818, -673.697, 92.5542, -677.746},
{57.1236, -693.153, -857.941, -1656.25, 127.091, -1050.39, 62.2914, -970.745},
{57.1236, -693.153, 63.0002, -1005.9, 127.924, -741.463, 81.1556, -695.788},
{60.2976, -681.796, -309.975, -1085.98, 82.4282, -1086.44, 60.2623, -965.706},
{60.2976, -681.796, 103.171, -795.289, 142.437, -717.822, 86.3587, -689.471},
{68.1363, -585.727, 106.84, -917.802, 79.725, -1295.15, 38.454, -948.345},
{68.1363, -585.727, 113.901, -609.803, 159.693, -646.236, 116.006, -610.762},
{78.3508, -615.251, 141.293, -652.2, 126.058, -619.128, 55.4169, -635.793},
{101.132, -593.183, 132.626, -610.892, 125.087, -596.415, 88.333, -601.38},
{101.405, -593.343, 132.365, -611.075, 124.92, -596.559, 88.6458, -601.583},
{106.84, -917.802, 113.901, -609.803, 40.5313, -936.948, 113.438, -596.031},

```

```
{128.806, -581.842, 115.607, -578.333, 108.861, -581.047, 124.321, -579.299},
{130.764, -582.914, 115.913, -578.345, 108.081, -580.83, 124.487, -579.632},
{131.576, -571.168, 124.995, -563.07, 120.128, -566.09, 127.653, -570.542},
{134.476, -563.821, 125.052, -551.119, 119.406, -556.079, 130.165, -563.043},
{135.326, -588.324, 112.734, -576.906, 101.767, -582.775, 126.581, -580.296},
{137.731, -591.581, 108.843, -578.35, 96.9578, -584.871, 128.335, -582.213},
{160.319, -568.364, 97.5775, -549.987, 117.084, -563.309, 182.669, -561.739},
{183.841, -463.82, 143.394, -440.652, 137.179, -464.286, 171.664, -464.717},
{207.079, -499.253, -2486.9, -3501.05, 30.792, -927.125, 69.1429, -969.89},
{207.079, -499.253, 320.276, 726.524, 172.342, -362.356, 224.26, -502.744},
{220.055, -312.871, 70.0221, -975.185, 468.037, 2564.34, 443.504, -1045.04},
{282.805, -340.441, 70.0221, -975.185, -311.692, -4512.91, 429.419, -1080.71},
{282.805, -340.441, 220.055, -312.871, -137.126, -241.21, -60.2897, -233.112}}
```

Graphics

```
Trajectories = Graphics[{BSplineCurve[AnkleData, SplineClosed → True],
  Blue, Dashed, BSplineCurve[FirstTaskTemp, SplineClosed → True],
  BSplineCurve[SecondTask, SplineClosed → True]}, Axes → True]
```

```
RRR = Graphics[{Thick, Line[{{0, 0}, KneeJoint[[1]], AnkleJoint[[1]], FootPos[[1]],
  SecondTask[[1]], AnkleJoint[[1]], FirstTaskTemp[[1]], KneeJoint[[1]]},
  Opacity[0.5], Polygon[{KneeJoint[[1]], AnkleJoint[[1]], FirstTaskTemp[[1]]},
  Polygon[{AnkleJoint[[1]], FootPos[[1]], SecondTask[[1]]}], Axes → True]
```

```
(*Export["B:\Dropbox\Current Research\Conferences\ASME 2015\RRR.pdf",RRR]*)
```

```
(*samp=SortedFirstFourBar[[1]]*)
```

```
(*samp2=SecondFourBarFinal[[8]]*)
```

```
samp = first
```

```
samp2 = second
```

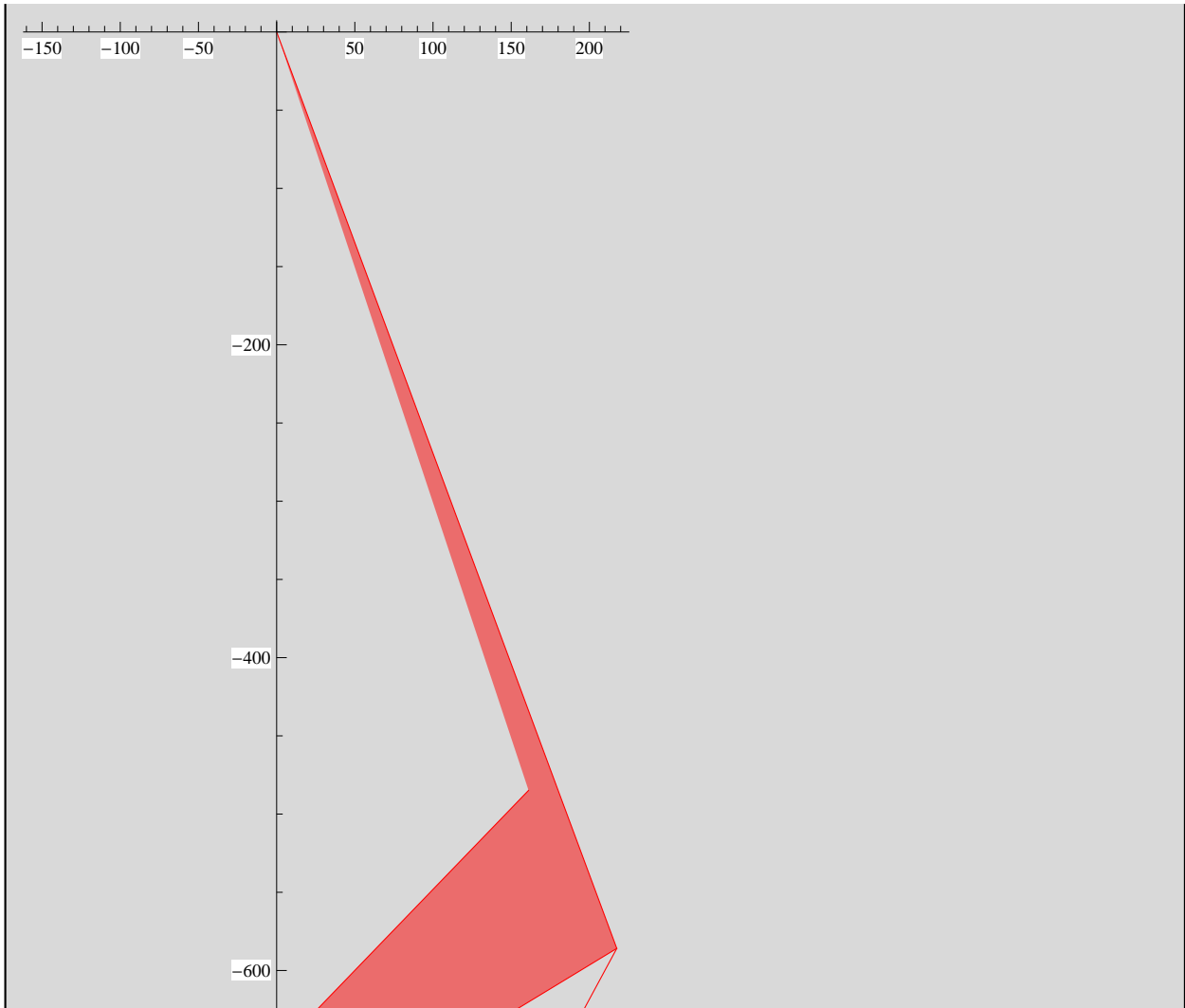
```
DrawFourBar1 = Graphics[{Blue, Line[{{samp[[1]], samp[[2]]},
  {samp[[7]], samp[[8]]}, {samp[[5]], samp[[6]]}, {samp[[3]], samp[[4]]}],
  Line[{{samp[[5]], samp[[6]]}, PFirst[[1]], {samp[[7]], samp[[8]]}],
  Disk[{samp[[1]], samp[[2]]}, .25], Disk[{samp[[3]], samp[[4]]}, .25], Opacity[0.5],
  Polygon[{{samp[[5]], samp[[6]]}, {samp[[7]], samp[[8]]}, PFirst[[1]]}], Axes → True]
```

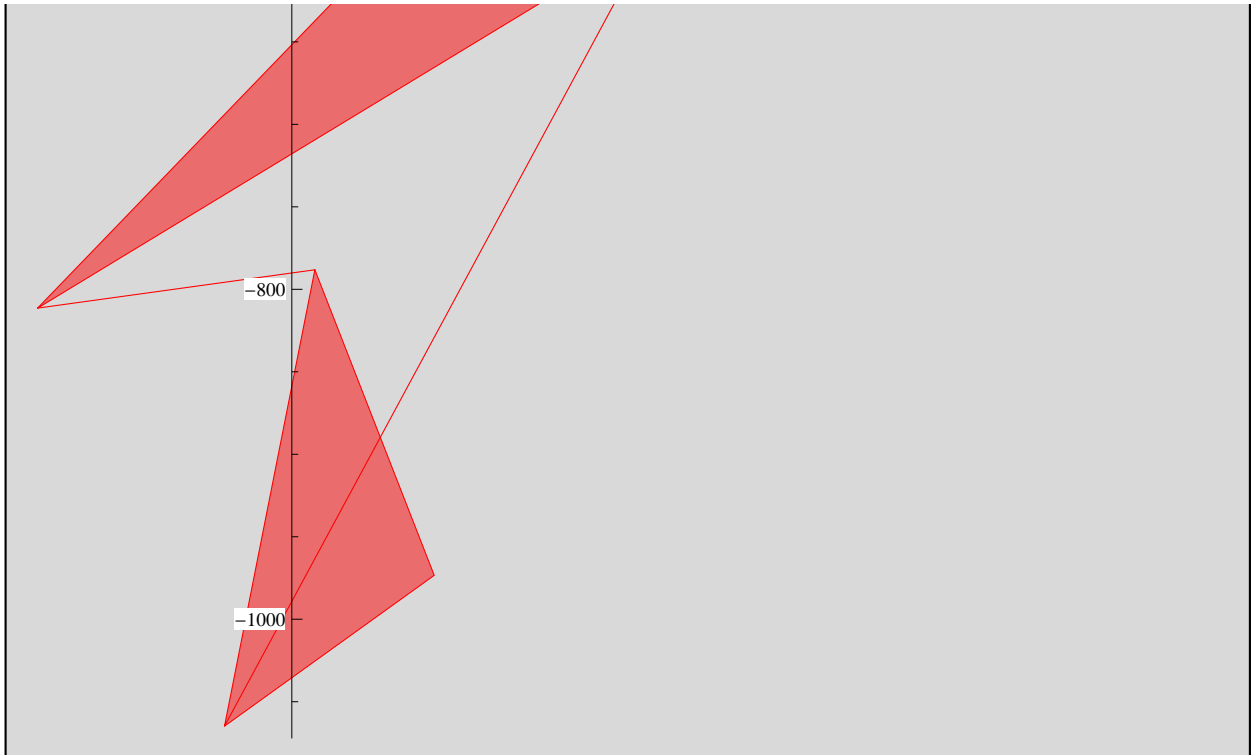
```
(*Export["B:\Dropbox\Current Research\Conferences\ASME 2015\DrawFourBar1.pdf",
  DrawFourBar1]*)
```

```

DrawFourBar2 = Graphics[{Red, Line[{{samp2[[1]], samp2[[2]]},
  {samp2[[7]], samp2[[8]]}, {samp2[[5]], samp2[[6]]}, {samp2[[3]], samp2[[4]]}],
  Line[{{samp2[[5]], samp2[[6]]}, SecondTask[[1]], {samp2[[7]], samp2[[8]]}],
  Disk[{{samp2[[1]], samp2[[2]]}, .25], Disk[{{samp2[[3]], samp2[[4]]}, .25],
  Line[{{0, 0}, {samp2[[3]], samp2[[4]]}, {samp2[[1]], samp2[[2]]}, KneeJoint[[1]]],
  Opacity[0.5], Polygon[{{0, 0}, {samp2[[3]], samp2[[4]]},
  {samp2[[1]], samp2[[2]]}, KneeJoint[[1]]}], Polygon[{{samp2[[5]], samp2[[6]]},
  {samp2[[7]], samp2[[8]]}, SecondTask[[1]]}], Axes -> True]

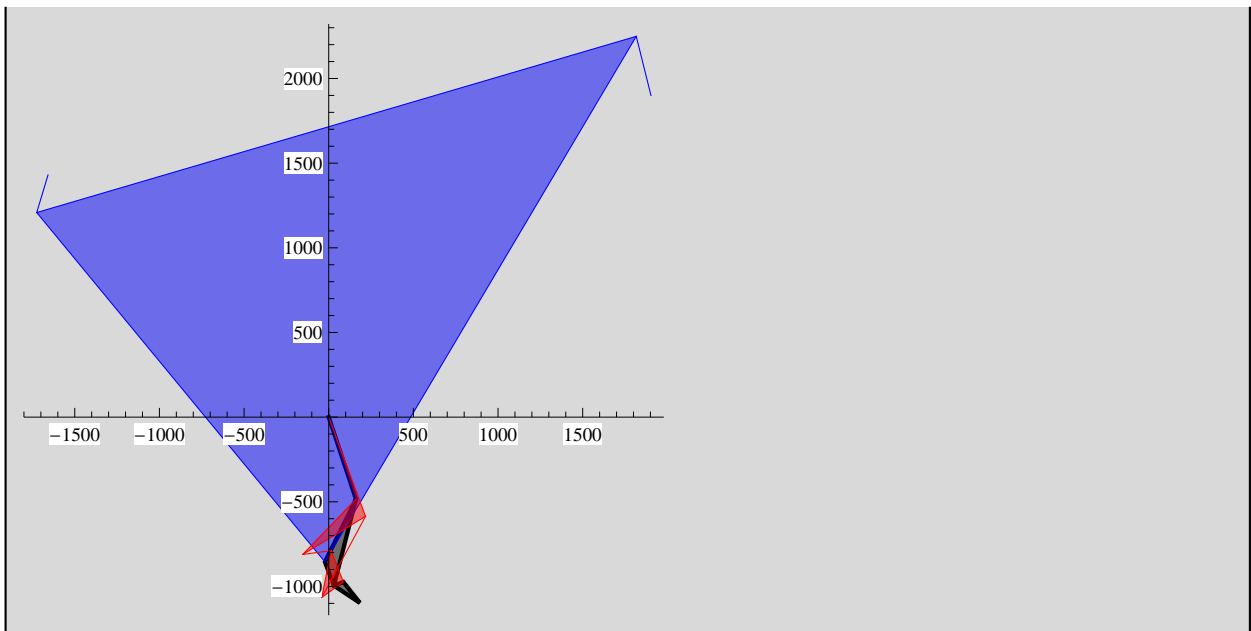
```





```
(*Export["B:\\Dropbox\\Current Research\\Conferences\\ASME 2015\\DrawFourBar2.pdf",  
DrawFourBar2] *)
```

```
Sixbardraw = Show[RRR, DrawFourBar1, DrawFourBar2]
```



```
(*Export[
  "B:\\Dropbox\\Current Research\\Conferences\\ASME 2015\\Sixbardraw.pdf",Sixbardraw]*)
```

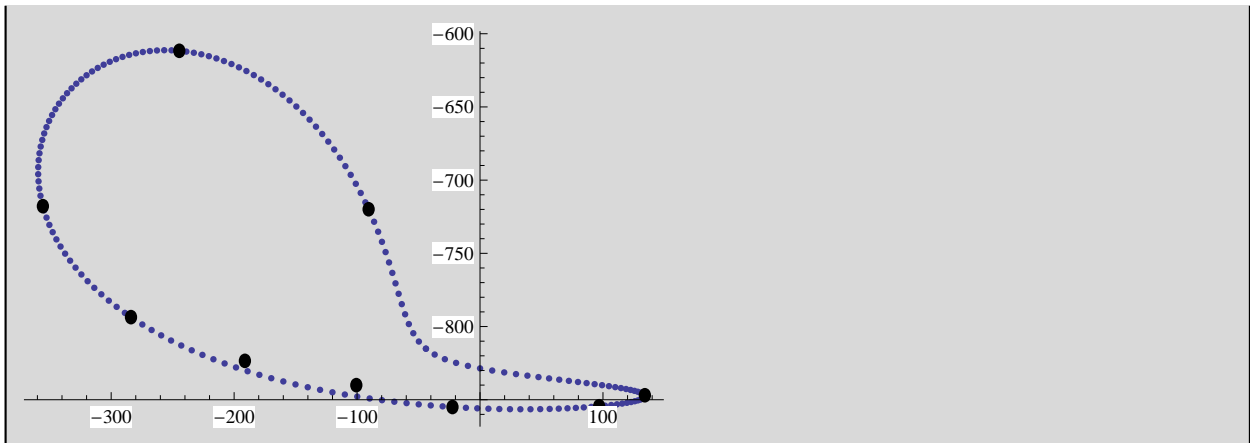
```
FourBarFrames [FourBar_,  $\theta$ ] :=
Module[{PtAstart, PtBstart, PtCstart, PtDstart, a, b, h, g, A, B, c,  $\Psi$ ,  $\phi$ ,
  TransAngle, r, s,  $\alpha$ , PtPmat, PtP, PtA, PtB, PtCmat, PtC, PtDmat, PtD, Frames},
  PtAstart = {FourBar[[1]], FourBar[[2]]};
  PtBstart = {FourBar[[3]], FourBar[[4]]};
  PtCstart = {FourBar[[5]], FourBar[[6]]};
  PtDstart = {FourBar[[7]], FourBar[[8]]};
  a = LinkLength [PtAstart, PtDstart];
  b = LinkLength [PtBstart, PtCstart];
  h = LinkLength [PtCstart, PtDstart];
  g = LinkLength [PtBstart, PtAstart];
  A = 2 * a * b * Cos[ $\theta$ ] - 2 * g * b;
  B = 2 * a * b * Sin[ $\theta$ ];
  c = g^2 + b^2 + a^2 - h^2 - 2 * a * g * Cos[ $\theta$ ];
   $\Psi$  = ArcTan[A, B] + ArcCos[c / Sqrt[A^2 + B^2]];
   $\phi$  = ArcTan[g + b * Cos[ $\Psi$ ] - a * Cos[ $\theta$ ], b * Sin[ $\Psi$ ] - a * Sin[ $\theta$ ]] -  $\theta$ ;
  TransAngle = ArcSin[(PtBstart[[2]] - PtAstart[[2]]) / g];
  r = LinkLength [PFfirst[[1]], PtDstart];
  s = LinkLength [PFfirst[[1]], PtCstart];
   $\alpha$  = ArcCos[(-s^2 + r^2 + h^2) / (2 * r * h)];
  PtPmat = Xmat [PtAstart[[1]]].
  Ymat [PtAstart[[2]]].Zmat [ $\theta$  + TransAngle].Xmat [a].Zmat [ $\phi$  -  $\alpha$ ].Xmat [r];
  PtP = {PtPmat[[1, 3]], PtPmat[[2, 3]]};
  PtA = PtAstart;
  PtB = PtBstart;
  PtCmat =
  Xmat [FourBar[[1]].Ymat [FourBar[[2]].Zmat [ $\theta$  + TransAngle].Xmat [a].Zmat [ $\phi$ ].Xmat [h];
  PtC = {PtCmat[[1, 3]], PtCmat[[2, 3]]};
  PtDmat = Xmat [FourBar[[1]].Ymat [FourBar[[2]].Zmat [ $\theta$  + TransAngle].Xmat [a];
  PtD = {PtDmat[[1, 3]], PtDmat[[2, 3]]};
  Frames = Graphics[{Line[{PtA, PtD, PtC, PtB}], Line[{PtC, PtP, PtD}],
    Axes -> True, PlotRange -> {{-50, 50}, {0, -80}}];
  {PtP}]
```

```
 $\theta$ in = Table[i * Degree, {i, 0, 360, 360 / 180}]
```

```
r1 = Table[Show[ListPlot[Partition[Flatten[
  Table[FourBarFrames [SortedFirstFourBar [[j]],  $\theta$ in[[i]], {i, Length[ $\theta$ in}]]], 2]],
  FirstTaskPlot], {j, Length[SortedFirstFourBar]}];(*make  $\psi$  positive*)
```

```
r2 = Table[Show[ListPlot[Partition[Flatten[
  Table[FourBarFrames [SortedFirstFourBar [[j]],  $\theta$ in[[i]], {i, Length[ $\theta$ in}]]], 2]],
  FirstTaskPlot], {j, Length[SortedFirstFourBar]}];(*make  $\psi$  negative*)
```

```
r2[[1]]
```



```
chosen = SortedFirstFourBar [[1]]
```

```
Tol = 100
```

```
loops = 100;
```

```
RandLinkage =  
  Table[Table[chosen[[i]] + RandomReal[{-Tol, Tol}], {i, Length[chosen]}], {j, loops}];
```

```
Table[  
  {j, Show[ListPlot[Partition[Flatten[Table[FourBarFrames[RandLinkage[[j]],  $\theta_{in}[[i]]$ ],  
    {i, Length[ $\theta_{in}$ ]}], 2]], FirstTaskPlot]}, {j, Length[RandLinkage]}}
```

```
j = 1;
```

```
Secondplots =  
  Table[ListPlot[Partition[Flatten[Table[FourBarFrames[SortedSecondFourBarRel[[j]],  
     $\theta_{in}[[i]]$ ], {i, Length[ $\theta_{in}$ ]}], 2]], {j, Length[SortedSecondFourBarRel]}
```

```
ListPlot[  
  Table[Flatten[FourBarFrames[SortedSecondFourBarRel[[8]],  $\theta_{in}[[i]]$ ], {i, Length[ $\theta_{in}$ ]}]
```

C.6 Mathematica Code for Approximate Six-Bar Path Synthesis

DateString[]

Tue 26 May 2015 13:51:51

Useful Functions

```
InvKin2R[K_, l1_, l2_, P_] := Module[{Kx, Ky, Px, Py, vv, ζζ},
  (*The output is the 2 configurations of the 2R chain*)
  (*{Ax,Ay}={Re[A],Im[A]};
  {px,py}={Re[p],Im[p]};*)
  {Kx, Ky} = K;
  {Px, Py} = P;
  vv = Map[ArcTan[Kx - Px, Ky - Py] + # * ArcCos[((Kx - Px)^2 + (Ky - Py)^2 + l1^2 - l2^2) /
    (-2 * l1 * Sqrt[(Kx - Px)^2 + (Ky - Py)^2])] &, {+1, -1}];
  ζζ = Map[ArcTan[Px - Kx - l1 * Cos[#], Py - Ky - l1 * Sin[#]] - # &, vv];
  (*MapThread[{V→Exp[I*#1],Z→Exp[I*#2]}&,{vv,ζζ}]*)
  MapThread[{v → #1, ζ → #2} &, {vv, ζζ}]

LinkLength[a_, b_] := N[Sqrt[Dot[b - a, b - a]]];

JointAngle[b_, c_] := ArcTan[Dot[b, c], Det[{b, c}]];

Zmat[θ_] := {{Cos[θ], -Sin[θ], 0}, {Sin[θ], Cos[θ], 0}, {0, 0, 1}};

Xmat[a_] := {{1, 0, a}, {0, 1, 0}, {0, 0, 1}};

Ymat[a_] := {{1, 0, 0}, {0, 1, a}, {0, 0, 1}};

Disp[x_] :=
  {{Cos[x[[1]], -Sin[x[[1]], x[[2]]}, {Sin[x[[1]], Cos[x[[1]], x[[3]]}, {0, 0, 1}};

R[θ_] := {{Cos[θ], -Sin[θ]}, {Sin[θ], Cos[θ]}};

Xmat2[x_] := {{x}, {0}}

i = 1;
j = 1;

Avar = {{Ax}, {Ay}}
{{Ax}, {Ay}}

Bvar = {{Bx}, {By}}
{{Bx}, {By}}

Cvar = {{Cx}, {Cy}}
{{Cx}, {Cy}}

Dvar = {{Dx}, {Dy}}
{{Dx}, {Dy}}

Fvar = {{Fx}, {Fy}}
{{Fx}, {Fy}}
```

```

Gvar = {{Gx}, {Gy}}
{{Gx}, {Gy}}

Hvar = {{Hx}, {Hy}}
{{Hx}, {Hy}}

P0var = {{P0x}, {P0y}}
{{P0x}, {P0y}}

Pj = {{Pjx}, {Pjy}}
{{Pjx}, {Pjy}}

```

Foot Data

```

DataIn =
  Import["B:\\Brandon's Dropbox\\Dropbox\\Current Research\\Walk data TAMU\\Herbert1.xls"]

```

A very large output was generated. Here is a sample of it:

```

{{{356.763, 1031.18, 414.531, 1031.81, 399.639, 931.774, 402.35, 781.782, 443.453, 528.889,
  392.524, 368.797, 420.157, 92.5819, 392.208, 35.7269, 571.524, 47.8266}, <<4701>>,
 {351.532, 1019.15, 409.179, 1018.92, 395.138, 918.832, 384.972, 770.026, 385.344,
  515.104, 304.554, 369.442, 281.353, 92.2395, 247.365, 41.1183, 431.577, 37.1617}}}

```

Show Less Show More Show Full Output Set Size Limit...

```

WalkData = DataIn[[1]]

```

A very large output was generated. Here is a sample of it:

```

{{{356.763, 1031.18, 414.531, 1031.81, 399.639, 931.774, 402.35, 781.782, 443.453, 528.889,
  392.524, 368.797, 420.157, 92.5819, 392.208, 35.7269, 571.524, 47.8266}, <<4701>>,
 {351.532, 1019.15, 409.179, 1018.92, 395.138, 918.832, 384.972, 770.026, 385.344,
  515.104, 304.554, 369.442, 281.353, 92.2395, 247.365, 41.1183, 431.577, 37.1617}}}

```

Show Less Show More Show Full Output Set Size Limit...

```
Points = Table[Partition[WalkData[[i]], 2], {i, Length[WalkData]}]
```

A very large output was generated. Here is a sample of it:

```
{{{356.763, 1031.18}, {414.531, 1031.81}, {399.639, 931.774},
 {402.35, 781.782}, {443.453, 528.889}, {392.524, 368.797},
 {420.157, 92.5819}, {392.208, 35.7269}, {571.524, 47.8266}},
 <<4701>>, {{{351.532, 1019.15}, {409.179, 1018.92}, {395.138, 918.832},
 {384.972, 770.026}, {385.344, 515.104}, {304.554, 369.442},
 {281.353, 92.2395}, {247.365, 41.1183}, {431.577, 37.1617}}}}
```

Show Less

Show More

Show Full Output

Set Size Limit...

```
Plots = Table[
  ListPlot[Points[[i]], PlotRange → {{-200, 1500}, {-200, 1500}}, {i, Length[Points]}];
(*ListAnimate[Plots]*)
```

```
SimplePoints =
Table[{Points[[i, 3]], Points[[i, 5]], Points[[i, 8]], Points[[i, 9]]}, {i, Length[Points]}
```

A very large output was generated. Here is a sample of it:

```
{{{399.639, 931.774}, {443.453, 528.889}, {392.208, 35.7269}, {571.524, 47.8266}},
 {{399.651, 931.879}, {441.487, 528.459}, {387.33, 35.8651}, {566.758, 46.9528}},
 {{399.583, 931.944}, {439.431, 528.116}, {382.49, 35.9357}, {562.06, 46.0919}}, <<4698>>,
 {{397.18, 919.048}, {388.279, 515.033}, {252.16, 40.9901}, {436.403, 37.2791}},
 {{395.138, 918.832}, {385.344, 515.104}, {247.365, 41.1183}, {431.577, 37.1617}}}}
```

Show Less

Show More

Show Full Output

Set Size Limit...

```
MovedSimple =
Table[Table[SimplePoints[[i, j]] - SimplePoints[[i, 1]], {j, 4}], {i, Length[SimplePoints]}
```

A very large output was generated. Here is a sample of it:

```
{{{0., 0.}, {43.814, -402.885}, {-7.431, -896.047}, {171.885, -883.947}},
 {{0., 0.}, {41.836, -403.42}, {-12.321, -896.014}, {167.107, -884.926}}, <<4699>>,
 {{0., 0.}, {-8.901, -404.015}, {-145.02, -878.058}, {39.223, -881.769}},
 {{0., 0.}, {-9.794, -403.728}, {-147.773, -877.714}, {36.439, -881.67}}}}
```

Show Less

Show More

Show Full Output

Set Size Limit...

```
(*ListAnimate[Table[ListPlot[MovedSimple[[i]], PlotRange → {{-400, 800}, {-1000, 200}},
 {i, Length[MovedSimple]}] ]*)
```

```
npos = 205
```

```
205
```

```
SimpleAnkle = Table[MovedSimple[[i, 3]], {i, npos}]
```

```
{{-7.431, -896.047}, {-12.321, -896.014}, {-17.093, -896.008}, {-21.771, -895.973},
{-26.368, -895.858}, {-30.873, -895.662}, {-35.266, -895.417}, {-39.538, -895.123},
{-43.708, -894.777}, {-47.84, -894.403}, {-51.985, -893.989}, {-56.129, -893.507},
{-60.251, -892.957}, {-64.38, -892.371}, {-68.529, -891.802}, {-72.659, -891.267},
{-76.718, -890.712}, {-80.658, -890.122}, {-84.478, -889.571}, {-88.215, -889.108},
{-91.9, -888.677}, {-95.538, -888.199}, {-99.151, -887.657}, {-102.777, -887.113},
{-106.47, -886.61}, {-110.294, -886.104}, {-114.261, -885.555}, {-118.349, -884.97},
{-122.555, -884.347}, {-126.863, -883.704}, {-131.249, -883.083},
{-135.716, -882.476}, {-140.252, -881.862}, {-144.839, -881.222},
{-149.483, -880.559}, {-154.188, -879.895}, {-158.944, -879.233},
{-163.717, -878.57}, {-168.499, -877.906}, {-173.306, -877.251}, {-178.141, -876.612},
{-182.988, -875.963}, {-187.814, -875.292}, {-192.602, -874.588}, {-197.346, -873.84},
{-202.045, -873.044}, {-206.69, -872.25}, {-211.29, -871.469}, {-215.854, -870.691},
{-220.392, -869.886}, {-224.878, -869.025}, {-229.318, -868.095}, {-233.758, -867.136},
{-238.228, -866.167}, {-242.713, -865.145}, {-247.206, -864.051}, {-251.73, -862.876},
{-256.267, -861.632}, {-260.791, -860.344}, {-265.318, -859.027}, {-269.854, -857.703},
{-274.409, -856.358}, {-279.005, -854.997}, {-283.649, -853.671}, {-288.35, -852.347},
{-293.155, -850.92}, {-298.111, -849.351}, {-303.182, -847.662}, {-308.309, -845.906},
{-313.491, -844.06}, {-318.775, -842.077}, {-324.147, -839.916}, {-329.572, -837.624},
{-335.043, -835.294}, {-340.546, -832.912}, {-346.063, -830.424}, {-351.578, -827.811},
{-357.064, -825.104}, {-362.506, -822.304}, {-367.898, -819.355}, {-373.228, -816.187},
{-378.499, -812.841}, {-383.708, -809.397}, {-388.832, -805.843}, {-393.825, -802.182},
{-398.653, -798.413}, {-403.294, -794.511}, {-407.72, -790.433}, {-411.844, -786.151},
{-415.635, -781.648}, {-419.11, -776.914}, {-422.25, -771.926}, {-425.022, -766.693},
{-427.417, -761.275}, {-429.426, -755.762}, {-431.02, -750.22}, {-432.153, -744.68},
{-432.791, -739.092}, {-432.902, -733.399}, {-432.433, -727.614}, {-431.343, -721.77},
{-429.609, -715.879}, {-427.251, -709.939}, {-424.31, -704.014}, {-420.787, -698.183},
{-416.652, -692.464}, {-411.928, -686.871}, {-406.703, -681.44}, {-401.071, -676.254},
{-395.099, -671.367}, {-388.853, -666.759}, {-382.43, -662.451}, {-375.971, -658.579},
{-369.654, -655.348}, {-363.552, -652.925}, {-357.604, -651.392}, {-351.674, -650.712},
{-345.651, -650.788}, {-339.565, -651.558}, {-333.535, -653.011}, {-327.636, -655.17},
{-321.81, -658.052}, {-315.87, -661.613}, {-309.562, -665.783}, {-302.672, -670.534},
{-295.1, -675.865}, {-286.862, -681.752}, {-278.045, -688.138}, {-268.701, -694.928},
{-258.804, -702.058}, {-248.327, -709.541}, {-237.311, -717.4}, {-225.851, -725.642},
{-214.027, -734.253}, {-201.83, -743.162}, {-189.207, -752.202}, {-176.133, -761.168},
{-162.646, -769.966}, {-148.794, -778.627}, {-134.615, -787.196}, {-120.115, -795.619},
{-105.28, -803.807}, {-90.128, -811.704}, {-74.75, -819.276}, {-59.231, -826.472},
{-43.587, -833.264}, {-27.841, -839.61}, {-12.065, -845.494}, {3.649, -850.923},
{19.221, -855.942}, {34.56, -860.565}, {49.6, -864.699}, {64.272, -868.242},
{78.495, -871.234}, {92.227, -873.802}, {105.427, -875.999}, {117.961, -877.692},
{129.762, -878.852}, {140.828, -879.539}, {151.157, -879.788}, {160.712, -879.576},
{169.42, -878.904}, {177.207, -877.838}, {184.05, -876.588}, {189.976, -875.453},
{195.029, -874.681}, {199.21, -874.341}, {202.411, -874.298}, {204.472, -874.401},
{205.258, -874.674}, {204.693, -875.315}, {202.774, -876.432}, {199.502, -877.85},
{194.929, -879.326}, {189.191, -880.718}, {182.469, -882.034}, {174.926, -883.345},
{166.857, -884.649}, {158.836, -885.839}, {151.514, -886.771}, {145.213, -887.271},
{139.696, -887.137}, {134.377, -886.432}, {128.835, -885.596}, {123.018, -885.042},
{117.062, -884.807}, {111.065, -884.674}, {105.07, -884.517}, {99.087, -884.416},
{93.113, -884.531}, {87.137, -884.915}, {81.156, -885.484}, {75.199, -886.149},
{69.259, -886.87}, {63.29, -887.589}, {57.295, -888.272}, {51.323, -888.925},
{45.333, -889.475}, {39.264, -889.86}, {33.094, -890.083}, {26.854, -890.193},
{20.593, -890.228}, {14.356, -890.206}, {8.172, -890.143}, {2.043, -890.055}}
```

```

SplineEquation = BSplineFunction[SimpleAnkle, SplineClosed → True][t]
BSplineFunction[{{0., 1.}}, <>][t]

tvals = Table[i, {i, 0, 1, 1/59}]

{0,  $\frac{1}{59}$ ,  $\frac{2}{59}$ ,  $\frac{3}{59}$ ,  $\frac{4}{59}$ ,  $\frac{5}{59}$ ,  $\frac{6}{59}$ ,  $\frac{7}{59}$ ,  $\frac{8}{59}$ ,  $\frac{9}{59}$ ,  $\frac{10}{59}$ ,  $\frac{11}{59}$ ,  $\frac{12}{59}$ ,  $\frac{13}{59}$ ,  $\frac{14}{59}$ ,  $\frac{15}{59}$ ,  $\frac{16}{59}$ ,  $\frac{17}{59}$ ,  $\frac{18}{59}$ ,  $\frac{19}{59}$ ,  $\frac{20}{59}$ ,
 $\frac{21}{59}$ ,  $\frac{22}{59}$ ,  $\frac{23}{59}$ ,  $\frac{24}{59}$ ,  $\frac{25}{59}$ ,  $\frac{26}{59}$ ,  $\frac{27}{59}$ ,  $\frac{28}{59}$ ,  $\frac{29}{59}$ ,  $\frac{30}{59}$ ,  $\frac{31}{59}$ ,  $\frac{32}{59}$ ,  $\frac{33}{59}$ ,  $\frac{34}{59}$ ,  $\frac{35}{59}$ ,  $\frac{36}{59}$ ,  $\frac{37}{59}$ ,  $\frac{38}{59}$ ,  $\frac{39}{59}$ ,
 $\frac{40}{59}$ ,  $\frac{41}{59}$ ,  $\frac{42}{59}$ ,  $\frac{43}{59}$ ,  $\frac{44}{59}$ ,  $\frac{45}{59}$ ,  $\frac{46}{59}$ ,  $\frac{47}{59}$ ,  $\frac{48}{59}$ ,  $\frac{49}{59}$ ,  $\frac{50}{59}$ ,  $\frac{51}{59}$ ,  $\frac{52}{59}$ ,  $\frac{53}{59}$ ,  $\frac{54}{59}$ ,  $\frac{55}{59}$ ,  $\frac{56}{59}$ ,  $\frac{57}{59}$ ,  $\frac{58}{59}$ , 1}

PVals = Table[SplineEquation /. t → tvals[[i]], {i, Length[tvals]}]

{{-12.3013, -896.019}, {-28.5017, -895.762}, {-43.4905, -894.79}, {-57.875, -893.271},
{-72.2304, -891.319}, {-85.8676, -889.402}, {-98.6012, -887.739}, {-111.58, -885.925},
{-125.994, -883.837}, {-141.499, -881.686}, {-157.736, -879.401}, {-174.374, -877.111},
{-191.139, -874.8}, {-207.465, -872.119}, {-223.279, -869.328}, {-238.762, -866.04},
{-254.421, -862.136}, {-270.165, -857.609}, {-286.202, -852.95}, {-303.278, -847.622},
{-321.419, -841.008}, {-340.361, -832.977}, {-359.46, -823.865}, {-378.044, -813.112},
{-395.699, -800.707}, {-411.249, -786.708}, {-423.17, -770.139}, {-430.681, -751.253},
{-432.729, -731.726}, {-427.766, -711.349}, {-415.486, -691.147}, {-396.802, -672.793},
{-374.806, -658.035}, {-353.679, -650.984}, {-332.749, -653.38}, {-311.995, -664.185},
{-286.041, -682.357}, {-252.92, -706.259}, {-213.557, -734.6}, {-169.259, -765.635},
{-120.308, -795.439}, {-67.6423, -822.553}, {-13.1429, -845.034}, {40.6634, -862.223},
{90.5369, -873.455}, {133.662, -879.072}, {167.855, -878.98}, {191.465, -875.24},
{203.915, -874.392}, {201.845, -876.813}, {184.236, -881.676}, {157.407, -886.006},
{136.079, -886.649}, {116.143, -884.797}, {95.3406, -884.501}, {74.597, -886.229},
{53.8532, -888.645}, {32.7667, -890.073}, {11.1091, -890.172}, {-12.3013, -896.019}}

ListPlot[PVals]

```

```

Femur = Mean[Table[LinkLength[MovedSimple[[i, 1]], MovedSimple[[i, 2]]], {i, npos}]]
397.874

LowerLeg = Mean[Table[LinkLength[MovedSimple[[i, 2]], MovedSimple[[i, 3]]], {i, npos}]]
502.599

AngleResults =
Table[InvKin2R[MovedSimple[[i, 1]], Femur, LowerLeg, PVals[[i]]], {i, Length[PVals]}]

```

```

{{{v → 4.58784, ζ → -6.0847}, {v → -1.4737, ζ → -0.198486}},
 {{v → 4.57119, ζ → -6.08727}, {v → -1.49322, ζ → -0.19592}},
 {{v → 4.54979, ζ → -6.07895}, {v → -1.50533, ζ → -0.20423}},
 {{v → 4.52529, ζ → -6.06398}, {v → -1.5131, ζ → -0.219201}},
 {{v → 4.49914, ζ → -6.04611}, {v → -1.51927, ζ → -0.23707}},
 {{v → 4.47647, ζ → -6.03309}, {v → -1.52738, ζ → -0.250099}},
 {{v → 4.45872, ζ → -6.02703}, {v → -1.53836, ζ → -0.256154}},
 {{v → 4.44137, ζ → -6.02223}, {v → -1.55035, ζ → -0.260951}},
 {{v → 4.42359, ζ → -6.01962}, {v → -1.5652, ζ → -0.263567}},
 {{v → 4.40796, ζ → -6.02301}, {v → -1.58463, ζ → -0.260173}},
 {{v → 4.39421, ζ → -6.03124}, {v → -1.60758, ζ → -0.251941}},
 {{v → 4.38414, ζ → -6.0468}, {v → -1.63504, ζ → -0.23639}},
 {{v → 4.37831, ζ → -6.07012}, {v → -1.66694, ζ → -0.213064}},
 {{v → 4.37259, ζ → -6.09289}, {v → -1.69809, ζ → -0.1903}},
 {{v → 4.37027, ζ → -6.1207}, {v → -1.73149, ζ → -0.162488}},
 {{v → 4.36615, ζ → -6.14485}, {v → -1.76258, ζ → -0.138335}},
 {{v → 4.35881, ζ → -6.16385}, {v → -1.79114, ζ → -0.119336}},
 {{v → 4.3464, ζ → -6.17425}, {v → -1.81517, ζ → -0.108936}},
 {{v → 4.34164, ζ → -6.19896}, {v → -1.84752, ζ → -0.0842212}},
 {{v → 4.34341, ζ → -6.23773}, {v → -1.88903, ζ → -0.0454565}},
 {{v → 4.32768, ζ → -6.24796}, {v → -1.91619, ζ → -0.0352237}},
 {{v → 4.28202, ζ → -6.20711}, {v → -1.91624, ζ → -0.0760772}},
 {{v → 4.23387, ζ → -6.16296}, {v → -1.9151, ζ → -0.120224}},
 {{v → 4.1742, ζ → -6.09873}, {v → -1.90302, ζ → -0.184454}},
 {{v → 4.10983, ζ → -6.02611}, {v → -1.88621, ζ → -0.257078}},
 {{v → 4.04107, ζ → -5.94376}, {v → -1.86284, ζ → -0.339425}},
 {{v → 3.96207, ζ → -5.83984}, {v → -1.82536, ζ → -0.443346}},
 {{v → 3.87869, ζ → -5.72367}, {v → -1.77818, ζ → -0.559511}},
 {{v → 3.79898, ζ → -5.60631}, {v → -1.7255, ζ → -0.676879}},
 {{v → 3.72076, ζ → -5.48127}, {v → -1.66198, ζ → -0.80192}},
 {{v → 3.64838, ζ → -5.35413}, {v → -1.58932, ζ → -0.929056}},
 {{v → 3.58757, ζ → -5.23374}, {v → -1.51173, ζ → -1.04945}},
 {{v → 3.54315, ζ → -5.13102}, {v → -1.43706, ζ → -1.15217}},
 {{v → 3.52441, ζ → -5.06457}, {v → -1.37819, ζ → -1.21861}},
 {{v → 3.53358, ζ → -5.03478}, {v → -1.33406, ζ → -1.2484}},
 {{v → 3.56679, ζ → -5.03704}, {v → -1.3035, ζ → -1.24614}},
 {{v → 3.62291, ζ → -5.06074}, {v → -1.2752, ζ → -1.22244}},
 {{v → 3.70002, ζ → -5.10187}, {v → -1.2462, ζ → -1.18132}},
 {{v → 3.79683, ζ → -5.16342}, {v → -1.22106, ζ → -1.11976}},
 {{v → 3.9108, ζ → -5.24747}, {v → -1.20435, ζ → -1.03571}},
 {{v → 4.03399, ζ → -5.34444}, {v → -1.19262, ζ → -0.938744}},
 {{v → 4.16481, ζ → -5.45436}, {v → -1.18732, ζ → -0.828825}},
 {{v → 4.29885, ζ → -5.57335}, {v → -1.18836, ζ → -0.709833}},
 {{v → 4.43389, ζ → -5.70152}, {v → -1.19804, ζ → -0.581666}},
 {{v → 4.56433, ζ → -5.83366}, {v → -1.21617, ζ → -0.449523}},

```

```

{{v → 4.68489, ζ → -5.96385}, {v → -1.24151, ζ → -0.319337}},
{{v → 4.7755, ζ → -6.05829}, {v → -1.25652, ζ → -0.224895}},
{{v → 4.81484, ζ → -6.08097}, {v → -1.24252, ζ → -0.202219}},
{{v → 4.85573, ζ → -6.12955}, {v → -1.25592, ζ → -0.153632}},
{{v → 4.89346, ζ → -6.20223}, {v → -1.29935, ζ → -0.0809579}},
{{v → 4.91839 - 0.0262596 i, ζ → -6.28319 + 0.0470485 i},
 {v → -1.3648 + 0.0262596 i, ζ → 0. - 0.0470485 i}},
{{v → 4.8474, ζ → -6.21007}, {v → -1.35416, ζ → -0.0731188}},
{{v → 4.76634, ζ → -6.10705}, {v → -1.32017, ζ → -0.17614}},
{{v → 4.69207, ζ → -6.01311}, {v → -1.28944, ζ → -0.270076}},
{{v → 4.64497, ζ → -5.97027}, {v → -1.28862, ζ → -0.312911}},
{{v → 4.61946, ζ → -5.96652}, {v → -1.30992, ζ → -0.316669}},
{{v → 4.60346, ζ → -5.97981}, {v → -1.34081, ζ → -0.303371}},
{{v → 4.5831, ζ → -5.98584}, {v → -1.36791, ζ → -0.297341}},
{{v → 4.55512, ζ → -5.97931}, {v → -1.38857, ζ → -0.303877}},
{{v → 4.58784, ζ → -6.0847}, {v → -1.4737, ζ → -0.198486}}

```

```
LegAngles = Table[{{v, ζ} /. AngleResults[[i, 2]]}, {i, Length[AngleResults]}]
```

```

{-1.4737, -0.198486}, {-1.49322, -0.19592}, {-1.50533, -0.20423}, {-1.5131, -0.219201},
{-1.51927, -0.23707}, {-1.52738, -0.250099}, {-1.53836, -0.256154}, {-1.55035, -0.260951},
{-1.5652, -0.263567}, {-1.58463, -0.260173}, {-1.60758, -0.251941}, {-1.63504, -0.23639},
{-1.66694, -0.213064}, {-1.69809, -0.1903}, {-1.73149, -0.162488}, {-1.76258, -0.138335},
{-1.79114, -0.119336}, {-1.81517, -0.108936}, {-1.84752, -0.0842212},
{-1.88903, -0.0454565}, {-1.91619, -0.0352237}, {-1.91624, -0.0760772},
{-1.9151, -0.120224}, {-1.90302, -0.184454}, {-1.88621, -0.257078}, {-1.86284, -0.339425},
{-1.82536, -0.443346}, {-1.77818, -0.559511}, {-1.7255, -0.676879}, {-1.66198, -0.80192},
{-1.58932, -0.929056}, {-1.51173, -1.04945}, {-1.43706, -1.15217}, {-1.37819, -1.21861},
{-1.33406, -1.2484}, {-1.3035, -1.24614}, {-1.2752, -1.22244}, {-1.2462, -1.18132},
{-1.22106, -1.11976}, {-1.20435, -1.03571}, {-1.19262, -0.938744}, {-1.18732, -0.828825},
{-1.18836, -0.709833}, {-1.19804, -0.581666}, {-1.21617, -0.449523}, {-1.24151, -0.319337},
{-1.25652, -0.224895}, {-1.24252, -0.202219}, {-1.25592, -0.153632},
{-1.29935, -0.0809579}, {-1.3648 + 0.0262596 i, 0. - 0.0470485 i}, {-1.35416, -0.0731188},
{-1.32017, -0.17614}, {-1.28944, -0.270076}, {-1.28862, -0.312911}, {-1.30992, -0.316669},
{-1.34081, -0.303371}, {-1.36791, -0.297341}, {-1.38857, -0.303877}, {-1.4737, -0.198486}

```

```

ΘVals = Table[(LegAngles[[i + 1, 1]] + LegAngles[[i + 1, 2]]) -
 (LegAngles[[1, 1]] + LegAngles[[1, 2]]), {i, Length[AngleResults] - 1}]

```

```

{-0.0169471, -0.0373727, -0.0601111, -0.0841548, -0.105286, -0.122326, -0.139111, -0.156576,
-0.172611, -0.187332, -0.199239, -0.207818, -0.216205, -0.22179, -0.22873, -0.238289,
-0.251916, -0.259557, -0.262298, -0.279224, -0.320126, -0.363132, -0.415284,
-0.471102, -0.530073, -0.596514, -0.665507, -0.730193, -0.791713, -0.846192,
-0.888986, -0.917043, -0.924612, -0.910276, -0.877455, -0.825458, -0.755327,
-0.668638, -0.567874, -0.459173, -0.343957, -0.226001, -0.107518, 0.00649786,
0.111344, 0.190771, 0.227445, 0.26264, 0.291884, 0.307388 - 0.0207889 i, 0.244911,
0.175878, 0.112672, 0.0706556, 0.0456001, 0.0280096, 0.00693529, -0.0202619, 0.}

```

Path 1

Path 2

Path 3

Solve for $\sin\mu$ and $\cos\mu$

Solve for $\sin\theta$ and $\cos\theta$

Raw Start Values

```

BertiniSolution = {A → 170.65082382210687` - 203.3506231782017` i,
  B → 0, CC → 37.4971164208232` - 152.17530508267447` i,
  DD → 104.3177109172471` - 163.0230275589266` i,
  F → 38.57077958788451` - 396.0002935720175` i,
  G → -33.81699397263717` - 102.67615495515747` i,
  H → 123.61862049168312` - 331.4430933270199` i,
  P0 → -12.301333333333352` - 896.0185000000001` i,
  Ac → 170.65082382210687` + 203.3506231782017` i,
  Bc → 0 + 0 i, CCc → 37.4971164208232` + 152.17530508267447` i,
  DDc → 104.3177109172471` + 163.0230275589266` i,
  Fc → 38.57077958788451` + 396.0002935720175` i,
  Gc → -33.81699397263717` + 102.67615495515747` i,
  Hc → 123.61862049168312` + 331.4430933270199` i,
  Pc0 → -12.301333333333352` + 896.0185000000001` i}

{A → 170.651 - 203.351 i, B → 0, CC → 37.4971 - 152.175 i,
  DD → 104.318 - 163.023 i, F → 38.5708 - 396. i, G → -33.817 - 102.676 i,
  H → 123.619 - 331.443 i, P0 → -12.3013 - 896.019 i, Ac → 170.651 + 203.351 i,
  Bc → 0, CCc → 37.4971 + 152.175 i, DDc → 104.318 + 163.023 i, Fc → 38.5708 + 396. i,
  Gc → -33.817 + 102.676 i, Hc → 123.619 + 331.443 i, Pc0 → -12.3013 + 896.019 i}

Tol = 10

10

loop = 50

50

dimVars = {A, B, CC, DD, F, G, H, P0, Ac, Bc, CCc, DDc, Fc, Gc, Hc, Pc0}

{A, B, CC, DD, F, G, H, P0, Ac, Bc, CCc, DDc, Fc, Gc, Hc, Pc0}

Start = Table[Table[dimVars[[i]] → BertiniSolution[[i, 2]] + RandomReal[{-Tol, Tol}] +
  RandomReal[{-Tol, Tol}] * I, {i, Length[dimVars]}], {j, loop}]

Start = {{A → 178.3297986793758` - 202.43799440450232` i,
  B → -8.23004685787695` - 6.611320732870372` i,
  CC → 28.38733086676281` - 153.88109582749593` i,
  DD → 105.97621934163479` - 161.15442966230648` i,
  F → 32.432585932153316` - 396.58818781751427` i,
  G → -28.27153627787966` - 111.48291180443209` i,

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$H \rightarrow 119.81838847235153 - 338.6681825343879 \text{ i},$
 $P0 \rightarrow -17.16428057655032 - 893.1707157235198 \text{ i},$
 $Ac \rightarrow 162.6322908899337 + 209.7812066841099 \text{ i},$
 $Bc \rightarrow -3.216889647671259 - 4.959050124233073 \text{ i},$
 $CCc \rightarrow 41.01972708112936 + 146.4861426860255 \text{ i},$
 $DDc \rightarrow 103.06841445134833 + 166.13610165697858 \text{ i},$
 $Fc \rightarrow 47.7656272851472 + 395.86027503515714 \text{ i},$
 $Gc \rightarrow -34.821504878573776 + 100.18112282207954 \text{ i},$
 $Hc \rightarrow 120.96651960066178 + 323.0017333159019 \text{ i},$
 $Pc0 \rightarrow -9.905276305113636 + 893.139722553484 \text{ i},$
 $\{A \rightarrow 160.8288662198759 - 196.8834697274363 \text{ i},$
 $B \rightarrow 6.430786657677714 - 9.726867036101034 \text{ i},$
 $CC \rightarrow 32.17496617107355 - 149.61330273254455 \text{ i},$
 $DD \rightarrow 103.722167701473 - 171.1651310371963 \text{ i},$
 $F \rightarrow 28.932986572218184 - 401.2370704133406 \text{ i},$
 $G \rightarrow -32.197064990447466 - 110.97682603665712 \text{ i},$
 $H \rightarrow 132.32675401069784 - 333.97180846426204 \text{ i},$
 $P0 \rightarrow -17.05049956537416 - 887.6835479227203 \text{ i},$
 $Ac \rightarrow 166.50117000528215 + 203.41330576120166 \text{ i},$
 $Bc \rightarrow -7.930398291279737 + 8.176188493787869 \text{ i},$
 $CCc \rightarrow 46.08942106123473 + 145.56690659173506 \text{ i},$
 $DDc \rightarrow 113.88177938767241 + 160.70373863238174 \text{ i},$
 $Fc \rightarrow 47.95273914901802 + 399.79764814405695 \text{ i},$
 $Gc \rightarrow -24.275008078319225 + 108.69882178181223 \text{ i},$
 $Hc \rightarrow 129.44414220778202 + 338.23535827179717 \text{ i},$
 $Pc0 \rightarrow -14.195686491894827 + 903.9991343355972 \text{ i}\},$
 $\{A \rightarrow 161.48270526418415 - 204.868626265085 \text{ i},$
 $B \rightarrow 6.599065668926578 - 2.887917432240492 \text{ i},$
 $CC \rightarrow 30.037424711706628 - 159.35380807880537 \text{ i},$
 $DD \rightarrow 113.60516194292475 - 164.26414382862944 \text{ i},$
 $F \rightarrow 37.16151206140341 - 393.1856708062954 \text{ i},$
 $G \rightarrow -40.63140453729616 - 96.61024297062852 \text{ i},$
 $H \rightarrow 122.53768695359217 - 335.3886238523841 \text{ i},$
 $P0 \rightarrow -6.516528614314451 - 897.0076832508968 \text{ i},$
 $Ac \rightarrow 179.5260396583592 + 194.60233358769855 \text{ i},$
 $Bc \rightarrow -3.215588198334821 - 5.626324342276284 \text{ i},$
 $CCc \rightarrow 46.8727395939095 + 159.69726819135008 \text{ i},$
 $DDc \rightarrow 99.54851344377997 + 163.22546748564002 \text{ i},$
 $Fc \rightarrow 45.81682864741749 + 389.10124181583717 \text{ i},$
 $Gc \rightarrow -27.285925497713585 + 94.82490228314288 \text{ i},$
 $Hc \rightarrow 120.63778298031156 + 325.83017120059 \text{ i},$
 $Pc0 \rightarrow -4.940827849290221 + 901.795719822804 \text{ i}\},$
 $\{A \rightarrow 169.15820215564378 - 211.82954129717425 \text{ i},$

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B → -3.275357505574725` - 2.8923885957107203` i,
CC → 31.220858331607666` - 158.1535329187364` i,
DD → 96.36819081142511` - 159.57204781977757` i,
F → 37.14339887441982` - 394.2003346258664` i,
G → -41.69643659060944` - 110.40910148914006` i,
H → 130.3132499923879` - 328.7206765048602` i,
P0 → -10.288941731043598` - 894.2208102631043` i,
Ac → 172.4571407926814` + 208.49611008271563` i,
Bc → 3.7422280605381673` - 7.96970278310884` i,
CCc → 28.102322251022287` + 145.25858234770442` i,
DDc → 113.66459926367196` + 171.29262843913222` i,
Fc → 35.4594605128952` + 392.539294870205` i,
Gc → -37.20469887277847` + 102.71638635006043` i,
Hc → 123.2226806377329` + 332.40517790452327` i,
Pc0 → -9.592692903100035` + 902.4835176742471` i},
{A → 176.69297200453758` - 211.82202215207005` i,
B → 3.710905441449029` - 4.651216131395866` i,
CC → 43.06353427825717` - 146.9441280395346` i,
DD → 100.92139870750489` - 158.63237727201758` i,
F → 45.91828241004555` - 398.7424694189757` i,
G → -31.813028960667232` - 100.20504146172787` i,
H → 113.65643094217177` - 324.9705932363827` i,
P0 → -20.355466231045014` - 888.2393267525022` i,
Ac → 177.43748164587294` + 211.51325870103898` i,
Bc → -4.158133831990803` + 0.8497610480585358` i,
CCc → 35.58237348961004` + 148.98046697239826` i,
DDc → 103.63711946605969` + 167.59209680889938` i,
Fc → 39.02309812910255` + 390.19381004959496` i,
Gc → -29.56204439269721` + 103.25472987985388` i,
Hc → 119.92624809080496` + 331.51273871531` i,
Pc0 → -19.936804672104387` + 900.3055763179225` i},
{A → 177.5070501454601` - 203.48215959074827` i,
B → 1.4536484122270075` + 1.6313364224057025` i,
CC → 42.72409655065032` - 149.06225594470177` i,
DD → 107.91476645089595` - 168.93733305660956` i,
F → 32.39047348474687` - 395.3266275303249` i,
G → -30.192839320197066` - 101.52202558651811` i,
H → 117.09082516875776` - 336.0584214731401` i,
P0 → -14.30945121754573` - 893.436854513171` i,
Ac → 160.85277760134824` + 200.8697499827036` i,
Bc → -3.9708547752040886` + 5.131715246968774` i,
CCc → 32.03743141253443` + 147.37128918932467` i,
DDc → 97.19189096184179` + 157.93821498768182` i,

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Fc → 34.70425733786365` + 397.4780469309872` i,
Gc → -39.51046741348672` + 92.92895007916121` i,
Hc → 122.32481666520994` + 331.9414332511891` i,
Pc0 → -17.701211533593884` + 904.4753891623652` i},
{A → 167.18311118648168` - 211.81695088873664` i,
B → -9.19037150459939` + 1.1636843475834837` i,
CC → 28.35887800445488` - 144.74627339424669` i,
DD → 95.59769374427057` - 166.39850645192763` i,
F → 47.383452360632205` - 405.655392417878` i,
G → -41.061906257401404` - 101.8823829320099` i,
H → 118.77427117775186` - 335.27710092322127` i,
P0 → -17.591428407802972` - 897.6032180194755` i,
Ac → 179.5652336071658` + 197.90567395387635` i,
Bc → -2.7963631049660975` - 5.4241074729948515` i,
CCc → 38.96234658217857` + 145.46697171293673` i,
DDc → 109.76667352790653` + 161.63242473026096` i,
Fc → 33.7039573351332` + 401.491083641798` i,
Gc → -25.59682000380036` + 97.17234383622075` i,
Hc → 123.69481684385937` + 321.992278613508` i,
Pc0 → -17.707839649190944` + 899.9256603055703` i},
{A → 168.71071609835658` - 199.57885597113008` i,
B → -1.5720106454265093` + 8.207139552411917` i,
CC → 32.63554977837566` - 154.5370264601744` i,
DD → 108.87977461654982` - 164.00386037486575` i,
F → 37.05992690569978` - 401.53155526972785` i,
G → -42.39572634466634` - 95.46535443921816` i,
H → 128.93822205738059` - 330.12220150345973` i,
P0 → -16.831003297908325` - 892.993360165483` i,
Ac → 172.53850117526906` + 200.6834363595912` i,
Bc → -9.859063718482233` - 2.383301286446766` i,
CCc → 34.19267950793474` + 161.65474435192752` i,
DDc → 109.73769003371297` + 157.26213569787785` i,
Fc → 42.512731126994225` + 399.8334790183078` i,
Gc → -24.82928541058768` + 95.20088461458533` i,
Hc → 116.33681413546945` + 339.34139919557504` i,
Pc0 → -9.667775964581649` + 896.9744260749794` i},
{A → 176.2368870037944` - 202.8550590430663` i,
B → 1.43438139803877` - 2.148242703083678` i,
CC → 34.368343776265704` - 160.1380221751596` i,
DD → 103.4535267740479` - 171.96327812451636` i,
F → 45.09632727966121` - 386.26964104570095` i,
G → -36.51536966733121` - 103.4482850693498` i,
H → 124.77000344599563` - 335.0109406950213` i,

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P0 → -6.754197215813077` - 891.6631736295935` i,
Ac → 180.41204893110458` + 210.57469647784012` i,
Bc → -0.7340737001968733` - 2.1533120852967222` i,
CCc → 47.24796692600175` + 149.85719209493624` i,
DDc → 109.37986184360486` + 161.70687496349828` i,
Fc → 29.857726644179248` + 396.43352317135594` i,
Gc → -26.33857534550475` + 109.73157633549644` i,
Hc → 116.77273217697827` + 337.0589535931034` i,
Pc0 → -6.984861785642265` + 890.3717403241021` i},
{A → 172.89387284958545` - 211.36425592247465` i,
B → 0.6923158547442476` + 3.3571494328248335` i,
CC → 36.770882282635625` - 151.63472331096744` i,
DD → 95.86743555006075` - 155.52339841938397` i,
F → 39.60376341417233` - 402.779224386957` i,
G → -42.36423294843643` - 103.93384907884105` i,
H → 130.70417539733648` - 327.20089627052585` i,
P0 → -7.855418841653316` - 899.5350489033912` i,
Ac → 166.51343810433508` + 198.74583497687212` i,
Bc → 4.110189788976783` + 9.692459797941211` i,
CCc → 41.601815926875375` + 153.56596357357964` i,
DDc → 109.0487274379272` + 155.38582001145065` i,
Fc → 30.555113166890976` + 403.38226097100437` i,
Gc → -38.057917056584714` + 98.7984868258778` i,
Hc → 115.89589888872086` + 332.9830932058495` i,
Pc0 → -16.39489193557995` + 898.0156652442728` i},
{A → 176.09945747975343` - 204.56330953783902` i,
B → -5.582776480859117` - 1.5485074056967285` i,
CC → 38.45503578882179` - 153.6662757322059` i,
DD → 95.520629176324` - 161.79272773925942` i,
F → 39.29097489210024` - 404.84898071722426` i,
G → -37.72947518685832` - 101.90827133707522` i,
H → 121.35588115567546` - 332.42803020741394` i,
P0 → -2.5148797473330387` - 905.1039456887393` i,
Ac → 172.38829577464483` + 205.00464122640528` i,
Bc → 1.5341110286000514` - 0.943459338649788` i,
CCc → 38.26017819871359` + 158.04472285864813` i,
DDc → 107.05780812603626` + 170.9987603102499` i,
Fc → 46.29078878492461` + 399.90333405862435` i,
Gc → -25.57080879237794` + 108.62483199485298` i,
Hc → 122.55286982176239` + 327.69939165827583` i,
Pc0 → -2.4681865742149594` + 896.0785934092804` i},
{A → 160.85024091529755` - 200.0125821338579` i,
B → 0.4025717722787334` + 5.225785328780461` i,

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CC → 42.19387847218837` - 154.01620310017017` i,
DD → 94.57531434937403` - 159.15327727958217` i,
F → 43.6932844035003` - 404.27664072871147` i,
G → -34.04572706751959` - 96.78220333412874` i,
H → 131.9147494231682` - 322.01030176835025` i,
P0 → -7.847850954233179` - 903.9084645541813` i,
Ac → 163.30712287967862` + 196.19780385596354` i,
Bc → 2.0206804981074313` - 0.9727849935703858` i,
CCc → 32.16857613401017` + 146.85036951504264` i,
DDc → 112.99696818774385` + 160.14044219413034` i,
Fc → 44.24096664668646` + 402.3666863403355` i,
Gc → -32.43223656115261` + 105.91338757440766` i,
Hc → 121.19257362403403` + 332.8788654395126` i,
Pc0 → -12.681336113575059` + 894.991994930033` i},
{A → 164.9187185954794` - 200.89845241094298` i,
B → 0.6717783524857524` + 7.1882150709594015` i,
CC → 38.038870973255555` - 148.3727473459229` i,
DD → 112.34333664920713` - 166.5825337355679` i,
F → 35.17082056897726` - 390.7659085336512` i,
G → -39.57022308881796` - 93.74096303095084` i,
H → 122.31449828674212` - 330.548410163524` i,
P0 → -18.553691981356074` - 901.9972441997638` i,
Ac → 163.70865168464226` + 199.73127142244132` i,
Bc → -5.200239731254147` + 3.2772023036199727` i,
CCc → 28.85060413085603` + 144.26057435494434` i,
DDc → 103.42745578401319` + 164.7773288085489` i,
Fc → 40.495019680856544` + 404.57903051418384` i,
Gc → -32.82068384726947` + 111.31059799946175` i,
Hc → 126.3981683678397` + 338.441059686613` i,
Pc0 → -20.220931502229618` + 901.9983790585561` i},
{A → 175.7996518259155` - 204.7983427018829` i,
B → 1.284692590353771` + 1.088252517966847` i,
CC → 45.73179823072312` - 154.09318852589445` i,
DD → 100.35814026045993` - 157.2162422531084` i,
F → 44.06373346415361` - 398.6734319020908` i,
G → -29.765595705350492` - 99.51972579955296` i,
H → 133.31909639561349` - 330.5384739031986` i,
P0 → -17.646176824627048` - 892.8926999995833` i,
Ac → 168.02245622594296` + 210.08782938006019` i,
Bc → 1.292084783477204` + 5.196635822801561` i,
CCc → 33.60131321367348` + 148.45399927611072` i,
DDc → 109.48590306792906` + 169.02364448462518` i,
Fc → 28.731994912692294` + 397.9726322798825` i,

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Gc → -33.9513100786682` + 93.32263462553271` i,
Hc → 117.00865206743181` + 327.37069236174017` i,
Pc0 → -21.34567262355695` + 888.3505012978809` i},
{A → 166.61265159448652` - 198.8884173898727` i,
B → -4.264412594700882` - 6.102241248887658` i,
CC → 29.95471976864858` - 155.91656878797863` i,
DD → 96.512744671946` - 158.57082206600862` i,
F → 30.476336868370446` - 393.9924031971208` i,
G → -35.12618783257435` - 103.55736001227885` i,
H → 119.0806807413734` - 330.5123374835845` i,
P0 → -14.197115594444925` - 904.1766190437357` i,
Ac → 163.49033166016002` + 202.17075843382713` i,
Bc → 0.7466542828831955` + 5.710519571461241` i,
CCc → 47.10400390782056` + 155.82680135704356` i,
DDc → 96.16050333052652` + 156.53878954219618` i,
Fc → 43.50825806806071` + 397.7772649129683` i,
Gc → -26.145878741373714` + 96.46471562420463` i,
Hc → 117.5382335046908` + 325.2701365979211` i,
Pc0 → -18.42018334499013` + 895.8227772530842` i},
{A → 162.2778147312575` - 211.36253880153097` i,
B → -8.978881249650279` + 6.357435467992978` i,
CC → 37.24107911714958` - 145.3144014084377` i,
DD → 103.28291504227991` - 161.0239624611429` i,
F → 43.55804883673711` - 399.1296247427034` i,
G → -25.058385368167514` - 98.40830200841701` i,
H → 116.38572117002147` - 340.9780864251859` i,
P0 → -5.08021492551252` - 895.7548093105645` i,
Ac → 179.87365805834656` + 196.020487139463` i,
Bc → 0.38044507958320395` + 2.4796496480331527` i,
CCc → 36.81991224025955` + 149.1993698835754` i,
DDc → 99.16115473148267` + 158.36233647599406` i,
Fc → 41.80426959710391` + 389.0664967408059` i,
Gc → -29.955524050242502` + 105.84451741661587` i,
Hc → 123.98338453749199` + 341.11092509960054` i,
Pc0 → -11.646394261893962` + 904.9439410517039` i},
{A → 172.6178427622852` - 208.6596365079911` i,
B → 7.376541376207491` + 7.446552048929135` i,
CC → 28.469289808438432` - 159.59416237667824` i,
DD → 97.57797918477928` - 156.34091020035808` i,
F → 42.92424071450319` - 386.8104649596586` i,
G → -41.79652625023953` - 107.08573123587733` i,
H → 124.84848093287474` - 326.1194805970561` i,
P0 → -10.076186423891256` - 891.0165100901613` i,

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Ac → 178.83997439739647` + 194.1304137961509` i,
Bc → -1.7514307488074294` - 5.613364237043726` i,
CCc → 44.76681775339997` + 142.7676498997748` i,
DDc → 105.09381041632189` + 154.61629064079847` i,
Fc → 39.64837501721359` + 403.1290593784926` i,
Gc → -24.745087924628848` + 111.39058328320024` i,
Hc → 125.38762988721417` + 329.4477762915535` i,
Pc0 → -7.391662036189784` + 893.4973946826194` i},
{A → 174.67753846334233` - 212.53992115666912` i,
B → 6.448705948033236` - 4.307731936417888` i,
CC → 29.06261870792294` - 159.1155608582098` i,
DD → 99.188109561075` - 172.7655334974755` i,
F → 43.07621639539006` - 395.74163951524497` i,
G → -29.300431834363906` - 106.75017033927983` i,
H → 127.95190346362199` - 331.80737494784717` i,
P0 → -19.160295516515035` - 897.8584673296099` i,
Ac → 175.66245096870216` + 212.67550750311239` i,
Bc → 6.509122251885813` + 0.2442093239793124` i,
CCc → 39.888453762128584` + 160.311372252259` i,
DDc → 101.82219505135302` + 165.48403418827405` i,
Fc → 29.708964928984848` + 399.5484591914112` i,
Gc → -29.328341117168193` + 105.70118634211033` i,
Hc → 123.75978514097854` + 324.573768055546` i,
Pc0 → -5.48629591833935` + 895.2003820142525` i},
{A → 174.01652695578167` - 209.49427717457775` i,
B → 3.6083571920726456` + 6.77549146325277` i,
CC → 30.720349667630778` - 143.79194991964638` i,
DD → 107.70690159027123` - 154.670816665478` i,
F → 43.247442910797254` - 389.37973083416597` i,
G → -42.129215060577934` - 111.98712623802332` i,
H → 117.90258288463897` - 330.4408107387317` i,
P0 → -15.753332508736902` - 898.6111695400284` i,
Ac → 172.6864868842213` + 208.552174526035` i,
Bc → -0.6576073838461802` + 5.260132453862575` i,
CCc → 36.143456229263016` + 152.46279877423476` i,
DDc → 96.61508364897081` + 165.73265245909852` i,
Fc → 48.3295813298288` + 399.1374856399756` i,
Gc → -43.0890867688608` + 98.09143203905968` i,
Hc → 131.59768098522093` + 322.40032248845773` i,
Pc0 → -20.142983942157223` + 897.7827462409538` i},
{A → 180.22832008959261` - 197.22859869944062` i,
B → 9.805226105121363` + 0.14351058680942685` i,
CC → 34.45591346122791` - 154.6709192825206` i,

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DD → 102.80546167758646` - 159.4869412143344` i,
F → 31.26088279906095` - 389.8284211856295` i,
G → -30.68675488408134` - 106.35912580823157` i,
H → 117.03758683605281` - 323.4992654240538` i,
P0 → -9.198726400276923` - 899.0630297508317` i,
Ac → 166.93488164797924` + 208.70317026303223` i,
Bc → -9.231731856445492` - 8.181880605855607` i,
CCc → 31.735088255015945` + 149.36636179972072` i,
DDc → 109.68695755316992` + 166.5487590679239` i,
Fc → 33.505570176275505` + 403.0386200447467` i,
Gc → -35.54443789982271` + 97.74261145722274` i,
Hc → 129.51962304817147` + 323.12999481056784` i,
Pc0 → -17.505816029287125` + 898.9078024949131` i},
{A → 164.82405077543697` - 206.76089499232856` i,
B → -9.010543147530825` + 6.8161729315403505` i,
CC → 34.21182982626189` - 149.3859211232368` i,
DD → 101.65924207697562` - 166.14014854004805` i,
F → 30.95436237679251` - 396.9912514293028` i,
G → -25.315330918441376` - 92.74662667204868` i,
H → 121.21273152002524` - 333.49034599613105` i,
P0 → -21.342261547928437` - 902.33777254444584` i,
Ac → 161.47020160436927` + 207.99632499467882` i,
Bc → -7.878193554064168` + 3.797621252620054` i,
CCc → 30.49951903213816` + 145.34798655340492` i,
DDc → 99.2098583934438` + 161.08823616676267` i,
Fc → 40.61424745713946` + 394.079707638572` i,
Gc → -26.080918269503208` + 94.87618727665992` i,
Hc → 133.16282253895938` + 327.8488423115978` i,
Pc0 → -2.8006671414128643` + 888.55114800278` i},
{A → 173.68185368250502` - 210.88506280633243` i,
B → -5.981736493116038` - 3.874618866286035` i,
CC → 29.35461939222658` - 152.4085069654851` i,
DD → 97.3415763119147` - 157.39868198203334` i,
F → 35.76176665535721` - 386.6099262515485` i,
G → -33.470639293396445` - 107.08189227188736` i,
H → 129.06773195188953` - 325.07209429600243` i,
P0 → -15.341097618289806` - 904.927718104477` i,
Ac → 168.49502101757912` + 202.50126394139954` i,
Bc → 1.9095896196329463` - 1.5753717638821527` i,
CCc → 36.853542821628764` + 156.52422073074285` i,
DDc → 106.08147064264821` + 157.26225206932813` i,
Fc → 37.390916069175084` + 402.76608401514295` i,
Gc → -29.615386081067612` + 106.73122642276473` i,

```



```

Hc → 128.39619333530652` + 333.894200638611` i,
Pc0 → -10.46771986317343` + 904.0103383835362` i},
{A → 166.3988424299859` - 202.22355568759133` i,
B → -6.24680736160429` + 4.194131008063373` i,
CC → 39.049210686546076` - 161.16356647449103` i,
DD → 107.96861724649071` - 168.67782356819856` i,
F → 45.60869387632833` - 405.48350422333795` i,
G → -25.90583334251975` - 111.62275251120373` i,
H → 123.45625325608268` - 324.66527017552227` i,
P0 → -19.82374138984131` - 899.134646386432` i,
Ac → 173.72648247016383` + 194.49907292090285` i,
Bc → 4.732667755797209` + 4.876064284199522` i,
CCc → 29.131929993633335` + 154.20766838255855` i,
DDc → 108.98678498702074` + 161.56862075323073` i,
Fc → 33.73073219815085` + 395.8823188923153` i,
Gc → -29.535397489883017` + 110.46916365522273` i,
Hc → 123.5671033752293` + 332.12121581942256` i,
Pc0 → -7.800299214086008` + 905.1356912671145` i},
{A → 174.86773364610852` - 205.8812758324174` i,
B → -8.192996145531211` - 9.991621417532524` i,
CC → 43.82213309973645` - 159.89588917176394` i,
DD → 99.73603205447537` - 159.38772670279477` i,
F → 29.524439543300723` - 402.19265316998076` i,
G → -39.05712382708785` - 105.0628081339408` i,
H → 121.9759694676475` - 338.8978043207157` i,
P0 → -11.879272628607856` - 901.662046796616` i,
Ac → 168.02752042775896` + 208.45946223237613` i,
Bc → -3.215786196341824` - 6.606954524236997` i,
CCc → 43.73445598303883` + 147.63292846062973` i,
DDc → 105.69338605540543` + 162.7369108827906` i,
Fc → 33.962580668047806` + 392.5093659786419` i,
Gc → -30.07527665890359` + 106.30327386288941` i,
Hc → 115.69967638579688` + 339.0013619376456` i,
Pc0 → -12.311848352308347` + 905.7359410685729` i},
{A → 175.89084164425824` - 209.30488062550916` i,
B → 7.98745374818364` - 0.6623915982232873` i,
CC → 32.7862761437987` - 161.0063139681046` i,
DD → 102.37192143671727` - 171.97686560873979` i,
F → 40.542716873156614` - 400.7845615315109` i,
G → -40.3000275533657` - 93.29541513703745` i,
H → 122.7473354745405` - 328.52032505471897` i,
P0 → -11.950538023258352` - 899.72653026973` i,
Ac → 167.2309525634537` + 200.08430360621045` i,

```

```

Bc → 7.329569641852672` - 8.101997769463448` i,
CCc → 32.871459189426446` + 159.7576149962159` i,
DDc → 103.81931345364241` + 156.34541992005563` i,
Fc → 31.366461389204346` + 397.58525800383984` i,
Gc → -31.858017819040356` + 93.81983020219494` i,
Hc → 117.35138090483812` + 335.3323429733685` i,
Pc0 → -6.234026108096698` + 899.6473588097514` i},
{A → 165.33758040014493` - 198.00647553606296` i,
B → -5.298363942103187` + 7.618085927377123` i,
CC → 41.20610678050901` - 153.1984133539532` i,
DD → 99.37802205348665` - 155.58880956579293` i,
F → 31.60198701339259` - 387.73632390078467` i,
G → -26.761233078217643` - 105.40587750552143` i,
H → 128.0501344115948` - 331.6024432690843` i,
P0 → -5.426804610113775` - 893.8468461575378` i,
Ac → 174.74901634846475` + 203.91959070150486` i,
Bc → 4.202805304808955` + 0.9286487965767165` i,
CCc → 27.599072627413342` + 146.05010613077013` i,
DDc → 103.11833492237247` + 161.32862743354298` i,
Fc → 35.50325203936384` + 396.02848800195824` i,
Gc → -41.21953427461112` + 103.43822631169908` i,
Hc → 115.71430386655929` + 324.84583595134217` i,
Pc0 → -6.5778970960899255` + 888.2904652831166` i},
{A → 175.92693745546467` - 196.23290403967343` i,
B → -3.54461025793972` + 2.8626224509769003` i,
CC → 36.93234785300061` - 145.6125904657312` i,
DD → 97.67240314161904` - 156.53483956869377` i,
F → 35.24858612194576` - 390.23266214067377` i,
G → -34.07456685449369` - 94.0054168773785` i,
H → 114.09900623494372` - 338.3065881819921` i,
P0 → -8.966810396368755` - 898.5391668257797` i,
Ac → 175.12711980924215` + 205.78054132887038` i,
Bc → -8.238845516779069` + 3.9484478052097387` i,
CCc → 46.985338713324786` + 154.02286341441197` i,
DDc → 96.6574688258462` + 168.9124402024991` i,
Fc → 29.935900358491295` + 395.9596166624886` i,
Gc → -28.365044097077586` + 93.36841349260268` i,
Hc → 116.03877531186328` + 330.66410170613653` i,
Pc0 → -9.169894118357801` + 896.6552932523446` i},
{A → 160.82602871949734` - 196.49530882451177` i,
B → 7.397842962164233` - 3.2740007212766713` i,
CC → 39.95249603617835` - 154.17345934353807` i,
DD → 111.69246760328727` - 158.46510587562838` i,

```

```

F → 48.21533173054997` - 398.9496727893251` i,
G → -26.775860222878656` - 104.01632827013714` i,
H → 121.9969420879726` - 337.48360514810526` i,
P0 → -22.079970540265798` - 900.0267976107249` i,
Ac → 178.0816453938537` + 202.83014470674533` i,
Bc → -4.452149303062654` + 4.874098199726895` i,
CCc → 34.951248470898804` + 155.47703853395464` i,
DDc → 112.64203169388412` + 163.00928244278265` i,
Fc → 38.04566893608535` + 387.9324195580985` i,
Gc → -41.351031799153134` + 111.65375364944822` i,
Hc → 125.62450570045016` + 336.75708959946024` i,
Pc0 → -8.061352856983602` + 887.2482521422462` i},
{A → 175.75931049776852` - 199.31015879148688` i,
B → 4.976911729494319` - 9.992118540297898` i,
CC → 38.88323436490898` - 152.16127368834998` i,
DD → 107.427051380378` - 161.51041568804936` i,
F → 35.62807980382206` - 395.66850334503965` i,
G → -24.00252379043817` - 99.00753104513127` i,
H → 127.2627137891561` - 331.8634713700834` i,
P0 → -8.559717071832315` - 900.3685188467075` i,
Ac → 166.68827014848895` + 199.07864996951534` i,
Bc → 2.2748807763218934` + 3.0307264666310516` i,
CCc → 38.38401886437538` + 147.91308860240585` i,
DDc → 97.2833709931574` + 159.62180202969893` i,
Fc → 36.81049596666786` + 388.2363638452841` i,
Gc → -25.753945038690617` + 108.11772083402573` i,
Hc → 117.8568837526149` + 334.60415883291535` i,
Pc0 → -14.453603079365207` + 894.2069992959089` i},
{A → 170.2813134455662` - 211.56210452283776` i,
B → 3.734094836547385` - 1.729414914232514` i,
CC → 40.10126229687692` - 148.11566633988912` i,
DD → 98.35710682351896` - 165.43785695512804` i,
F → 37.78360659038135` - 402.2228299587552` i,
G → -26.334108193737954` - 108.26156172745416` i,
H → 131.39595880992655` - 323.07830291773445` i,
P0 → -7.859291685356892` - 904.5222569122308` i,
Ac → 170.2501859458915` + 196.7911356506499` i,
Bc → -0.2773053894708255` + 8.384477450789348` i,
CCc → 37.09612778405351` + 155.51423827550695` i,
DDc → 94.49840714107134` + 162.30563280757835` i,
Fc → 45.577803268591104` + 404.45683406732655` i,
Gc → -41.01120461849521` + 95.14219374644088` i,
Hc → 118.04148305643534` + 337.64872834139754` i,

```

C.7 Mathematica Code for the Cam Design

Useful Functions

```
LinkLength[a_, b_] := N[Sqrt[Dot[b - a, b - a]]];

JointAngle[b_, c_] := ArcTan[Dot[b, c], Det[{b, c}]];

Zmat[θ_] := {{Cos[θ], -Sin[θ], 0}, {Sin[θ], Cos[θ], 0}, {0, 0, 1}};

Xmat[a_] := {{1, 0, a}, {0, 1, 0}, {0, 0, 1}};

Ymat[a_] := {{1, 0, 0}, {0, 1, a}, {0, 0, 1}};

Disp[x_] :=
  {{Cos[x[[1]]], -Sin[x[[1]]], x[[2]]}, {Sin[x[[1]]], Cos[x[[1]]], x[[3]]}, {0, 0, 1}};

Disp2[θ_] := {{Cos[θ], -Sin[θ]}, {Sin[θ], Cos[θ]}};

Xmat2[x_] := {{x}, {0}};

Ymat2[y_] := {{0}, {y}};

i = 1;

j = 1;
```

Foot Data

```
DataIn =
  Import["B:\\Brandon's Dropbox\\Dropbox\\Current Research\\Walk data TAMU\\Herbert1.xls"]
```

A very large output was generated. Here is a sample of it:

```
{{{356.763, 1031.18, 414.531, 1031.81, 399.639, 931.774, 402.35, 781.782, 443.453, 528.889,
  392.524, 368.797, 420.157, 92.5819, 392.208, 35.7269, 571.524, 47.8266}, <<4701>>,
 {351.532, 1019.15, 409.179, 1018.92, 395.138, 918.832, 384.972, 770.026, 385.344,
  515.104, 304.554, 369.442, 281.353, 92.2395, 247.365, 41.1183, 431.577, 37.1617}}}
```

Show Less Show More Show Full Output Set Size Limit...

```
WalkData = DataIn[[1]]
```

A very large output was generated. Here is a sample of it:

```
{{{356.763, 1031.18, 414.531, 1031.81, 399.639, 931.774, 402.35, 781.782, 443.453, 528.889,
  392.524, 368.797, 420.157, 92.5819, 392.208, 35.7269, 571.524, 47.8266}, <<4701>>,
 {351.532, 1019.15, 409.179, 1018.92, 395.138, 918.832, 384.972, 770.026, 385.344,
  515.104, 304.554, 369.442, 281.353, 92.2395, 247.365, 41.1183, 431.577, 37.1617}}}
```

Show Less Show More Show Full Output Set Size Limit...

```
Points = Table[Partition[WalkData[[i]], 2], {i, Length[WalkData]}]
```

A very large output was generated. Here is a sample of it:

```
{{{356.763, 1031.18}, {414.531, 1031.81}, {399.639, 931.774},
 {402.35, 781.782}, {443.453, 528.889}, {392.524, 368.797},
 {420.157, 92.5819}, {392.208, 35.7269}, {571.524, 47.8266}},
 <<4701>>, {{351.532, 1019.15}, {409.179, 1018.92}, {395.138, 918.832},
 {384.972, 770.026}, {385.344, 515.104}, {304.554, 369.442},
 {281.353, 92.2395}, {247.365, 41.1183}, {431.577, 37.1617}}}
```

Show Less

Show More

Show Full Output

Set Size Limit...

```
Plots = Table[
  ListPlot[Points[[i]], PlotRange → {{-200, 1500}, {-200, 1500}}, {i, Length[Points]}];
(*ListAnimate[Plots]*)
```

```
SimplePoints =
Table[{Points[[i, 3]], Points[[i, 5]], Points[[i, 8]], Points[[i, 9]]}, {i, Length[Points]}
```

A very large output was generated. Here is a sample of it:

```
{{{399.639, 931.774}, {443.453, 528.889}, {392.208, 35.7269}, {571.524, 47.8266}},
 {{399.651, 931.879}, {441.487, 528.459}, {387.33, 35.8651}, {566.758, 46.9528}},
 <<4699>>, {{397.18, 919.048}, {388.279, 515.033}, {252.16, 40.9901}, {436.403, 37.2791}},
 {{395.138, 918.832}, {385.344, 515.104}, {247.365, 41.1183}, {431.577, 37.1617}}}
```

Show Less

Show More

Show Full Output

Set Size Limit...

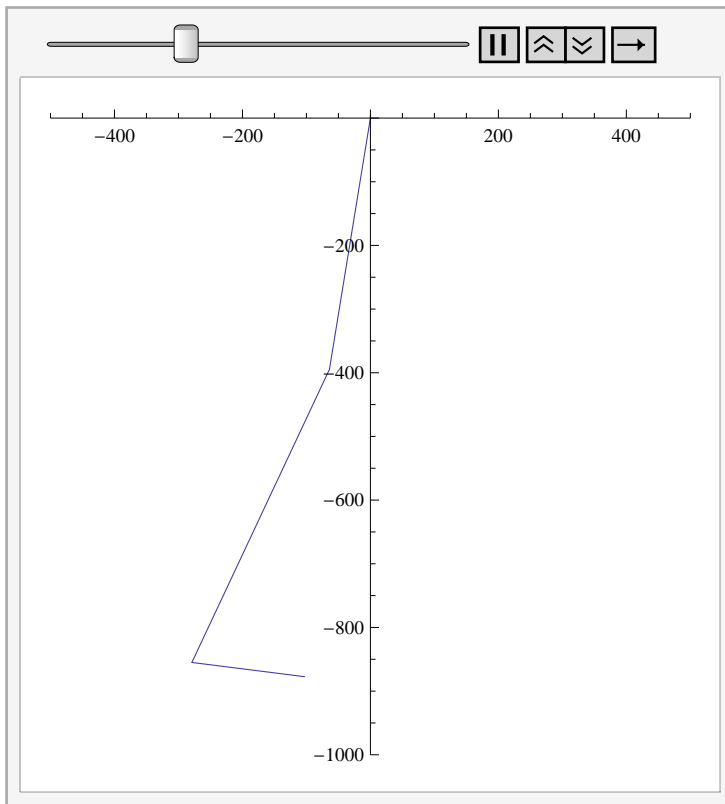
```
MovedSimple =
Table[Table[SimplePoints[[i, j]] - SimplePoints[[i, 1]], {j, 4}], {i, Length[Points]}];

Foot =
Max[Table[LinkLength[MovedSimple[[i, 3]], MovedSimple[[i, 4]]], {i, Length[MovedSimple]}]]
184.343
```

```
LowerLeg =
Max[Table[LinkLength[MovedSimple[[i, 2]], MovedSimple[[i, 3]]], {i, Length[MovedSimple]}]]
526.941
```

```
FootAngle[InputPoints_] :=
Module[{angle},
  angle = ArcTan[InputPoints[[4, 1]] - InputPoints[[3, 1]],
    InputPoints[[4, 2]] - InputPoints[[3, 2]]];
{angle}]
```

```
ListAnimate[Table[ListLinePlot[MovedSimple[[i]],
  AspectRatio -> 1, PlotRange -> {{-500, 500}, {5, -1000}}], {i, 205}]]
```



Cam Design

11 = 75

75

12 = 100

100

13 = 11 + 12

175

r = 40

40

offset = 18 Degree

18 °

```

atemp = Flatten[Table[FootAngle[MovedSimple[[i]], {i, 205}]]
{0.0673748, 0.0617162, 0.0564983, 0.0519036, 0.0474209, 0.0431077, 0.0390071, 0.0347881,
0.0302634, 0.0263935, 0.0239299, 0.0219393, 0.0187791, 0.0144534, 0.0103304, 0.00727023,
0.00493991, 0.00260377, 0.0000957892, -0.0020153, -0.00343075, -0.00470983,
-0.00650393, -0.00854167, -0.010419, -0.012182, -0.0136862, -0.014771, -0.0159751,
-0.0176436, -0.019332, -0.0204838, -0.0211985, -0.0222065, -0.0237202, -0.0251765,
-0.0265236, -0.0280563, -0.0296423, -0.0309134, -0.031764, -0.0325581, -0.0338441,
-0.0357112, -0.0376554, -0.0394121, -0.0412003, -0.0434566, -0.0462742, -0.0494458,
-0.0527659, -0.0565014, -0.0608118, -0.0654627, -0.0703964, -0.0756752, -0.0814152,
-0.0877173, -0.0945724, -0.101906, -0.109602, -0.11768, -0.126223, -0.135081,
-0.144342, -0.154198, -0.164492, -0.175123, -0.186278, -0.198042, -0.210403,
-0.223758, -0.238133, -0.252999, -0.268483, -0.285142, -0.302914, -0.321178,
-0.339636, -0.358585, -0.378625, -0.399889, -0.42209, -0.445051, -0.46866, -0.493015,
-0.518191, -0.54389, -0.570319, -0.597595, -0.625454, -0.654077, -0.683519, -0.713545,
-0.744163, -0.775643, -0.808289, -0.84216, -0.876751, -0.911587, -0.946836, -0.982816,
-1.01966, -1.05675, -1.09365, -1.1302, -1.1662, -1.2017, -1.23678, -1.27122,
-1.30498, -1.33744, -1.36584, -1.38552, -1.3934, -1.38869, -1.37289, -1.349, -1.3195,
-1.28537, -1.24657, -1.20334, -1.15692, -1.10917, -1.06218, -1.01787, -0.977027,
-0.938572, -0.900859, -0.862838, -0.823684, -0.782857, -0.740047, -0.695666,
-0.651161, -0.608236, -0.567787, -0.528941, -0.489668, -0.448638, -0.406515,
-0.364982, -0.325356, -0.28789, -0.252306, -0.218418, -0.186375, -0.155244, -0.124031,
-0.0928904, -0.0622404, -0.0321347, -0.00321741, 0.0238523, 0.049326, 0.0727095,
0.0923561, 0.107496, 0.118152, 0.124674, 0.126971, 0.12532, 0.122626, 0.124552,
0.135029, 0.154292, 0.179806, 0.206687, 0.229985, 0.247449, 0.259374, 0.266319,
0.268124, 0.265122, 0.259224, 0.253142, 0.247936, 0.242865, 0.237807, 0.234072,
0.231598, 0.22677, 0.21587, 0.199874, 0.183929, 0.17194, 0.162493, 0.151437, 0.138784,
0.127425, 0.118419, 0.110416, 0.102186, 0.094247, 0.0874385, 0.0813147, 0.0756697,
0.0704239, 0.0654561, 0.0605016, 0.0556332, 0.0506191, 0.0452221, 0.0397813, 0.0347355}

θStart = N[Table[i, {i, 0, 359, 360 / 205}]] Degree
{0., 0.0306497, 0.0612994, 0.0919491, 0.122599, 0.153248, 0.183898, 0.214548, 0.245197,
0.275847, 0.306497, 0.337147, 0.367796, 0.398446, 0.429096, 0.459745, 0.490395, 0.521045,
0.551694, 0.582344, 0.612994, 0.643643, 0.674293, 0.704943, 0.735592, 0.766242, 0.796892,
0.827541, 0.858191, 0.888841, 0.919491, 0.95014, 0.98079, 1.01144, 1.04209, 1.07274,
1.10339, 1.13404, 1.16469, 1.19534, 1.22599, 1.25664, 1.28729, 1.31794, 1.34859, 1.37924,
1.40989, 1.44054, 1.47118, 1.50183, 1.53248, 1.56313, 1.59378, 1.62443, 1.65508, 1.68573,
1.71638, 1.74703, 1.77768, 1.80833, 1.83898, 1.86963, 1.90028, 1.93093, 1.96158, 1.99223,
2.02288, 2.05353, 2.08418, 2.11483, 2.14548, 2.17613, 2.20678, 2.23743, 2.26808,
2.29873, 2.32938, 2.36003, 2.39068, 2.42133, 2.45197, 2.48262, 2.51327, 2.54392,
2.57457, 2.60522, 2.63587, 2.66652, 2.69717, 2.72782, 2.75847, 2.78912, 2.81977,
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