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The Hall of the Fountain in the Zisa's Palace and the Palatina Chapel in the Norman Palace (Palermo).
Graph-numerical data bank and image data base to run and use different methods of survey.

The research here described deals with the Hall of the Fountain in the Zisa's Palace and with the Palatina Chappel in the Norman Palace.

It has been made a survey all over the monuments with modern methodologies and instruments. With these surveyes it has become available an interesting data base.

The availability of heterogeneous data (numeric data and images), to get metric-geometric and documental informations, has improved the research.

Here is explained a methodology to run and use data from surveyes. It's made by archives of different nature: graph-numerical data bank (bi-threedimensional) and image data base, of which we studied how to connect them directly.

This thing has promoted the study of an integrated system to use them together and exchange each other. It has requested to find representation forms diversified and more complex described in this paper.

The informations and cognitive levels already acquired are more and more available in large quantities and the quality becomes deeper.

The analytical methods of surveying even of representation and description are diversified and complex.

The risk is to dissipate one's efforts and to loos data paradoxically, if there isn't an organic management of treatment.

The representation plays the role of mediation beetwen the phisic complexity of the nature, of the architecture, and all the intervention that can be carried out on the monuments: not only material intervention of restoration and conservations, but also cognitive and documental.

The reserch of exhaustive shapes and syntetic kinds of representations, of reading filters on different level, are

here presented through a sequence of examples and different experiences woven up again each other by the thread of this argument.

Digital sections and representation

The conservative restoration of the Hall of the Fountain has requested a survey of the structure, peculiar for the arabic covering (muqarnas), and a survey of the important decoration with mosaics and frescos.

It has been made a punctual survey of the cross-sections using modern and electronic instruments (theodolite T1600 with DIOR 3002 and laser pointing device - Wild). This let to know carefully the geometry of the intrados of the hall. The sections are comparable with the profiles get cutting the structure on the preferential planes of symmetry: these planes cross the intersection point of the two central axes of the Hall.

Particularly the planes of section are orthogonal each other. Two planes are vertical and define the longitudinal and the trasversal section; the third is horizontal and define the planimetry.

The points surveyed (500) are located along the profiles without any materialization and are selected according to these general principles:

- special points located on the geometric discontinuances of projection and background, decorative discontinuances between mosaics and drip-stones, and at last materic discontinuances (stone and chalk of the muqarnas)

- points located homogeneously on the surfaces, plan and not plane, in order to determine the geometric trend and state.

The graphic elaboration employed an informatic system which let a direct management of numeric data bank of the Cartesian co-ordinates of the points.

The draw is built, like a dress, on the points surveyed: the same have one constant co-ordinate so that the planimetric section concern to xy plane (Fig.1), the longitudinal one to the yz plane (Fig.2) and the trasversal to the xz plane.

The survey, which is punctual, becomes continuous joining together the points with lines, according to the contour conditions between one point and the one in contiguity, thank to the monographyes drawn up with accuracy.

This let to get high precision and sharpness of the outline, especially where the profile loses an elementary geometry and form to get folds determined by projections and background, indentation and gorge of the anfractuuous muqarnas.

With this principle used to select the points to be surveyed we can describe even these complex state.

The management of treating the detail made possible to appreciate and esteem the richness of these forms: infact we cannot reduce them to elementar model enough exhaustive of the structure in exam. At the same time we notice and observe that the reading of the draw isn't immediatly, and becomes difficult in the interpretation, especially if related to realty.

The way backwards from the cognitive process get from the survey of an object to its draw can be proposed only in a syntetyc way and with immediatly.

The solution and alternative choice to stop to model semplified through the most important and principal form didn't agree to our aim, since it would mean to lose informations and knowledges intrinsically get with this methodology of survey.

For the complex case of the muqarnas it has been decided for an interpretation and reading of the draws scanned through three different level: first the reading of the structural function of fillet surface between the vertical wall offset each other; second the reading of the models (we define them 'eidotipi') directly related by the eyes to the image, and last the further definition of these.

So the profile has been integrated sketching the eidotipi connected to the section (Fig.2).

Eidotipi are the frontal draws of the structure elements cut from the section plane and represented upsetting the plane of 90 grads.

The contour line of the profile is the vertical one on the eidotipi intersected by the horizontal on the point surveyed.

These elements are a mediation between the reading of the section and the connection to reality.

The elementar models located one by one singularly have priority in the knowledge of the structural way of built, instead the knowledge of the details in which the model consists too, is limited inside them.

Infact a complex representation like this one, without filters, could made flat the interpretation, since the contour line is so rich to become only a corrugated and ondulated line, undoing the aim of the survey with a paradox.

Integration of the digital sections with the stereoplotting of the fronts

The only one datum system used for topographic survey and the photogrammetric one allowed the management of one graph-numeric archive relative to the Hall of the Fountain. The stereoplotting of the fronts has been mutually integrated with the digital sections. This represented the

natural conclusion of the classic representation bidimensional of the section with its own front, overcoming the division necessary in the redaction of the two series of graphic elaborations in order to the different methodologies used for the survey of the fronts and of the sections (Figg. 3-4).

Particularly the complexity of the fronts and of the fotografics models justified, in the stereoplotting, to specify and individualize some reading level diversified through the draw lines. This has been obtained giving priority to the interpretation of the structure with offset planes and filled though the typical arabic covering with muqarnas; only in second time proceeding to the reading and acquisition of the rich decorative system.

At last comes the localization of the state of degree relative to the structure and to the decoration.

Threedimensional management

The traditional representation kinds just explained, in some cases can be not enough exhaustive. So that it has been requested to find a different management to approach the representation of some architectural objects. Two cases are here presented.

The survey of the intradox of a theatre (Palermo- Teatro Massimo) with the theatre-hall, tieres of boxes, orchestral cavea, has been semplified locating six radial sections and one planimetric section at the height of 1.80 mt on the floor.

The threedimensional system, numeric and graphic, in which the co-ordinate relative to the singular sections have been put and ordered, allows an integrated use of the same.

The section, if singularly drawn, represent an orthogonal projection, but in effects it is a threedimensional entity.

The survey has been made in order to determine and calculate the volume characterized by asymmetrical profiles because of the form of the plain, like an horse-shoe, and by an iron vault, the geometric center of which doesn't clash with the highest point. This has requested to materialize graphically the envelope and the volume enveloped.

The spatial location of the single sections and the creation af a threedimensional box (Fig.5) achieve first of all a way of syntetic knowledge which would be realized with difficult and hard work, keeping each section separated.

But it could be, in second time, the starting-point for the natural representation of an ideal fillet-surfaces between the two contiguous half sections, going on the directrix of the planimetry broke in the intersection space between the two sections.

The generatrix and the directrix in this case have a not linear profile.

The continuous and threedimensional representation of surfaces can make up for the lack of the orthogonal projections, if complex like these one. Infact there are some geometric form not understood univocally through representation from only one point of view and through the digital stereoplotting of one object.

Here is presented an example. The stereoplotting of the five different covering structures of the Hall of the Fountain in the Zisa's Palace (Fig.6) is obtained with the connection of the single models of everyone part of this structure (the photogrammetric survey has been made with two cameras, Wild P31, 100 mm and 50 mm). But this kind of vectorial elaboration on line doesn't exhaust the understanding and comprehension of these arabic architectonics forms; therefore it can request a natural return to the photographic image or to the reality, in this case to lot of images because of the muqarnas surfaces muqarnas don't let to locate an only one preferential plane of representation.

Solid modelling and continuous representations in the Palatina Chappel.

The complexity of this famuos monument is determined by the contemporary presence of architectures and decorative patrimony coming from different historical cultures (norman, arabic, romanic...)

So it is very difficult to make synthesis and describe some formes so further from our architecture and culture only with traditional bidimensional representation. So they are here described and presented in a different way. Besides these kind of representation, already explained and trated in this paper, 3d model can be a solution to this problem too.

Infact if it's dressed with colors, lights and shadows, it has the continuity that let us to experience and know immediatly the complex shapes of nature.

The threedimensional management of the data banks to create a solis model can be applied to the representation of the topographic network with ellipsoides: this make up the first grid and the natural ambient for the syntesis and the collocation of the different graphic elaborations (sections and stereoplotting on line too) like in Figg. 7-8.

Image archives and data base.

The comprehension and process of knowledge of the architectures come true in different ways, from numbers and digital data, but even through the images. Those are infact an endless and inexhaustible source of informations; above all they are enowed and provided of the continuity requisite and therefore of the direct perception.

At the Palatina Chappel it has been made the photogrammetric survey of all the surfaces, vertical and horizontal structures, inside and outside.

This rich and exceptional documentation, also expansive for costs and temps, has emphasized the problem of an use not only proceeding through the traditional stereoplotting on line, which fixes in only one way the modalities of reading, as described for the case of the fronts of the hall of Zisa's Palace.

So it has been developed the acquisition (Bit -mapped graphics) of phothographics images to use them integrated with vectorial elaborations on line, bi-threedimensional. (Fig.9).

As first step for the spatial location of the images it's necessary to create graphic archives of image data base, in order to be able to interfere with them.

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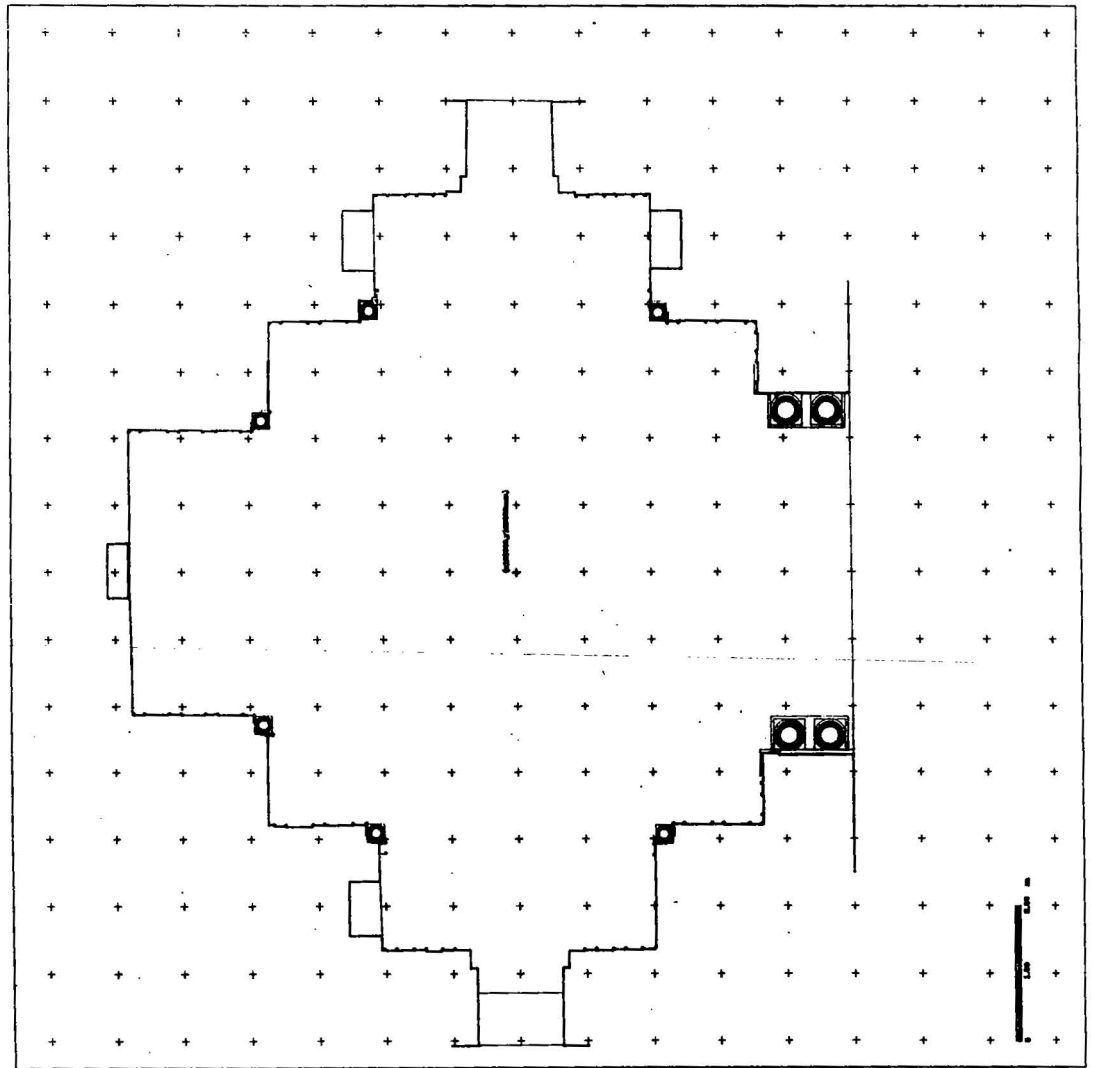


Fig.1
Zisa's Palace - The Hall of the Fountain. The planimetry, an horizontal digital section, has been punctually surveyed.

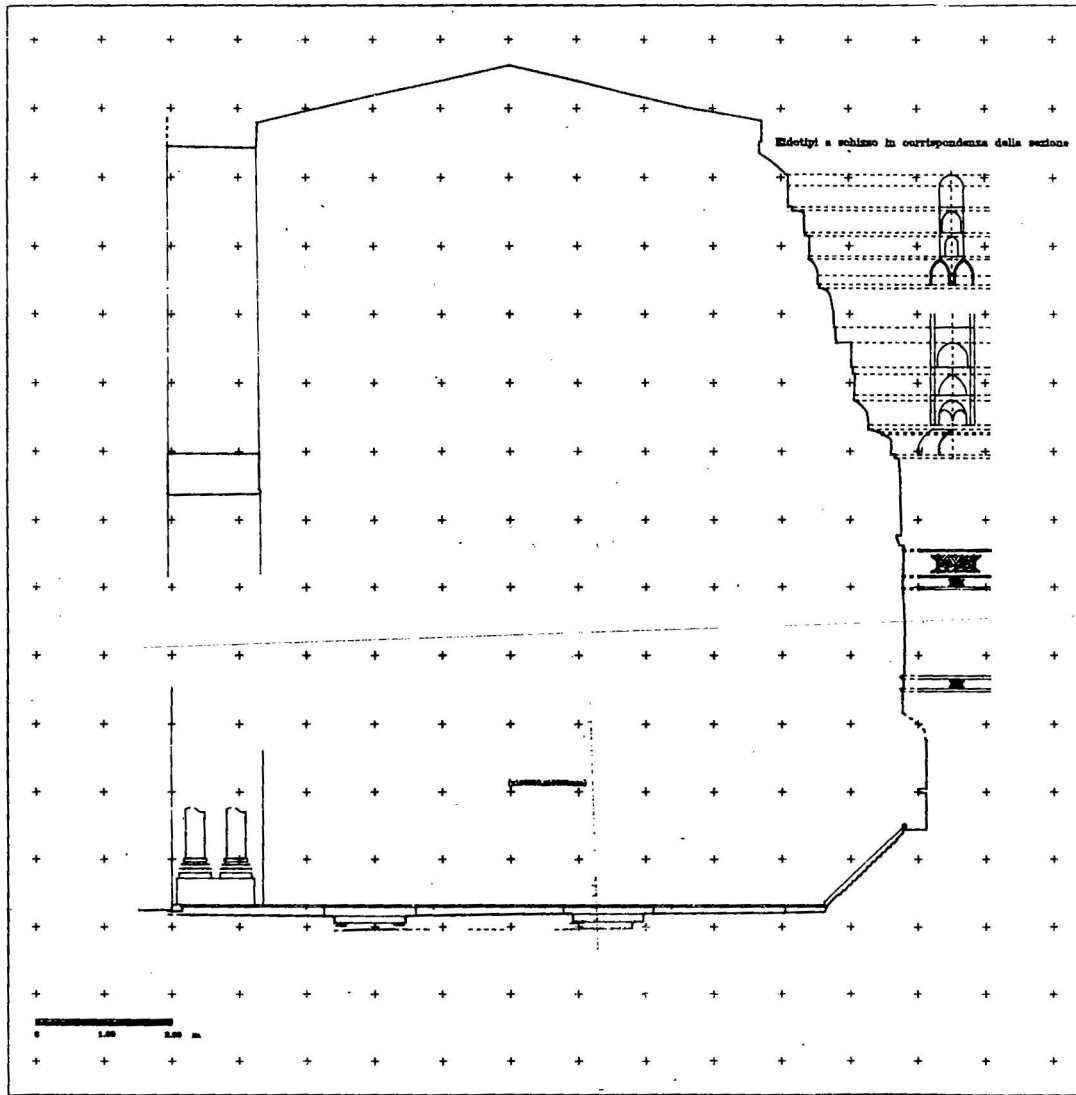


Fig.2
Zisa's Palace - Representation of the longitudinal section and drawing of 'eidotipi' through elementary model

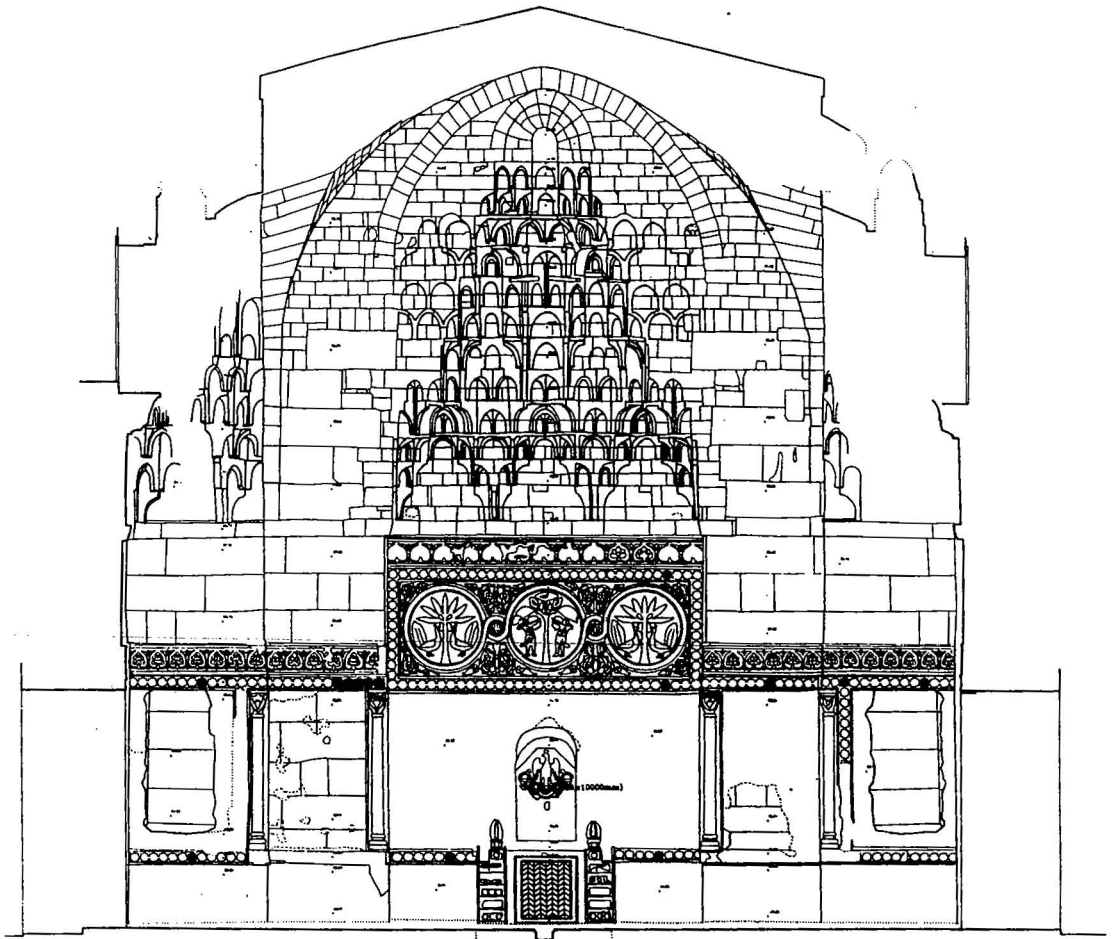


Fig.3
Zisa's Palace - The digital cross-section (transversal) has been mutually integrated with the stereoplotting of the front of the fountain.

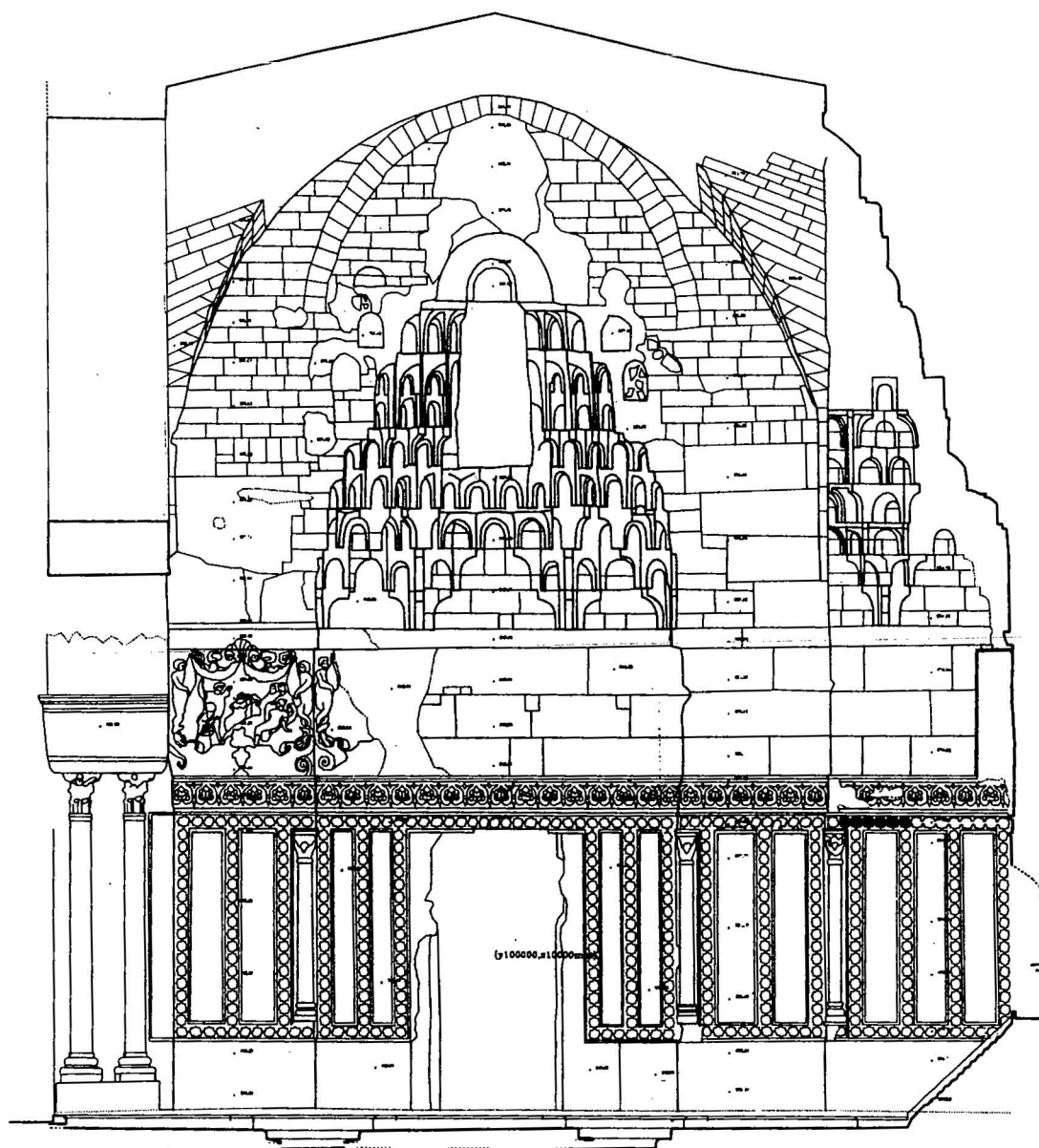


Fig.4
Integration of the other cross-section (longitudinal) with its own front

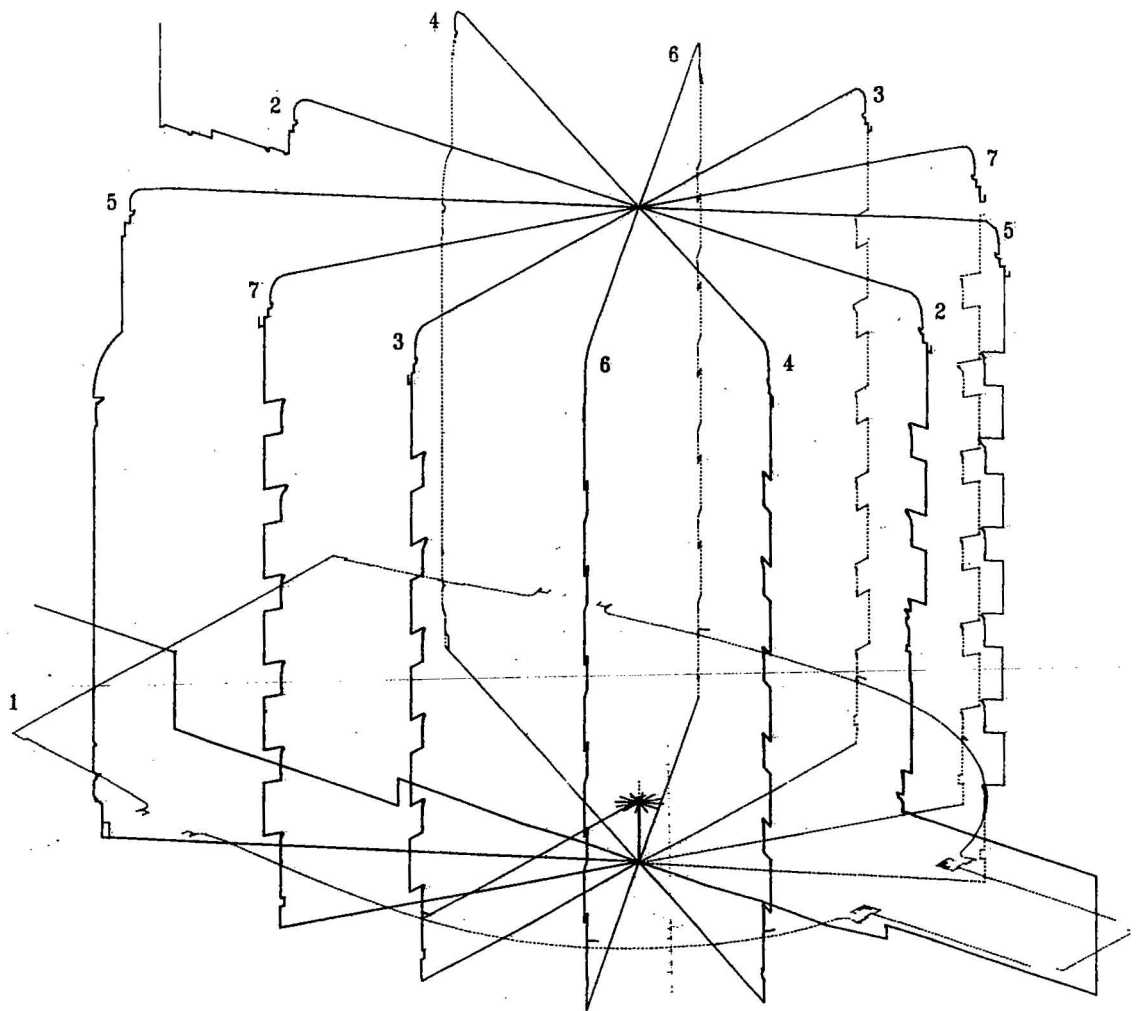


Fig.5
Teatro Massimo (Palermo) - Threedimensional model and
spatial placement of the radial sections with the
planimetric one.

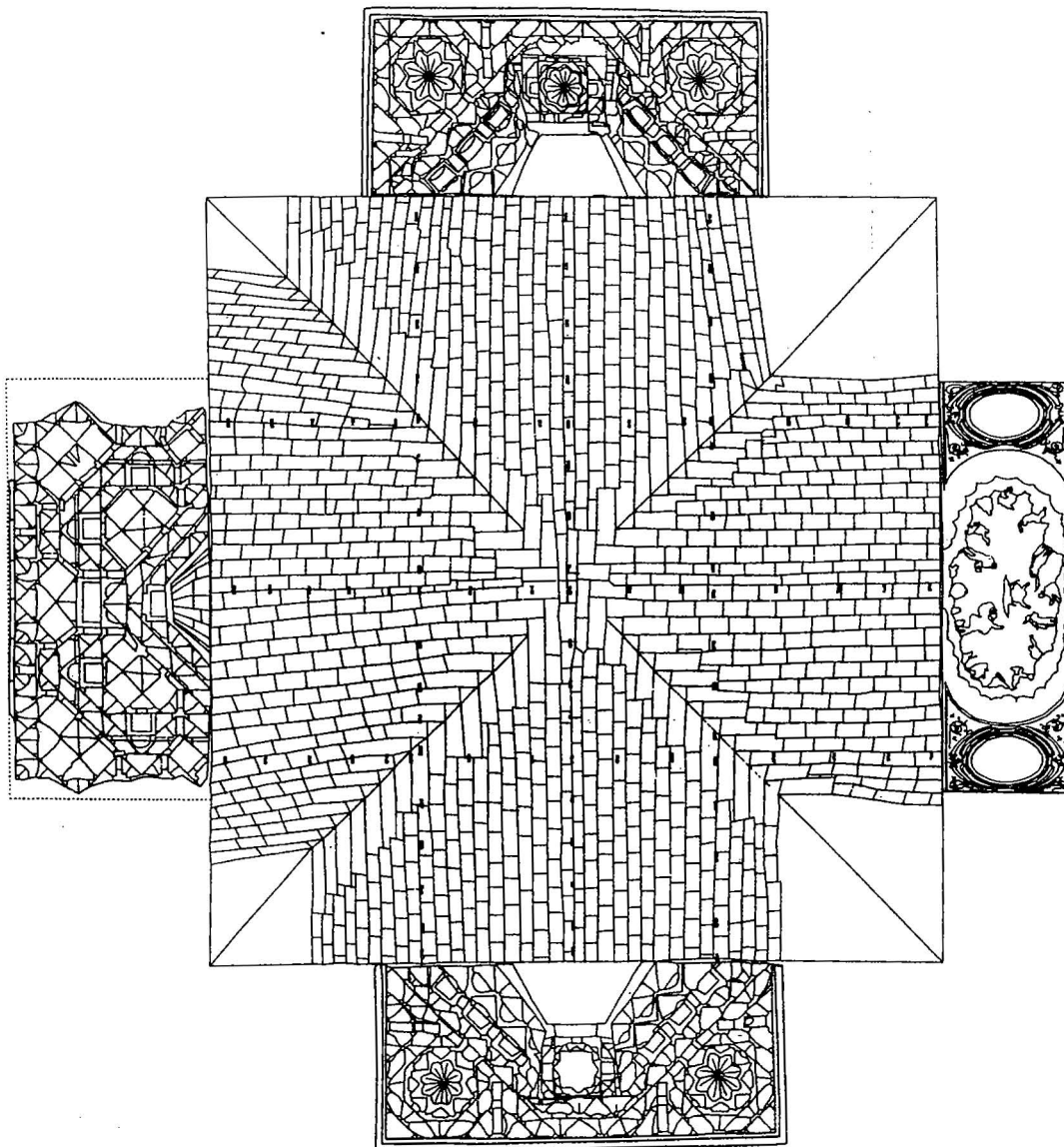


Fig.6

The stereoplotted of the complex covering structures with muqarnas in the hall of the Fountain. This kind of representation isn't enough exhaustive to describe its own geometry

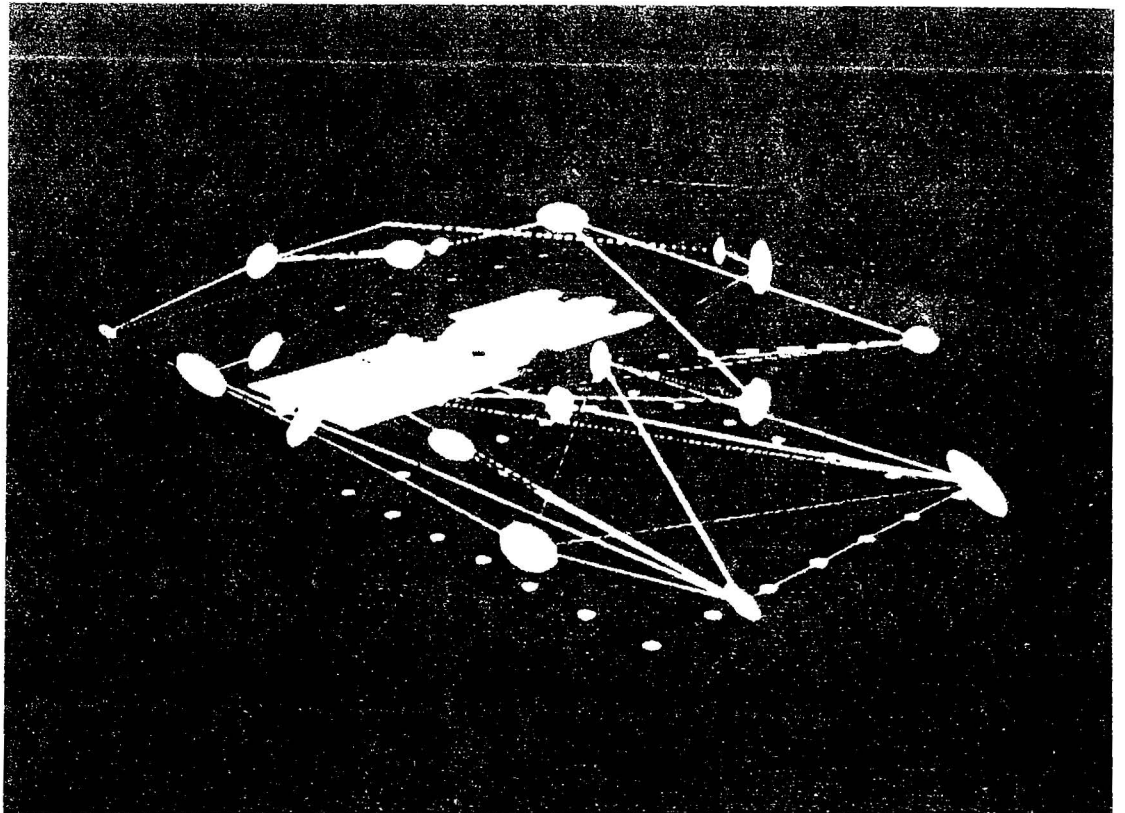


Fig.7
The Palatina Chapel - A perspective representation of the tridimensional topographic network with the ellipsoids and its own solid model.

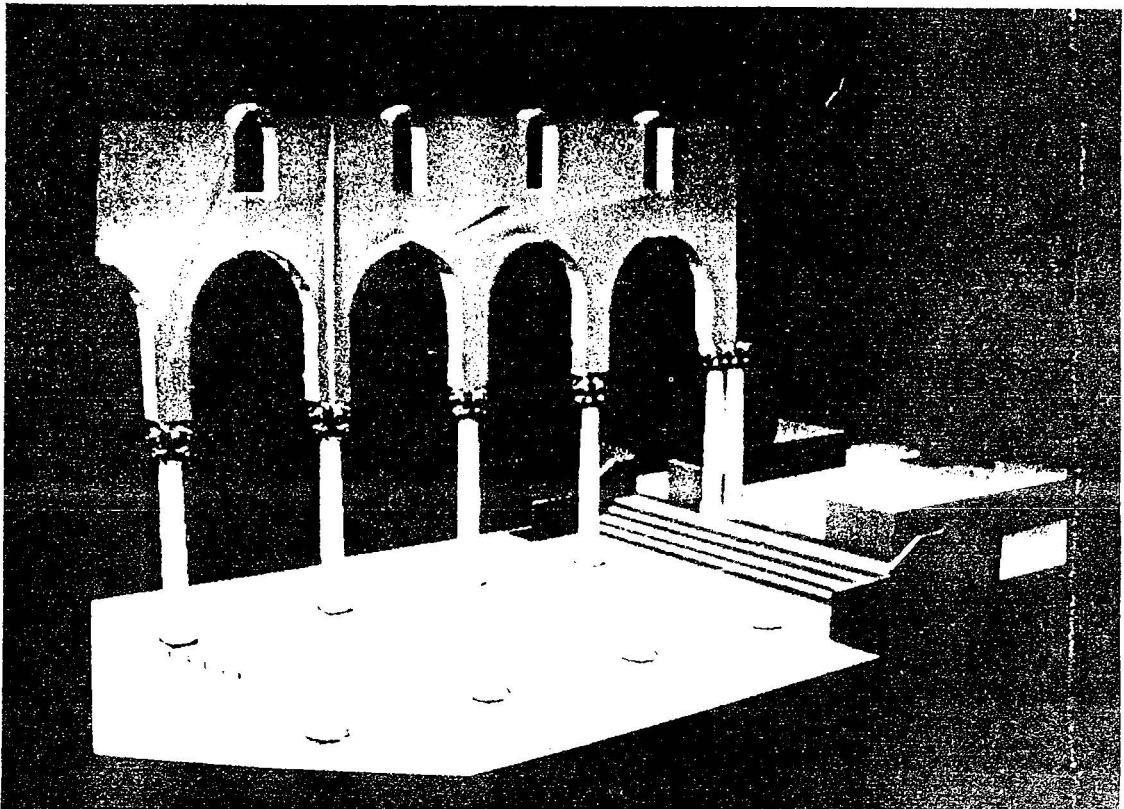
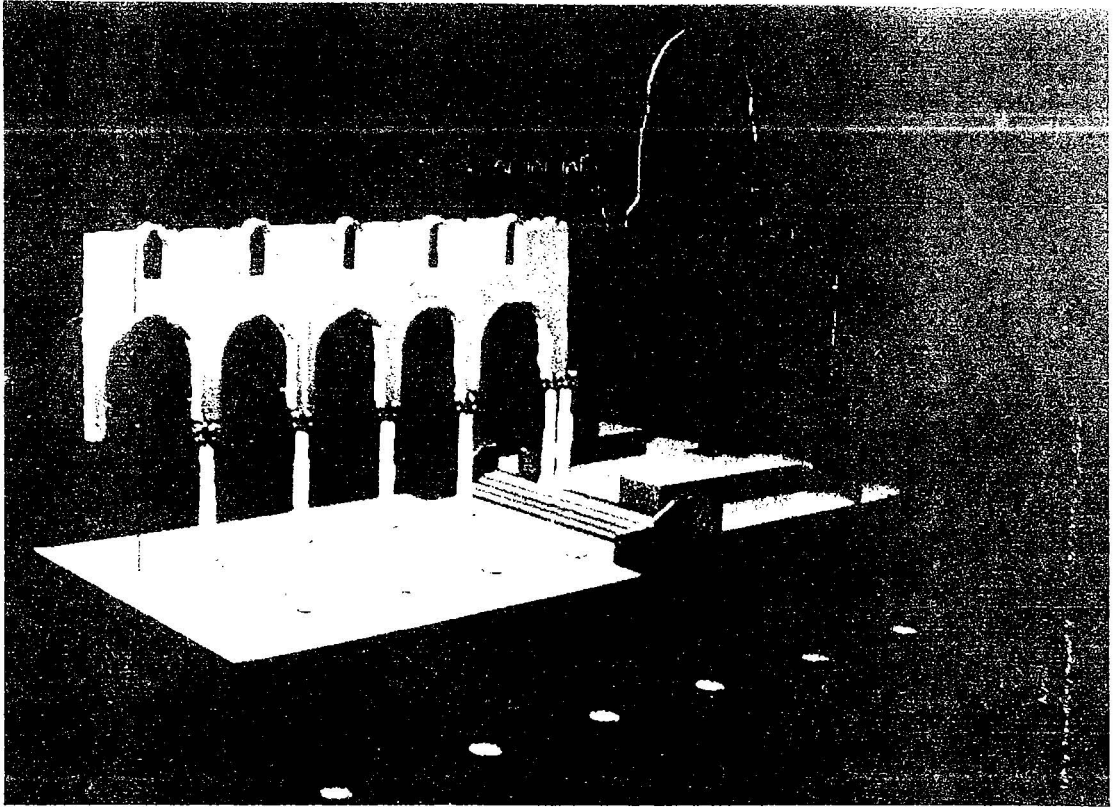


Fig.8

The Palatina Chapel - An example of spatial placement, in only one datum system, of different kinds of representation, solid modelling and digital sections of the intrados, in a graph-numerical data bank to adjourn progressively.

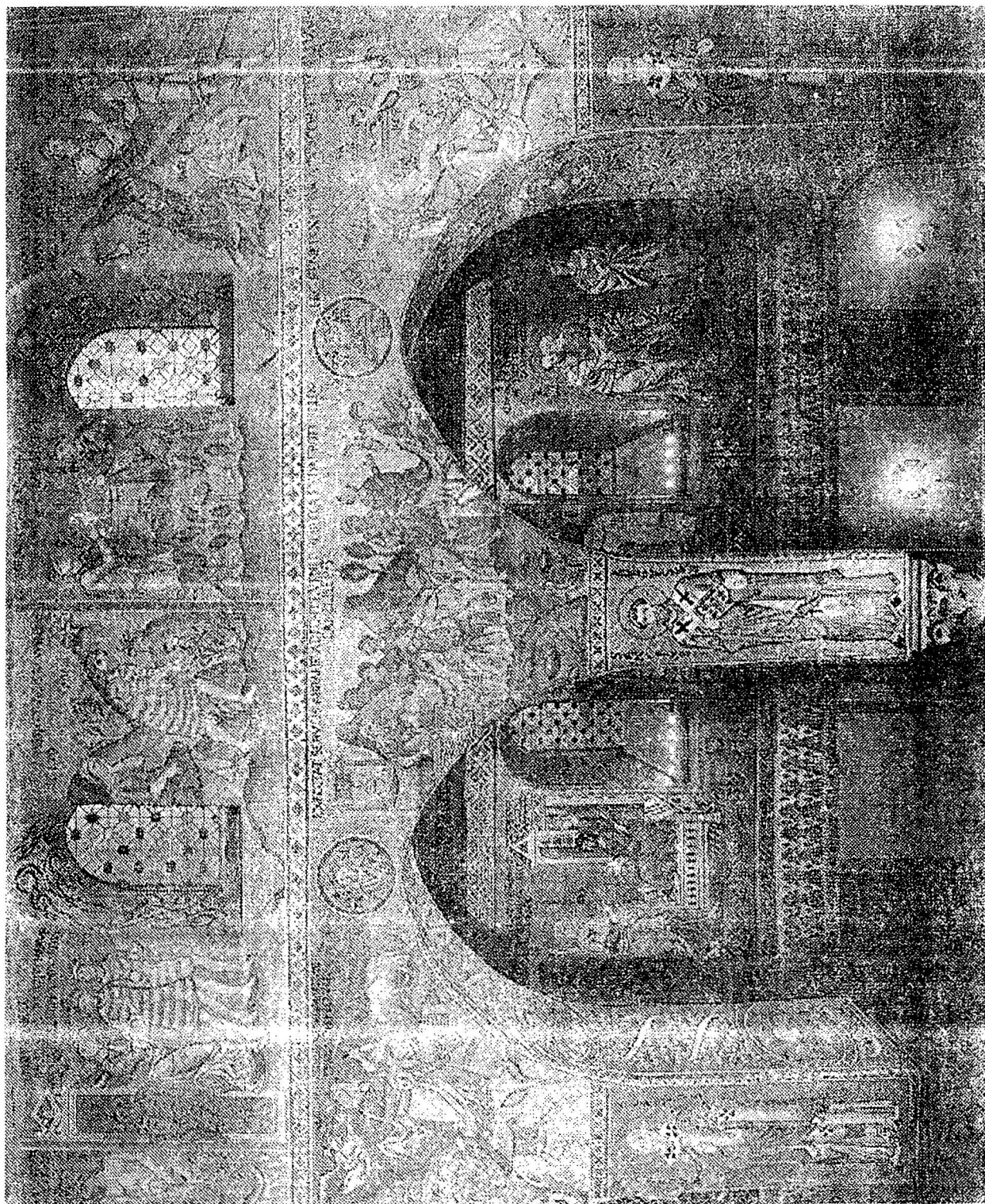


Fig.9
The Palatina Chapel - An image of the photogrammetric data bank acquired by high resolution scanner and printed on paper. Mutual integration of this image with its own digital section is possible too.