

ST. MARCUS' BASILICA IN VENICE. AN APPLY OF IMAGE PROJECTION ON A DOME

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ABSTRACT

This research is part of a wider study involving different interlocutors and disciplines for the project of the conservation of St.Marcus' Basilica. Particularly this contribution is a part of a larger program of computerization that begun with the project of survey of the Basilica. In its latest phase the research has studied the possibility and has evaluated the potential of the image projection technique. Thus the present test is an illustrative work focusing on the study of the Basilica's domes. First it has been tested the chance to project the images of the mosaical domes on the digital terrain in a threedimensional space. The research presents a theoretical contribution about the relationship between the survey process and the conservation one, in their most advanced teorical and scientific acquisition. The attention to the conservation and the theorization of the conservation in the protection of the monuments, make possible a redefinition of the role of survey. Its traditional meaning is expanded and placed in a close and not easy relationship with the disciplines that are present in the process. The study of the images, considered as primary vehicles of knowledge and of signs, makes necessary to coordinate and to decode them, to join the images to the shape and geometry of the building. These last particulars remain one of the main purposes of the survey. This paper is tightly connected with the paper presented at this congress by R.Brumana and G.Vassena with the title 'St.Marcus' Basilica in Venice: analysis of digital images projection', because they belong to the same research.

Keywords: architectural, image interpretation, raster, 3-D, projection



FIG.1 - GRAPHIC RESTITUTION WITH LINES OF THE CENTRAL DOME OF THE 'ASCENSIONE' IN THE ST. MARCUS' BASILICA IN VENICE.

INTRODUCTION

In 1982 the Procuratoria di San Marco, in the person of Proto arch. Ettore Vio, decided to start a systematic and scientific (Brumana R., Galeazzo G., Monti C., Vio E., 1989) survey of all the St. Marcus' buildings. This work was intended to support the work of continuous maintenance and restoration made by the technicians and workers of the Procuratoria, but the final purpose was to achieve the possibility to build up a "complete text of knowledge about each single part of the Basilica. These informations must be recorded on electronic support, so to obtain horizontal sections of the history of the monument in a well specified year or period, and in a diachrony way for each single part with a correct mosaic of photograms in the finale phase of representation".

In such archives all the data collected in former times (as images, texts, graphics, chemical-physical analysis, test on materials....) are organized in a structure suited not only for the registration, but for the systematics and comparative research of data. The finality is a rigorous control of the different phenomena concerning the Basilica, a study of the main historical and architectural characteristics and to give an operative support for the works of restoration or for the usual managerial routine (Galeazzo G., 1988). Such computerized archives are growing up in parallel with the project of research regarding the preliminary

investigation of the static behaviour and the state of conservation of the bearing walls of the St. Marcus Basilica.

The here presented work of research has been made possible by the collaboration of the Procuratoria di San Marco and the Dep. of I.I.A.R. of the Politecnico of Milano in occasion of the celebrations of the millennium of foundation of the San Marco Basilica (1994).

The photogrammetric takens and the restitutions are made by G.E.O.S.I.G.M.A.

It is without any doubt that this research acquire a great value also in the sphere of the computerization of the registration. The need to make good archives is of fundamental importance in the administration of the enormous architectural and artistic richness of our country.

1 - THE THEORY OF CONSERVATION AND THE REDEFINITION OF THE RULE OF THE SURVEY: TOWARDS A REDEFINITION OF THE MEANING.

The contribution of the conservative approach to the theory of the restoration and, therefore of the monument conservation is to be considered quite new, if we consider that the architecture and everything of what is built has always been an object of transformation; it is only with the birth of the historiography in the XIX that such attention has taken a form characterized by a growth of conscience about the object of restoration and the concept of restoration. In those years we saw the birth of a new discipline of the restoration that gave life to different interpretation (from the critical restoration of idealist origin to the philological one of positivist origin). The point of view of the approach at the monument is, in the last fifty years, quite changed, cause of the modern philosophical and historical disciplines. These ones have claimed the materiality of the building revaluting its materic culture and have refused the big

1.1 THE SYNTHESIS MADE BY THE SURVEY AND BY REPRESENTATION

To the survey are so asked non predefinite synthesis and this let us see an aspect that can seem to be contradictory: the deviance from the norm becomes the rule with which the object of the analysis can be read. The analysis is extended in the meanders of the building and the cognitive analysis is the point of departure of the intervention and this must be joined with the contribution of the other historical, scientific, physical disciplines...

The panorama becomes bigger also in function of the technical-scientific progress that grows up inside each of these disciplines.

The number of relationships increases towards the infinite; on the other hand we can say that much more is the level of knowledge, much more is the possibility to reduce in a responsible way the intervent to a "minimum" absolutely necessary.

For this reason a synthesis is needed, that has the difficult task to make possible the field of intervention using of these elements and that will never be exhaustive.

The survey becomes the privileged place of this synthesis (Brumana R., Crippa B., Vassena G., 1990). From the traditional meaning of survey as a group of symbols and marks, partially already decoded, during the act of surveying and during the real representation; from the meaning of survey as transposition and translation on a drawing of the measurements to obtain the shape and the geometry; we arrive to a bigger interpretation where the survey is the location of marks still to be decoded and where can be added new contributions cognitive as a big collecting pot (as a catalogation following historical, artistic and geographic attributes).

A second aspect regards the drawing, that is the representation: the drawing with lines, even if it comes from different methodologies of survey, synthesizes only some aspects. For this reason the

philosophical and ideological systems that have an univocal and restrictive interpretation of the modality of intervention: the relativity between the points of view is placed at the centre of our attention. In this way are recognized all the values, relationships and interpretations that can result from the texture of the building. All this represents the best and inalienable centre for the communication, the reading and the transmission of that small, but unreproducible piece of history 'tranche de vie': so every removal is a loss of informations, of documentation and of culture.

The revaluation of the material aspect extends the object of conservation not only at the emergency period, the monument in its nineteenth-century conception, but the notion of good as an unreproducible resource.

From these theoretic preambles and from these considerations derive two elements. On one hand we have the redefinition of the purposes inherent to the intervention of conservation that for this reason involves all the disciplines here afferent and on the other hand the growth of the effort of catalogation.

The role of those disciplines which, from the technical and operative point of view intervene in the conservative process becomes redefined and more clear (Matteini M., Moles A., 1984): first of all the importance of the interdisciplinary character that means to have a contribution of different disciplines that help to the knowledge and to the individuation of the methodology of working. The centralness of the object, the consciousness of its uniqueness make possible that cannot be accepted rules of interpretation fixed in advance. The different disciplines care this aspect, renewing the relationship with the technics, the instruments and the methodologies themselves. In this scenery comes out, in the top, the survey.

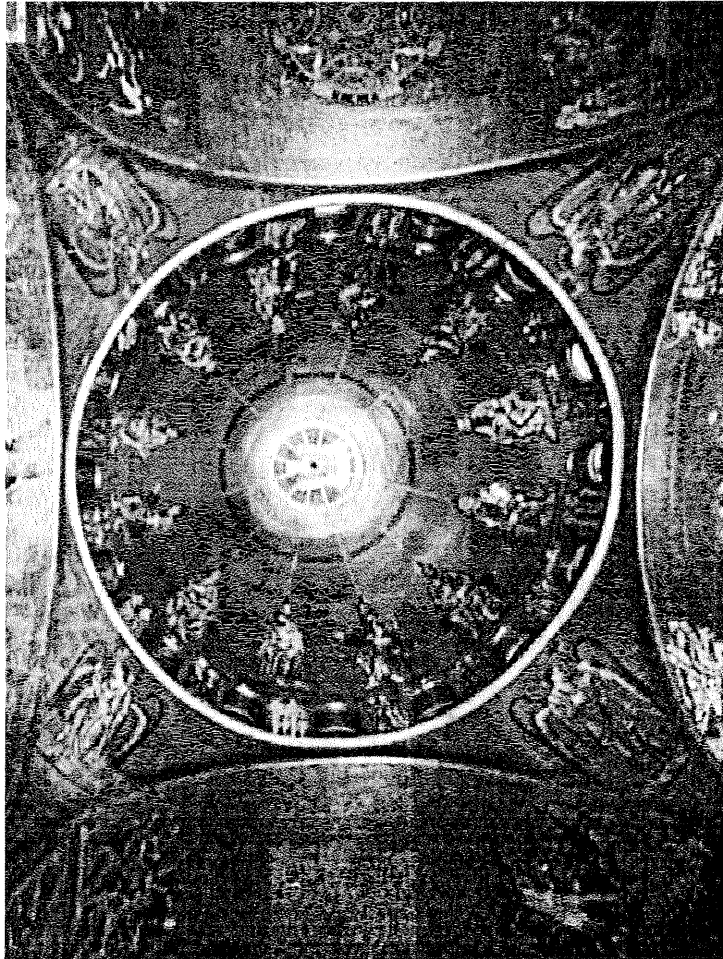


FIG.2 - THE ASCENSIONE'S DOME IN THE ST. MARCUS BASILICA.
DIGITAL IMAGE OF PHOTOGRAMMETRIC TAKENS HAS BEEN ACQUIRED
WITH SCANNER.

restitution of the iconographic repertory, of which our monuments are very rich, gives us a lot of drawings so beautiful as, for certain reasons, useless (Fig.1). The synthesis in this case is sclerosed because it loses important signs. In this way we are bounded to run again through the phase of data collection or to go back to the object: the photography results to be a privileged vehicle, if some well defined condition are respected, of infinite signs that, only in a second phase will be decoded and analyzed. Also the photography permits a natural synthesis, and than the digital photo (Fig.2).

This is more meaningful if we think to the incredible richness of the iconographic and decorative patrimony that establishes a new object of research. With these studies now we have the need to transmit the material and formal informations, of which the building is the most important support. The static-structural stability is the "condicio sine qua non" to the maintenance of these painted and mosaic surfaces.

We remember the floor of St.Marcus, where the knowledge of the geometry characterized by an undulating trend, caused by structural movements, is strictly correlated to the mosaical covering and to the knowledge of the state of deterioration visible on the parts of the floor decorated with scenes or with geometric drawings.

Therefore it is not possible a clear division between the structure (Brumana R., Crippa B., Vassena G., 1990) and its surface, more or less formalized. Infact the figure becomes an index of the condition of the structure. Therefore these are new signs that can be added to those ones contained in the shapes in whom the surfaces are visible.

There is so the need of a systematic basin of varied informations, numbers, drawings. To them are added indexes of evaluation of the state of conservation, analysis and interventions.

The process of computerization has open even in this branch a lot of possibilities, from the control of the traditional drawing to the research in the field of digital images.

The electronic archives are different: those ones that collected in a vectorial form the various restitutions made with lines, the drawings already realized and only later the drawings acquired on an informatic support; those ones that collect the photographic images in a raster format (digital images) (Fig.2).

Now we are studying the positioning and the use of the images in the geometric three-dimensional space of the architectural building.

2 - THREE-DIMENSIONAL SURFACES AND DIGITAL IMAGES

The planning of the research of the cataloguing and of the administration of the images on one hand, and of the representation of three-dimensional surfaces, essential support to the projection, on the other hand, proceed together.

For the representation of the surfaces, we are looking for the possibility to arrive at a semiautomatic or guided process for the generation of surfaces with DTM. In architecture the surfaces are usually discontinuous. This characteristic is a big handicap for the automation that is usually working, with some exceptions, to the terrestrial ground considered as a continuous surface that grows up in the direction of the third dimension. The architecture is also characterized by some "hidden points". For this reason there is the need to change the points of taken and of restitution, in the way to make visible those hidden parts.

Let us think to a complex structure like a church. From this point of view some different applications have already been done (Brumana R., Crippa B., Vassena G., 1990) but it is interesting to point out an interesting experience.

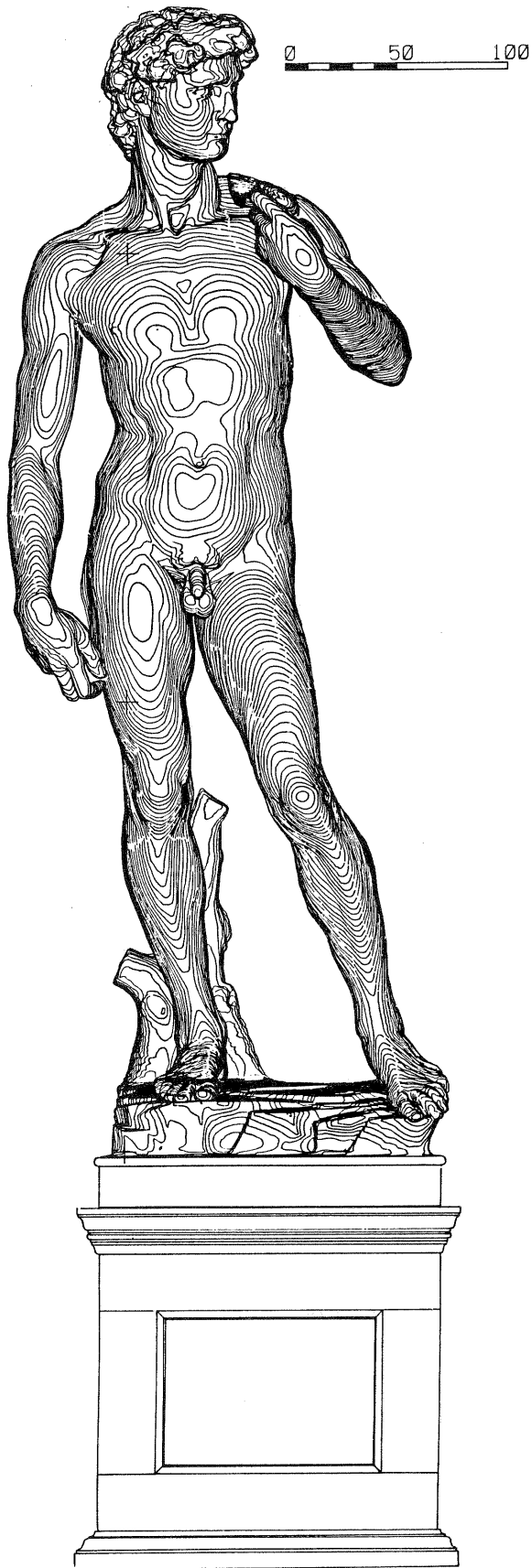
2.1 AN EXPERIENCE ON A SCULPTURE: THE DAVID

We are speaking of the "David", the "Gigante" as was suddenly called the work of Michelangelo that was begun on the 1501.

The metric surveys were made using of the technic of close range photogrammetry obtaining the realization of the traditional graphic restitution and numerical one with lines or contour lines. Such restitutions allow to associate directly into the computer the observation already given by the restorers through visual analysis and those ones given by the diagnostic analysis, in the way to obtain some specific thematic maps.

Then using of the total photographic covering of the statue obtained with the photograms, we arrived at the acquisition of three-dimensional coordinates of points and of lines of discontinuity using an analytical stereoplotter. Therefore a special data processing, still in a testing phase, for the evaluation and the manipulation of the three-dimensional solid models permitted the definition of a direct representation of the statue (Fig.3).

BRACCIO DESTRO



VISTA ANTERIORE

VISTA LATERALE

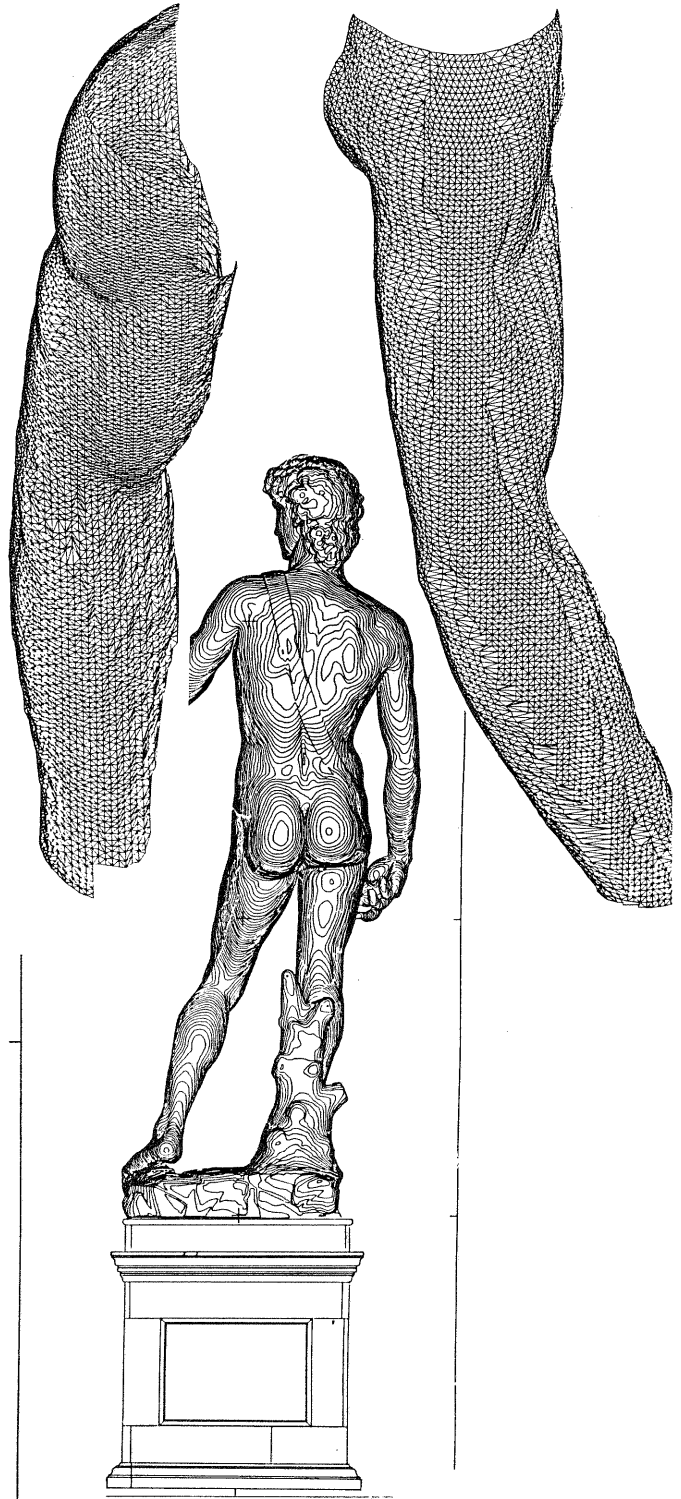


FIG.3 - MICHELANGELO: DAVID (Florence). TRADITIONAL RESTITUTION WITH CONTOUR LINES OF THE SCULPTURE ON THE TWO FRONTAL VIEWS.
3D MODEL OF THE RIGHT ARM DIRECTLY AND AUTOMATICALLY OBTAINED FROM THE RESTITUTION. HERE ARE PRESENTED THE FRONT AND THE LATERAL VIEWS OF THE ARM.

2.2 THE IMAGES OF THE BASILICAL DOMES

If the David is located in the branch of research of the 3-D representation, the images branch is studied in the St. Marcus domes. In particular in the applications of the Spirito Santo's (Pentecoste) (Fig.2) and Ascensione's domes the corresponding DTM has followed the methodology before indicated.

We are working with a geometric surface not plane, but easily trasformable to a semispheric spatial shape, without hidden points and discontinuities; it's the DTM of the dome (Fig.4).

Unfortunately the times of intervention on a monument open to the public, with 4000 visitors every day, make every operation always very long and, for this reason, we are still in a qualitative phase of individualization of the methodological process illustrated in the associated paper (Brumana R., Vassena G. "St.Marcus' Basilica in Venice. Analysis of digital images projection").

The projection of an image on its belonging surface has, as a consequence the overcoming of the conception of bidimensionality of the image.

It happens a convergence between the disciplinary approach of the conservative intervention on the surfaces and the disciplinary approach on the survey itself.

In fact a relation more and more closer with the third dimension appears. It

creates a new bridge between two worlds that, in the history of the restoration, had follow different assumptions and operative choise. The first one of the structures and the second of the surfaces, decorated, plasted, with mosaic...., that too often has been reduced to the images. Infact often the matter, which introduced a great cultural thickness, also physically, is negleted (Fig.5).

This research has been developed using of Fondi MURST 40% 1990/1991

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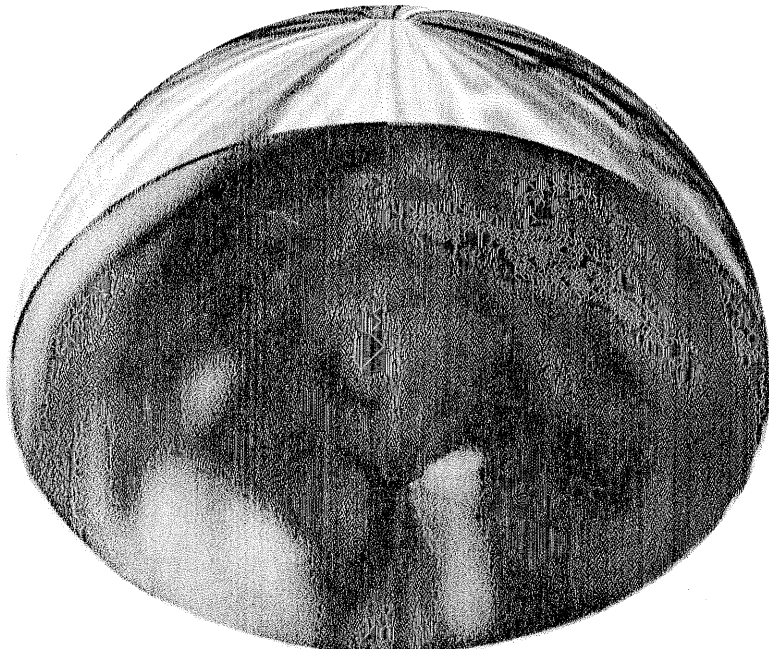


FIG.4 THE DOME OF ASCENSIONE. ST. MARCUS' BASILICA. THREE-DIMENSIONAL ELABORATION OF THE PHOTOGRAMMETRIC RESTITUTION: THE DIGITAL MODEL HAS BEEN TREATED WITH SOLID MODELLING AND SMOOTHING OF THE ELEMENTARY SURFACES.

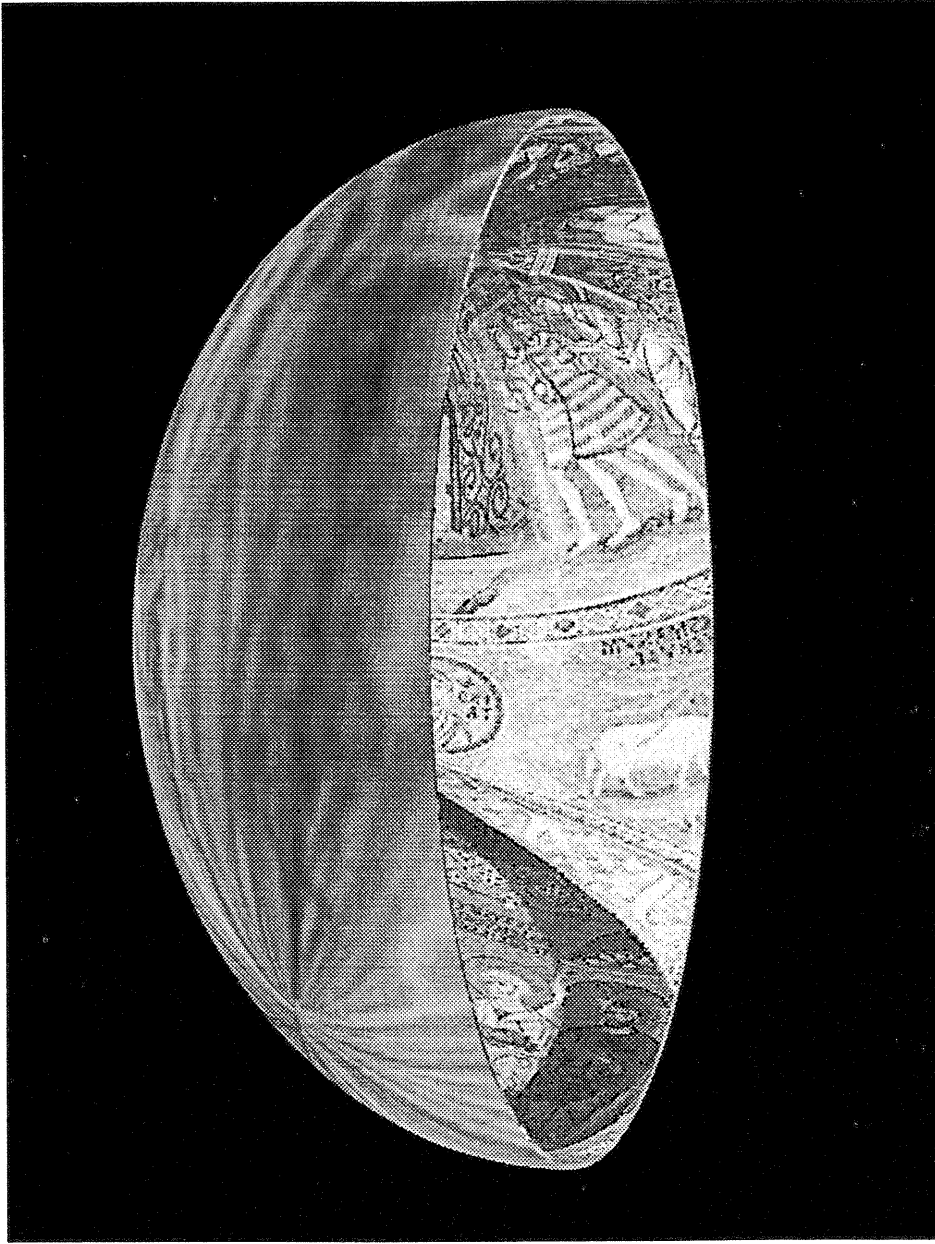


FIG. 5 - SPIRITO SANTO'S DOME IN THE ST. MARCUS' BASILICA. THE MOSAICS ARE PROJECTED ON THE INTRADOS OF THE DOME. THE BEGINNING OF THE RESEARCH: THE IMAGE OF THE DOME IS PROJECTED ON ITS OWN SEMISPHERIC 3D SURFACE. THE RESULT IS PRINTED WITH LASER POSCRIPT. THE PRINCIPLE OF THIS PROCESS IS TO MEMORIZE A GREAT NUMBER OF PHOTOS AND IMAGES AND TO PROJECT THEM ON THEIR OWN PROJECTIVE HOMOLOGY BETWEEN ONE POINT ON THE IMAGE AND ITS CORRESPONDING ON THE 3D MODEL.