Bio-Fi: Inverse Biotelemetry Projects

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ABSTRACT
Bio-Fi is a collection of art projects undertaken by S.W.A.M.P. (Studies of Work Atmospheres and Mass Production), collaborative art projects by Douglas Easterly and Matt Kenyon. S.W.A.M.P. projects attempt to find creative expression within elements of culture that are inherently counter-creative. The Bio-Fi series utilizes physical computing technology to access patterns and relationships surrounding a corporation, that couldn't be seen using any other medium. The field of 'biotelemetry' researches ways of gathering vital physiological data from living organisms through transponders (worn or implanted), which relay information to remote hardware [1]. With all biotelemetric applications, it is integral that the transponder-bearing subject is a synecdoche for its larger social group. In this respect, Bio-Fi projects are a sort of 'inverse-biotelemetry'. Test subjects are not released into a natural environment, but trapped within a synthetic environment whose conditions are tempered by various systems of information: Wi-Fi signals are like water, information mined from the internet is food, and electronic pulses become sunlight.

Categories and Subject Descriptors
J.5 [**Computer Applications**]: Arts and Humanities – *fine arts*. C.3 [**Computer Systems Organization**]: Special-Purpose and Application-Based Systems – *Real-time and embedded systems*.

General Terms
Documentation, Design, Economics, Experimentation, Human Factors, Theory.

Keywords
Art, Economics, Inverse Biotelemetry, Physical Computing

1. INTRODUCTION
Spore1.1 is our first Bio-Fi project (see Figure 1). It is a self-sustaining ecosystem for a rubber tree plant purchased from Home Depot. An onboard computer uses a Wi-Fi connection to access Yahoo stock quotes once per week and keep a database of week ending stock values. When the stock value rises from the previous week's mark, a microcontroller triggers the water pumps, feeding the rubber tree plant. When the value is down at the weekly comparison, the plant is not watered.

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Figure 1. Spore 1.1 – case, hardware and plant.

2. CONCEPT
Home Depot is a large corporation that specializes in home and garden products and services. During the 1990's, Home Depot saw rapid growth in both, its stock value (3,700%) and its implementation of a sophisticated inventory control system [2]. Home Depot has over 1700 retail outlets, which quickly and efficiently distribute its products all of which are assembled overseas [3][4]. Cumulatively this generates a singular vision to consumers: choice and convenience equals freedom.

The premise of Spore 1.1 is to expose choice and convenience as mechanisms of control. The primary components of this project are a rubber tree plant (purchased from Home Depot), stock market data from Home Depot's weekly closing value, and a microcontrolled irrigation system that negotiates and binds these two entities. Ideal plant health is achieved through weekly watering, while a corporation's health can be monitored through its stock market value. Spore 1.1 links the stock market value of Home Depot to the physical health of one of its products, thereby diminishing the comfortable distance separating corporate profit and its real-life effects outside of its profit margin. As the company does well, so

does the plant – if the company suffers losses, Spore 1.1 does not get watered.

With biotelemetry, individual monitoring is used to gather data for achieving some kind of homeostasis between individual, social group and environment using or responding to cybernetic conditions. In our Bio-Fi projects, as seen in Spore 1.1 – a kind of inverse scenario of biotelemetry is established. Data is gathered from a corporation (the collective exhaust of various human, cybernetic and social activity) and then used to effect the rubber tree plant, consequently expressing a viewpoint regarding the relationship between the individual and corporation.

3. HARDWARE

Spore 1.1 is a self-sustaining ecosystem for a rubber tree plant. Within the plexi-glass casing, a variety of hardware is installed to control its watering maintenance. This hardware consists of a small form factor CPU (Epia M10000), with 802.11b card, a 1 gig hard drive, a Teleo Multi IO Module microcontroller, 4 small water pumps and various batteries and power supplies. In the middle of this hardware is a *Ficus Elasticus* – a rubber tree plant.

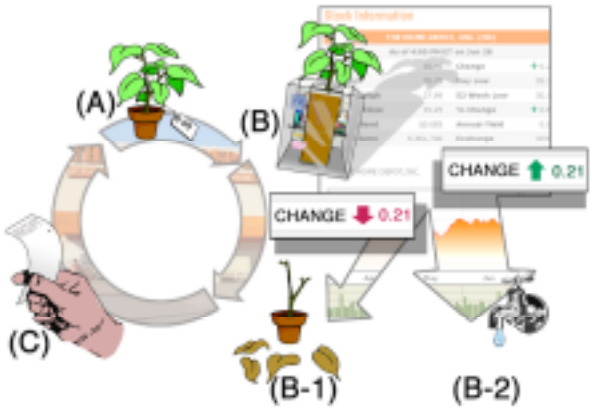

Figure 2. Spore life-cycle. (A) Plant is purchased at Home Depot. (B) Plant is installed within case. (B-1) HD stock goes down for the week – plant is not watered. (B-2) HD stock goes up for the week – plant is watered. (C) If plant dies, the 1-year guarantee is invoked, and (A) a new plant is purchased.

4. IMPLEMENTATION

The watering maintenance is a weekly schedule consisting of two main stages 1) weekly stock data acquisition 2) microcontroller software. These stages are executed by two Unix cron jobs.

The first cron job executes a PHP script checking the week's ending value for Home Depot via Yahoo and writes it to a text file. The script overwrites whatever value is stored in the text file, so there are actually two text files - an extra one to store the previous weeks value. The second cron job executes a custom C application. This application first reads the value from the old text file and the new text file, and stores these as a pair of variables. It then compares the two, and determines if the newer value is greater than last week. If the recent value is higher, indicating Home Depot's current stock has risen, a function is called that signals the Teleo Multi IO board to run the electric pumps connected to it's digital outputs. A timer in this application executes another function stopping the pumps after 1 minute. If the stock has stayed the same, or lost value from last week's closing, the function operating the Teleo is not called, and Spore 1.1 will have to wait until next week for a possible feeding. Lastly, the application copies the new value to old text document for the following week.

(a) (b) (c)

Figure 3. Spore 1.1 results over 3 months. (a) October 2003, (b) November 2003, (c) December 2003

5. RESULTS

Home Depot's stock ratings varied the whole time of the project. In November and December, however, Spore1.1 received water on 8 consecutive weeks. Its health seemed to steadily deteriorate after that, as its roots became rotted, and eventually died in January 2004. This was an unexpected result, as we assumed a weekly 1 minute watering would not kill the plant, rather only a lack of water would kill it. But it somehow seemed appropriate that the plant would die because of an overabundance of Home Depot stock gains (see Figure 3).

6. ACKNOWLEDGMENTS

Thanks to Jonah Langenbeck, Christine Catsifas and Walter Averett for initial ideation input.

7. FUTURE PROJECTS

Spore 2.0 is near completion. With this project, installed devices (feeders) are positioned near Wi-Fi hubs where a determined signal-to-noise ratio releases an agar formulated to attract local mold cultures. The unit also has elements of self-sufficiency, as it is solar powered, contains onboard hardware for Wi-Fi reception, and a microcontroller for electronic valve adjustment

8. REFERENCES

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