VSMM 2008

Digital Heritage

Proceedings of the 14th International Conference on Virtual Systems and Multimedia

Project Papers

20–25 October 2008
Limassol, Cyprus

M. Ioannides, A. Addison, A. Georgopoulos, L. Kalisperis (Editors)

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Cover image: The young woman here is holding a measuring stick for a Roman foot and is labeled as KTICIC, short for the Founding Spirit or the Creation. The mosaic can be seen in the Eustolios House, in the ancient Greco Roman city of Kourion in Cyprus that was destroyed by an earthquake in 365 AD. Photo: M. J. Ioannides.

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This volume contains the Project Papers presented at VSMM 2008, the 14th International Conference on Virtual Systems and Multimedia which took place on the 20 to 25 October 2008 in Limassol, Cyprus. The conference title was "Digital Heritage: Our Hi-tech-STORY for the Future, Technologies to Document, Preserve, Communicate and Prevent the Destruction of our Fragile Cultural Heritage".

The conference was jointly organized by CIPA, the International ICOMOS Committee on Heritage Documentation and the Cyprus Institute. It also hosted the 38th CIPA Workshop dedicated on e-Documentation and Standardization in Cultural Heritage and the second Euro-Med Conference on IT in Cultural Heritage. Through the Cyprus Institute, VSMM 2008 received the support of the Government of Cyprus and the European Commission and it was held under the Patronage of H. E. the President of the Republic of Cyprus.

Foreword

These conference proceedings contain a selection of papers that focus on multi-disciplinary research involving both Cultural Heritage (CH) Informatics and also the use of technology for initial data-capture and digitization, information data-processing, reconstruction, modelling, visualization, documentation and archiving, as well as visualisation of results and dissemination to the scientific and cultural-heritage communities and to the public. The contributions in these proceedings will definitely assist all experts involved in Cultural Digital Heritage in restoring, renovating, protecting, documenting, archiving, and monitoring history and prehistory, to secure this information for years to come. It is clear that a worldwide collaboration in this area will help make the past accessible to the present and the future.

Cultural Heritage is being transformed by the nature of digital representation of culture in which production, documentation, and distribution of an artefact are one and the same. Understanding and defining digital cultural heritage has implications for documentation practices and the experience of cultural institutions.

Digital devices provide unique access to archives and cultural exhibits, enhancing the capacity of museums and collections to encourage community building and civic engagement. Collection databases once used solely by museum professionals are now being made available locally and globally through the Web. Increasingly, access to cultural heritage is digital and experienced through electronic images and facsimiles. Digital tools and information and communication technologies are merging as the basis for preserving cultural heritage. Digital 3D modeling provides precise and complete documentation of cultural heritage objects and sites and should be used in conjunction with traditional techniques. Of great interest to the scientific community in the last few years, especially in the areas of architecture and preservation, are 3-D modeling, visualization and animation of cultural-heritage monuments and sites. The cooperation between photogrammetry and computer graphics has led to the development of new tools and techniques that are particularly useful for the documentation and archiving of cultural heritage in a digital format. These new tools and techniques include not only photogrammetry, but also 3-D reconstruction, visualization, animation and virtual reality. Technical achievements in modeling, rendering, and animation have made possible the creation of virtual environments, providing a convincing visual experience of cultural heritage structures and sites.

The island of Cyprus is a particularly appropriate venue for a conference on Virtual Systems and Multimedia dedicated to CH because of the long and rich pre-history and history of the island. The historical and archaeological context of Cyprus is the physical and ideal setting of this conference. The past story of Cyprus is the history of the interaction of the cultures and peoples of the lands surrounding the Mediterranean Sea, which was the central means of communication, transport, trade and cultural exchange between diverse peoples. Its history is important to understanding the origin and development of the Mesopotamian, Egyptian, Persian, Phoenician, Jewish, Greek, Roman, Arab and Ottoman cultures and, hence, is important to understanding the development of Western civilization as we understand and experience it today.

The roots of cultures and civilizations are embodied in their architectural structures and archaeological sites, and this cultural heritage should be preserved for future generations. The importance of preservation can be seen in the efforts of international organizations to document important structures and sites. UNESCO and ICOMOS have called for all national and international organizations that are responsible for manmade monuments to document cultural-heritage objects and sites with methods that include traditional and newer, innovative technologies. The integration of these technologies offers great promise and the use of digital technology in particular has rapidly changed documentation techniques.

The importance of Digital Cultural Heritage is evident by the participation and cooperation of a large number of people and organizations including the following:

- The 14th International Conference on Virtual Systems and Multimedia VSMM 2008, dedicated on Digital Heritage (http://www.vsmm.net/)
- The 38th CIPA International Workshop dedicated on e-Documentation and Standardization in Cultural Heritage (http://cipa.icomos.org)
- The 2nd Euro-Med Conference on IT in Cultural Heritage.

We extend our thanks to all those, whose labour, financial support, and encouragement made this joint event possible. The International Program Committee, whose members represent a cross-section of Archaeology, Computer Graphics and Design, Architecture, Surveying, History and Engineering worked tenaciously and finished their work on time.

Especially Mr. Nikolas Valerkos, who designed and managed the webpage and Dr Andreas Lanitis who supervised the web-based submission system and guided the effort that published these proceedings. We would like also to express our gratitude to our co-organizers The Cyprus Institute, the Department of Antiquities in Cyprus and the Technological University of Cyprus. Finally, our institutional sponsors, the Ministry of Education and Culture, the University of Cyprus; and our official carrier, Cyprus Airways who provided money and 'gifts of kind' that made the conference possible.

Our Keynote Speakers, Javier Hernandez-Ros, European Commission, John Van Oudenaren, World Digital Library, *Library of Congress*, Massimo Negri, Europeana and European Museum Forum; Prof. Donna J. Cox, *University of Illinois at Urbana-Champaign;* Vassilios Tsingas, Elliniki Photogrammetriki Ltd; Kareem M. Darwish and Ahmed El-Shimi, *Cairo Microsoft Innovation Center,* are not only experts in their fields but also visionaries for the future of IT in CH. They promote the e-documentation of the past in such a way for its preservation for the generations to come.

Most of all we would like to thank the Cyprus Government, the European Commission, UNESCO WHC, ISPRS, ICOMOS, VSMM-Society and CIPA, that entrusted us with the task of organizing and undertaking this unique event and wish all participants an interesting and fruitful experience.

Marinos, Alonzo, Andreas, Loukas
Limassol, Cyprus 2008

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SYSTEMISATION OF KNOWLEDGE FOR THE CONSERVATION AND CULTURAL DEVELOPMENT OF PIEDMONT'S MOSAIC HERITAGE.

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KEY WORDS: Mosaic heritage, Testimony, Cataloguing resources, Standardisation, Metadata

ABSTRACT:

Mosaics, in all their possible variants of form, material and location, can and must be recognised within the definition of Architectural Heritage. A further examination also reveals that mosaics are fully included within the definition of Cultural Heritage and, so, constitute part of the CH of a territorial area. In the absence of specific regulations, studies have been carried out in relation to source data and scheduling instruments at national and regional level with a view to devising a schedule model specifically for the mosaic, so that it is no longer regarded as an archaeological finding in its own right, but as a systematic element. These have been compared with other local situations, in Italy and abroad, which need unambiguous parameters for standardisation. These operations pass unavoidably through the identification of parameters, metadata, final users and methods through which the project could be developed in the future. Of no small importance is the diversified input of specific and inter-disciplinary skills, which are necessary for a correct cataloguing of resources; that means determining the obligatory fields and structuring the various headings, devising also appropriate key words. The cataloguing procedure is fundamental in the process for an effective cultural development of Piedmont's mosaic heritage. More precisely, it becomes an element in a structure for multi-level querying of the Territorial Information System, devised in particular for visualising data relating to files on interactive support, but also for a web-GIS configuration.

1. GENERAL INTRODUCTION

Mosaics, in all their possible variants of form, material and location, can and must be recognised within the definition of Architectural Heritage, which is defined as "all buildings and structures of conspicuous historical, archaeological, artistic, scientific, social or technical interest, including their fixtures or fittings" (Granada Convention1985, Art 1 (1)). If this definition is accepted, it follows that the mosaic is included as a fixture or fitting forming part of a building, within the category of architectural heritage. In addition, on further examination, mosaics are fully included within the definition of Cultural Heritage, which means "property and objects of artistic, historical, archaeological and demo-ethno-anthropological interest" (Consolidated Text, point 1, section 1, article 2 (1)) and, as such, constitute part of the Cultural Heritage of a territorial area.

The project for the *Systemisation of knowledge for the conservation and cultural development of Piedmont's mosaic heritage* has been created by an inter-disciplinary research group from Turin Polytechnic*, which, for various reasons, has looked at the Piedmont region as a possible field for application. The contribution of a number of sectors has increased the possibilities for analysis and varied the value, nature and quality of the results in a tangible way. In this project it has been sought to exploit the technological capacity of the TIS (Territorial Information System) in order to relate data of varying nature with a geographical representation.

It is our intention for an instrument so designed to be used as an open information system, capable of being continually updated and of guaranteeing a correct process for acquisition, organisation and sharing of documents which will lead to a widening of knowledge, as well as a greater protection and development of a complex phenomenon.

In this context, the Turin Polytechnic research group has sought to identify and promote programmes that focus upon this category of Cultural Heritage, through a systematic development of knowledge for the conservation of this resource, in both the material sense as well as in its value as testimony of a particular period of time. The mosaic is in fact closely linked with the architectural and territorial context in which it is found. Many of the mosaics examined** can be regarded today as true historical works of art, because they are

* Group formed for the purpose of studying the Piedmont territorial area which includes various scientific and disciplinary sectors covering representative areas as well as evaluation and development aspects, with the support of the institution to which they belong – headed by the Dean, Prof. Rocco Curto – and involving the collaboration of young academics who take part in the research activities, which are carried out in close contact with teaching staff.

In this respect, we wish to thank the Doctor of Research, Carlotta Fierro, and Historical Architect and Conservator, Michela Vycpalek.

** In this occasion, we have analyzed all the 65 mosaic's located in Piedmont (Italy) territory (in situ or in museums) in 8 district (Torino, Cuneo, Asti, Alessandria, Vercelli, Novara, Biella, Verbania).

now no longer to be found in the context in which they were designed and made and, even where they have been conserved and are accessible to the public, they are difficult to understand if they are removed from their original setting.
The mosaic is designed to fit in a specific architectural setting as you can see in the relationship between St. Mary Cathedral and its mosaics (following figure).

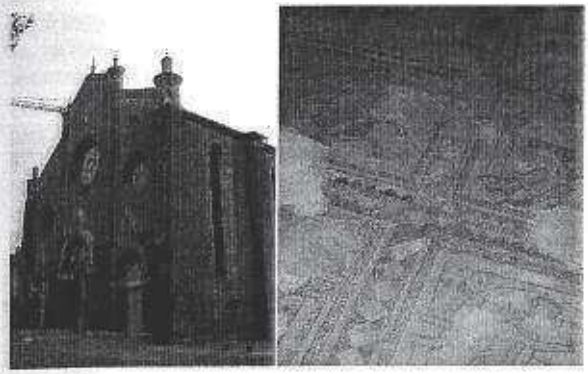

Figure 1: Mosaic in its context: St. Mary Cathedral's (Asti) mosaic floor representing the myth of Sanson

It follows that the first focus of research has been aimed at analysing the relationship between decoration and architecture, between Cultural Heritage and Architectural Heritage. Without this, it has no context and it therefore loses part of its significance. Having defined the objectives, this programme to understand mosaics in relation to their architectural surroundings envisages the acquisition, monitoring and management of information resources.
We focused on:

- gaining knowledge of state of the art of mosaic's documenting and scheduling;
- instruments for cataloguing Cultural Heritage/Mosaic Heritage (Torino, Piedmont, italian Regions, Europe);
- Database/DBMS/TIS (from Access to ArcView through the evaluation of Open Source) for the development programmes of sustainable tourism;
- Mosaic as an instrument for the *creation of value*.

These consist of various kinds of material which we decided to organize, initially, through the creation of a database and, subsequently, to link it to the relevant surveying system which enables it to be georeferenced.

2. SYSTEMISATION OF KNOWLEDGE OF THE MOSAIC AS A CULTURAL RESOURCE

In order to manage complex information systems, documentary data and pictures, it is important to choose an appropriate archive instrument which is flexible and capable not only of collecting information but above all of monitoring it and making it accessible. The disorganised, casual accumulation of data, aimed at amassing the largest quantity of information, becomes an end in itself. When data and information are stratified without structuring the acquisition according to unambiguous parameters and according to closed fields of compilation – which limit the subjectivity of the compiler in order to encourage the objectivity of the analysis – there is a risk of losing logical links connecting together the various pieces of information. It follows that the most complex aspect of the work of cataloguing is in the actual planning of ways of accessing to the information, since information technology makes it possible to memorise and consult quantities of data in logical-associative ways. Today it is necessary to design instruments that are capable of adapting themselves to changes in cognitive and communication paths, in other words through the use of dynamic cataloguing.

The structuring of the databases lies at the very foundation of the plan for an information system for the promotion of the Piedmont area, through the creation of an instrument for the definition of thematic paths. In specific terms, a database has been designed to catalogue mosaics in the Piedmont region in the various periods, seeking to link them to the territorial area and above all to the architectural contexts in which they were created. In some cases fragments, which are not conserved *in situ* any more, have come to light and are now displayed in surrounding far away from their original site. The database has been organised, starting from the analysis of existing forms of cataloguing for the mosaic, and it has been compared with the most modern information systems in Piedmont.

The cataloguing, management and development of this resource can therefore become of growing importance at regional level and lead to the adoption of new models and instruments that are capable of satisfying the requirements of flexibility and of integrating information of varying origin and nature. The phase for acquiring knowledge about museum exhibits covers the acquisition, monitoring and management of information resources, which consist of materials of varying types. Studies of source data and scheduling instruments at a national (ICCD) and regional (Guarini Project, source data of the Piedmont Cultural Monitoring Unit and the Regional Tourism Monitoring Unit) level have been carried out in order to devise a schedule model specific for mosaics, so that they are no longer regarded as archaeological findings but a systematic element, in absence of specific regulations. These have been compared with other local situations, in Italy and abroad, where unambiguous parameters are needed for the purposes of standardisation.

Below is a description, with a SWOT analysis – an acronym indicating the Strengths, Weaknesses, Opportunities and Threats – in relation to the systemisation of knowledge for the development of Piedmont's mosaic heritage.

2.1 Instruments for Cataloguing Cultural Heritage/Mosaic Heritage in Italy

Analysing the operation of the ICCD*, the *Istituto Centrale per il Catalogo e la Documentazione italiano* – an institution set up in 1959 in order to promote and coordinate cataloguing and documentation activity, as well as setting up and managing the general cataloguing system for cultural resources of archaeological, historical, artistic and environmental interest – it is immediately apparent that there is no specific cataloguing system for the mosaic. Mosaics are included in the category of archaeological findings and such a choice is clearly limiting when it comes to mosaics that do not come from archaeological excavations.

The need for an articulated organisation of information, taking into account the descriptive and interpretative nature of the architectural, environmental, archaeological, historical and

* For further information: http://www.iccd.beniculturali.it

artistic information, has been examined by the ICCD, drawing attention to a rigorous structure of information contained in descriptive files and aiming towards a standardisation of them, so that they are compatible with the various types of file, in order that it is possible, through automation, to reconstruct the connective framework which links the various works to the relevant architectural and territorial contexts. First of all the ICCD has sought to provide a conceptual definition of the mosaic under examination as a "simple object", "composite object" or "group of objects" and to propose specific compilation procedures for each of these. Subsequently, for the structuring of data, it has arranged the information into elementary units which are independent from hardware and software systems. After this, the information is divided up into fields, sometimes grouped into paragraphs, which can then be structured into sub-fields.

Afterwards, it has been analysed according to the type of data and logical relationships between the data that can be acquired in the various existing file models, highlighting the possible ways of implementation.

Mosaics are included in the category of objects to be catalogued within the sector of Archaeological Heritage in the sub-category of Moveable Resources, and therefore mosaics that are still *in situ* (being Property Resources) would remain excluded from the "RA" *–reperto archeologico* (archaeological find)– file, even if it has been proposed to create a *RA-M file* which relates exclusively and specifically to Mosaics; vocabularies have been compiled in relation to the mosaic, the non-figurative mosaic and the mosaic floor.

For completeness, an examination is made of the "OA" *–opera d'arte* (work of art)– file and the "A" *–architettura* (architecture)– file in order to obtain a direct relationship with architectural contexts in which the mosaics are created*.

2.1.1 RA file. File devised by the ICCD for the cataloguing of Archaeological Resources: it contains a whole series of specific information that connects this type of asset with the place in which it is found and the characteristics of the excavation. In relation to the purpose of the research, it is inappropriate for documentation of mosaics that have not come to light during archaeological excavations. The file is subdivided into 22 paragraphs that can include structured (and non-structured) fields, with the possibility of adding further sub-fields that are recognisable within the same framework with a code for each heading.

From a SWOT evaluation, the RA file shows its particular points of strength insofar as being complete and clear for Archaeological Finds, standardised and therefore accessible throughout the whole national territory; its weaknesses are the clear lack of flexibility in the description of more detailed mosaics – not originating from archaeological excavations – and difficulty in compilation, despite the use of key words, for use in the management of the rich heritage of mosaics in Piedmont.

2.1.2 OA file. File created by the ICCD for cataloguing Works of Art, subdivided into 21 paragraphs for each of which there can be structured (and non-structured) fields, with the possibility of adding further sub-fields that are recognisable within the same framework, with a code for each heading.

From a SWOT evaluation, the OA file demonstrates various points of strength in being exhaustive and technical for works of art, with specific key words for mosaic resources, suitable for compilation by the authorities responsible for managing the territory; its weakness is to be fairly inflexible in relation to the specific characteristics of mosaic resources and difficult for the general, non-specialist user to compile, despite the provision of key words; as a result it is not suitable for managing the rich heritage of mosaics in Piedmont.

2.1.3 A file. File created by the ICCD for cataloguing Architectural Monuments. The A File is subdivided into 32 paragraphs, each of which can include structured (and non-structured) fields, with the possibility of adding further sub-fields that are recognisable within the same framework with a code for each heading. A further 16 are introduced, which give a more specific description of the architectural monument.

From a SWOT evaluation, the A file demonstrates various points of strength in providing an exhaustive technical description of the architectural resource, which is suitable for compilation by authorities responsible for administering the territorial area; its weaknesses includes a clear unsuitability in managing data relating to mosaics except for the description in the relevant architectural context; it is also difficult for the general, non-specialist user to compile, despite the provision of key words; as a result it is not suitable for managing the rich heritage of mosaics in Piedmont.

2.2 Instruments for Cataloguing Cultural Heritage/Mosaic Heritage in Piedmont

After an examination of the cataloguing directives and standards drawn up at national level by the ICCD, the next step relates to research projects at regional level carried out, throughout Italy for the management of cultural resources and, where they exist, relating directly to mosaics.

This began, naturally, with a consideration of the situation in Piedmont, where no cataloguing in relation to mosaics has been carried out up until now. The study was then widened to cover those Italian regions that have created well-established databases, specifically for the cataloguing of mosaics.

2.2.1 Guarini Project. Even though there have never been any cataloguing activities relating exclusively to mosaics, projects are currently being carried out for the archiving and monitoring of resources over the entire regional area, in its overall form, including archive and library resources and cultural resources in the widest sense of the word.

In this respect, first of all, there was an examination of the Guarini Project**, which was set up by Piedmont Regional Authority in the mid-1990's and consisted of the Guarini Cultural Resources, Guarini Archives and Guarini Library Resources. Since 1994, Guarini software has been the standard cataloguing instrument in the Piedmont area and CSI-Piemonte

* This analysis was carried out following the specific compilation regulations (for the RA file, the OA file and the A file) to be found at: http://80.205.162.235/Catalogazione/standard-catalografici/normative/scheda-ra; scheda-oa; scheda-a

** For further information: http://www.regione.piemonte.it/cultura/guarinipat/index.htm

Information Consortium has the task of setting up the software and distributing the procedure among the authorities responsible, providing also the necessary assistance. In 2000, the *Guarini Venaria Reale* software was created as a result of the need to catalogue the documents produced during study and monitoring programmes for the restoration of the Savoy Royal Palace at Venaria Reale.

The standards used are reminiscent of those of the ICCD, with variations relating to the models of the specific files for each type of Resource.
The starting point was based upon the work of the ISAD*** (General International Standard Archival Description), standards drawn up by the ICA (International Council on Archives), adopted by the Committee for Descriptive Standards (Stockholm, 19-22 September 1999); although modifications were made in relation to the hierarchy of information and the inclusion of new fields that provided a greater amount of details.

Of fundamental importance was the association of one or more images to the catalogue record and the georeferencing of data relating to the territorial area. During the phase of access to the catalogue system it is necessary for users to provide information of identity and there are various levels of access: supervisor (use of all functions), reader (consultation and printing of data only), file holder (access to its own files only) and officer (non-default user who cannot carry out maintenance of external files).

The final objectives are the development of Piedmont cultural heritage, collaboration between authorities and institutions, the diffusion of information acquired among citizens and researchers and, naturally, the safeguarding and promotion of the catalogued resources.

A SWOT evaluation of the Guarini software indicates, among its points of strength, that it has been created specially for the cataloguing of Piedmont cultural heritage, but this now also represents a point of weakness, since, although it is shared by the scientific community, its application cannot be shared at national level. It also presents various difficulties when it comes to compilation by a general, non-specialist user.

2.2.2 OCP - Observatory Cultural Piedmont. There was also a study of the census of Museums and Cultural Resources in Piedmont carried out by the Piedmont Regional Authority in collaboration with *Fondazione Fitzcarraldo* and *IRES* (the Economic and Social Research Institute), operating at national level but in this case relating to the part concerning Piedmont. This promotes surveys in social, economic and territorial fields, with functions of support for the programming action of the Piedmont Regional Authority and other institutions and local authorities at regional level.

The purpose of the survey was the creation of a database with detailed information on many different aspects of museums and cultural resources, which is accessible to the public in controlled form, even though free of charge. In particular, surveys were carried out on institutions that satisfy the definition of museum as laid down by ICOM (International Council of Museums), drawing up a list, sub-divided according to province and category, of the cultural institutions involved in the survey, which include several places where mosaics are conserved*.

It should be pointed out that attention was given during the survey phase to the relationship between the resources and the territorial area, and to the possibility of visiting and viewing the collections. Among the cataloguing criteria there is an alphanumerical code consisting of the initial of the province of origin and a progressive number so as to provide a faster way of searching and compiling the files.

A SWOT evaluation of the Census of Museums and Cultural Resources shows, among points of strength, that it is fully shared with the authorities responsible for administering the territorial area; the weakness is in not offering the possibility of access to Metadata but only to statistical data and the processing of resources subdivided by province.

2.3 Instruments for Cataloguing Cultural Heritage/Mosaic Heritage in other Italian Regions

The Emilia Romagna and Veneto Regional Authorities have tackled the problem of computerised management of mosaics with local projects aimed at the cataloguing of territorial areas and their mosaic resources.

From the examination of these types of file, various limitations emerged in relation to their adaptability for cataloguing Piedmont mosaics, especially with regard to the purposes and the different users involved in the projects currently being operated in the Emilia Romagna and Veneto Regions.

2.3.1 CIDM - International Documentation Centre for the Mosaic of Ravenna (Emilia Romagna Region). In 2003, the CIDM was created as part of the MAR (Ravenna City Art Museum) in order to promote research, study and cultural development of mosaics in the city which symbolises the culture of the mosaic**. It has two distinct databases: one for the mosaic (ancient and contemporary) and one dedicated to contemporary mosaic workers (which is a list of companies, firms and private mosaic makers operating in the Ravenna area).

The research carried out by the CIDM has sought to produce a catalogue file that was compatible with ministerial surveying standards relating to cultural resources, which at the same time was accessible by internet to everyone, even though there were various different kinds of user.

The work led to the production of documentation and to the promotion of mosaic work, with the creation of a single catalogue file, structured in the same way for ancient as well as for modern mosaics, in which only the appropriate fields are completed according to type.

In relation to files' structure the starting point was the OA (works of art) files of the ICCD with additional data derived from other standards relating to files for RA (archaeological resources), OCA (contemporary works of art), A (architecture) and (CA) archaeological sites. The files are brought together in

*** For further information: http://www.anai.org/attivita/N_isad/Isad_main.htm

* For further information: http://www.ocp.piemonte.it/; http://www.fitzcarraldo.it/; http://www.ires.it/

** For further information: http://www.mosaicocidm.it/index.do

the database and can be consulted on line. There is a limitation to this system of filing, due to the fact that there is no opportunity for an overall vision of the complete catalogue file for all headings because only the compiled fields are visible.

From a SWOT evaluation, the CIDM project demonstrates its points of strength in being suitable for the management of mosaics from various periods of time, with a specific but sharable language that is open to the general user; its weaknesses are in not offering points of contact with the architectural context in which the work was located and/or relocated.

2.3.2 **TESS – Padova (Veneto Region).** The second project examined has been created by the Department of Archaeology at Padua University for cataloguing mosaics from the Roman period in the Veneto Region[***].

The TESS project, from these initial objectives, was extended to mosaics in Liguria, Tuscany, Emilia Romagna and Friuli Venezia Giulia, and created a database that would meet the requirements of accessibility and user-friendliness, as well as completeness of information, to offer a cataloguing instrument that would assist in protection and also in the study of mosaics on the basis of their decorative forms, distribution, craftsmen and local ways.

The project was built upon a study of research carried out in France in the middle of the last century with the first attempts to catalogue ancient mosaics. The file has a hierarchical structure arranged on six levels, from general to specific.

The TESS file is devised to provide a synthesis between the requirements for an historical and artistic reconstruction in relation to the mosaic and the administrative requirements of protecting and conserving the cultural heritage. All of this is reflected in the study of classes of user with a protected, hierarchical system of access according to the person wishing to gain entry, in order to avoid interference and undesired access to information.

From a SWOT evaluation, the TESS project demonstrates, among its points of strength, an inclusion of the relationship between mosaic and architectural context, and a comprehensive description with specific language; its weaknesses include the fact that its objective is to manage ancient mosaic pavements and this means that the Padua model is poorly adaptable to cataloguing a broader time period, and also that the language is too technical and difficult to be shared with the general user.

2.4 Comparison with European Cataloguing Instruments of Cultural Heritage/Mosaic Heritage

In France, the *Ministère d'Etat, chargé des Affaires Culturelles* was created in 1959, thanks to the work of André Malraux. After various changes, it became the present *Ministère de la Culture et de la Communication*[*]. The cataloguing activities led to the creation of the *Inventaire des Monuments et Richesses Artistiques de la France* which, although it includes very many databases, does not include any specific cataloguing system for French mosaics.

In Great Britain, the MDA[**] (Museum Documentation Association) is the central body which is equivalent to the Italian *Istituto per il Catalogo e la Documentazione* and the French *Inventaire* described above. The MDA set up a series of cataloguing models some time ago under the control of the *Royal Commission on the Historical Monuments of England* which has also produced publications in the form of manuals for a correct and unambiguous form of compilation; but here, once again, there is no specific cataloguing system for mosaics.

3. MOSAIC HERITAGE AS AN INSTRUMENT FOR THE CREATION *OF VALUE*

The mosaic resources cataloguing project also has the purpose of enabling the authorities responsible for administering the Piedmont cultural heritage to carry out protection and cultural development activities. These users (Superintendent and regional and municipal offices) can broaden such headings and operate the system, thanks also to the widespread and specific knowledge of the territorial area.

It is appropriate to seek to protect these resources on the basis of the current legislation, to create value not only in relation to the object itself but also for the architectural and territorial context, and also to define projects for promotion and conservation that are sustainable over time, planning public or private initiatives that lead to investment in the territorial area.

What has emerged from the state of the art with regard to cataloguing instruments for mosaic resources is the lack of a specific cataloguing system for mosaics. This has been confirmed by direct contact with local institutions.

3.1 BM file project

The catalogue file proposed for the Piedmont mosaics, BM file *(Bene Mosaico)*, for the purposes described above, has therefore been devised as a single file subdivided into various thematic sections for greater ease of research, along with a bibliographical entry that is similarly structured.

Innovative fields in this specific mosaic cataloguing project are in *italic* font in order to give an easier understanding. These fields are new relatively to all the file cards analyzed before.
The fields include:

- LR – PLACE OF DISCOVERY

ID Finding place, Country, Region, District, *Finding district ISTAT Code*, Finding municipality, Finding actual place, *Finding place ISTAT Code*, *Place at the time of finding*, Finding street code, Finding street number, *IGM map*.

- LC – PLACE OF CONSERVATION

ID Conservation place, Conservation in situ ((Y/N), Country, Region, District of conservation place, *Conservation district ISTAT Code*, Conservation municipality, Conservation actual place, *Conservation place ISTAT Code*, *Place at the time of finding*, Conservation street code, Conservation street number, *IGM map*.

- CA – ARCHITECTURAL CONTEXT

ID Architectural context, Architectural context typology, Actual name, *Execution age*, *Specificy execution age*, *Bibliography for the age*, Architectural plan with room

[***] For further information: http://www.archeologia.unipd.it

[*] For further information: http://www.culture.gouv.fr/culture/inventaire/patrimoine.html

[**] For further information: http://www.mda.org.uk.html

indication, *Architectural plan caption*, Room typology, *Iconographyc image*, Room form and dimension

- O – OBJECT

ID Object, Illustrating image, *Image caption*, Object Typolgy, Execution age, *Bibliography for age and autors*, Dimension, Execution method, Materials, Coloration form, Decoration typolgy, Brief description, Description, Bibliograpy, Geometric decoration (Y/N), Geometric decoration theme, Geometric decoration modular repetition, *Geometric decoration description*, *Geometric decoration image* (following Figure 2), *Geometric decoration image caption*, Vegetable decoration (Y/N), Vegetable decoration theme, Vegetable decoration modular repetition, *Vegetable decoration description*, *Vegetable decoration image*, *Vegetable decoration image caption*, Figurative decoration (Y/N), Generic subject matter, Relevant category, Theme, Specific subject, *Figurative decoration description*, *Figurative decoration image* (following Figure 3), *Figurative decoration image caption*, Inscription (Y/N), Inscription postion on mosaic, Language, Text transcription, *Explanation/Traduction text*, *Bibliography for the inscription*, *Inscription image*, *Inscription image caption*, *Existing schedule file for the mosaic or its context (Y/N)*, *Schedule file typology*, *Compiling authority*, *Schedule file number*.

- R – RESTORATION

ID Restoration, Restoration actions (Y/N), *Restoration act chronology*, *Bibliography for the chronology*.

- V – CULTURAL DEVELOPMENT

ID Development, *Reference to Local Tourist Agencies*, *Possibility to view (Y/N)*, *Explanation of unvisibility*, *Existing road network*, *Existing railway network*, *Existing public trasport network*, *WebGis trasport link*, *Place of conservation typology*, *Place of mosaic exhibition*, *Possibility to visit (Y/N)*, *Visit condition*, *Access condition*, *Contact*, *Website*, *Inclusion in existing circuits (Y/N)*, *Promoting authority*, *Circuit name*, *Information availability*, *Total tourist movements: arrives*, *Total Tourist movements: presences*, *Italian tourist movements: arrives*, *Italian tourist movements: presences*, *Foreign tourist movements: arrives*, *Foreign tourist movements: presences*, *Tourists medium stay*, *Total number of accomodation*, *Cultural heritage presence*, *Cultural heritage typolgy*, *Total number of cultural heritage in the area*, *Number of visitors*.

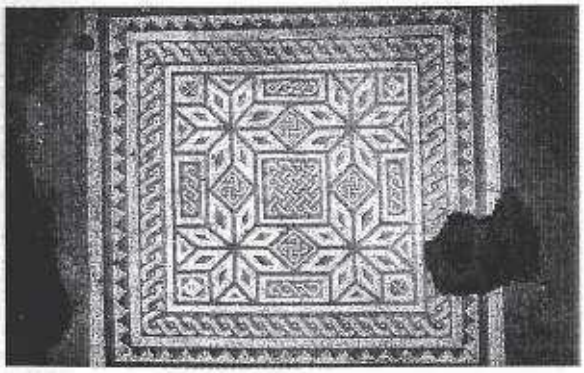

Figure 2: The floor fragmentation, coming from Tortona (AL), shows geometric decoration with modular repetition of elements as teeth saw, two top twists, lozenges, Solomon knot

Figure 3: Figurate fragmentation part of Casale M.to (AL) ancient Cathedral with religious theme showing Abramo fighting four Kings

3.1.1 From Access to ArcView through the evaluation of Open Source. These sections have been organised on Access with related databases, with a primary key that provides a clear unambiguous identification of the mosaic.

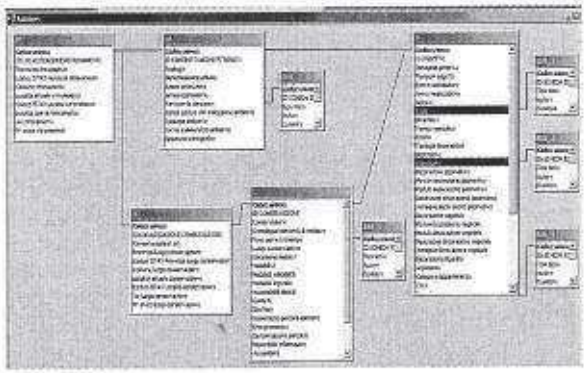

Figure 4: ACCESS relational form

The creation of a database that is integrated into Access has made it possible to manage data and information of different kinds through a conceptual project which includes standard as well as newly devised data fields and a logical project according to a multi-profile arrangement, in other words for a multiplicity of potential users at regional level.
In order to share this info system the "Open Source" system should be used. In this contest we prefer to split information on different levels using easily accessible programs. These programs are already working in public structures that use *Office* DBMS info systems.

3.2 Instruments for the *creation of value*

With a view to rediscovering mosaics not only as objects to be preserved and promoted, but at the same time as factors that give special value to the territorial area, it has been necessary to carry out an initial examination of their territorial distribution in order to identify certain thematic considerations.

Once that all useful information have been collected, and that BM file has been proposed for the management of the mosaic resources in order to promote the cultural development of Piedmont, the following phase is to analyze how the project could be developed with a dialogue with the responsible authorities and to understand how to promote the necessary

involvement and interaction between the various specific authorities in order to produce a correct cataloguing system for the provision of information, protection and cultural development of the resources and the territorial area itself.

After having recognised the cultural context, identified the relevant standards, defined the rules for compiling the files, the principle of sharing and interaction form the basis for the multi-language portals that are to be set up. Their cultural importance and value is clear, given the possibility of sharing information between institutions, administrations and users. They consequently demonstrate the need for a Territorial Data Infrastructure as a fundamental factor in managing cultural resources.

This objective provides the creation of an information system in which the information relating to the mosaics goes together with the information relating to the territorial contexts, in the form of georeferenced interactive thematic maps. This information architecture makes it possible to make individual queries, according to the area of interest, as well as overlay operations on all information relating to each individual point which is clearly and unambiguously positioned.

In a subsequent phase, the interdisciplinary research group arranged cultural development programmes for the mosaic resources in the specific context of the Piedmont region, through the setting up and visualisation of thematic maps which were created *ex novo*.

3.2.1 Tourist circuits in Piedmont Region: state of the art. Given that the purpose is to create itineraries based on the territorial distribution of the mosaics, it was of fundamental importance to consider this option in relation to the tourist circuits already organised and promoted by the Piedmont Regional Authority, i.e. the Piemonte Emozioni[*] and Piemonte Card initiatives which are season tickets for Turin and Piedmont museums. Analysing these programmes, various points of contact emerged between the main territorial attractions and the presence of mosaics.

In order to carry out a reciprocal promotion of the central attractions and the mosaic resources, a field entitled "description of itinerary" was inserted into each itinerary, providing the possibility of viewing in detail some of the files illustrating the individual attractions over the territorial area in relation to the accommodation available.

The twofold nature of the Territorial Information System – of planning and managing information fixed to a mapping support specifically created by the Piedmont Region SITAD[*] - makes it possible to pass from the cataloguing and archive phase for each resource to the programming of data into the georeferenced support, with the possibility of querying the system in relation to the management of cultural development aspects.

3.2.2 Profile of final users. Four different final users have been identified: researchers and academics interested in mosaics; tourists and enthusiasts interested in mosaics; researchers, academics and experts in the management and development of the territorial area; and finally the 'administrator'. In specific terms, the first of these categories includes those people who have a scientific approach to the objects, who are interested in a whole series of headings which provide information that is as comprehensive and correct as possible about the architectural context and the circumstances of the discovery, the date of the architecture and of the mosaic itself, an analysis of the decorations and techniques used, and indications about any restoration or other operations. This first level of analysis (for the subsequent choice of fields to be included in the catalogue file) has made it necessary to look at the specific disciplines for understanding the history, technique and iconography of the mosaics which only an historian, restorer or expert can have. From this point of view it is of fundamental importance to draw up a suitable and accurate list of key words to which the compiler must refer in programming the data under specific headings. Tourists and mosaic enthusiasts, on the other hand, could be users with different needs, who wish to learn more about Piedmont mosaics and visit the sites. This has led to the inclusion of additional headings relating to the cultural development of the resource, which are useful to the tourist in providing information about locations, methods of access, viewing, possibility of visits, as well as a whole series of information relating to logistics and practical matters (opening hours, booking, etc.). In this respect, the local ATL (Local Tourist Agencies) have been of fundamental importance.

The third category of user relates to researchers, academics and experts who are concerned with the administration and cultural development of the territorial area, since the creation of itineraries presupposes the inclusion of headings relating to the problems of administration (particular codes, information about access and the possibility of visits), with additional information about the potential of the area (tourism and cultural interest). This consideration involves an analysis of tourist figures (subdivided according to the ATL) and cultural attractions already available in a given area. Interdisciplinary skills – which are fundamental to cultural development – provide such fields as a result of the activities of data entry, monitoring and figures obtained. The structure of the database provides tourists with information regarding the real possibilities of access to mosaic resources: continual updating makes it possible a periodical and systematic support in the programming of cultural attractions and means of access to them, in the same way as the heading for restoration operations.

4. TOWARDS PROGRAMMES FOR THE DEVELOPMENT OF THE PIEDMONT MOSAIC HERITAGE

The Territorial Information System case study of mosaic resources in Piedmont is directed towards objectives which relate to an understanding of the mosaics themselves and the factors that describe them, as well as their territorial distribution and their protection and cultural development in terms of access etc., in line with their possibilities of attracting tourism. Such actions can create value for the mosaic resources through information, territorial promotion, etc. The mosaic therefore becomes an asset to be promoted and, at the same time, appreciated for the workmanship contained within it.

[*] For further information: http://www.piemonte-emozioni.it/

[*] SITAD, Sistema Informativo Territoriale Diffuso (Cross-territory Information System), for further information: http://www.regione.piemonte.it/sit/argomenti/pianifica/sit/sitad.htm, http://www.sistemapiemonte.it/serviziositad/index.shtml

The project makes it possible to carry out multilevel queries of the system, with a variety of different scenarios and the possibility of integrating different data sources relating to specific objectives, such as itineraries by groups of experts to visit mosaics that have a particular common characteristic or, alternatively, routes identified on the map, following pre-selected routes and/or according to accessibility. The creation of pre-arranged itineraries can assist local development and produce effects upon the social and economic system, promoting particular areas only in relation to the infrastructures available.

The Territorial Information System, organised in this way, developed using the ESRI, makes it possible to access a set of possible choices, put together on the basis of subjective relationships or of objective parameters and regulations, and therefore offering the possibility of selecting from a 'fixed menu' or an 'a la carte menu'. The data, with its twofold alphanumerical and geographical properties, is viewed directly by the programme in separate layers, which are different in nature, for example covering Region, Province and Municipal areas. In particular, two new layers have been included, entitled "mosaics" and "mosaic discoveries", which provide specific information identifying mosaics that can be actually visited in the territorial area and places where mosaics have been discovered and are not visitable any more.

In order to indicate the distribution of mosaics across the territorial area, they have been classified according to the state in which they are to be found (mosaics conserved in situ, re-mounted, temporarily not viewable, no longer viewable). The final result is to have the 'Mosaics' layer sub-divided into two sub-fields (mosaics conserved in situ and re-mounted mosaics) and the 'Mosaic Discoveries' layer into three parts (mosaics re-mounted (meaning on their original site), mosaics temporarily not viewable and mosaics no longer viewable).

4.1 A structure for multi-level query

With regard to the predefined set of queries to the system, a first level of most elementary research consists of consulting the data base of mosaic resources by district (Province, Local Tourist Agencies, etc.). By using this type of query, it is possible to cross-relate and georeference various pieces of information regarding one or more aspects concerning the aesthetic or artistic value of the mosaics.

A second level of query relates to the presence of mosaics within the municipal area, interrelated with the option of visiting other similar mosaics. It is possible to carry out a cross-related analysis, for example, between Roman and Medieval mosaics and the presence of cultural resources defined as historical and archaeological ones.

A third level of consultation offers the possibility of inter-relating routes already devised by others *ex-novo*: in this case, it is necessary to choose on the basis of the authority offering the itinerary (*Piemonte Emozioni, Piemonte Card*) and on the basis of the mosaics being researched (e.g. Roman mosaics) or on the basis of their location within the territorial area (provincial, local tourist agency, regional etc.).

A fourth level, on the other hand, focuses attention on the question of accommodation in municipal areas where the mosaics are, because someone following such itineraries might be interested in finding out about available accommodations. This querying method is relevant from the point of view of Regional Tourist Monitoring Unit statistics.

Finally, a fifth level, aimed more at those involved in tourism promotion and territorial development, rather than direct users of the programme, seeks to correlate the places in which mosaics are to be found with tourist movements.

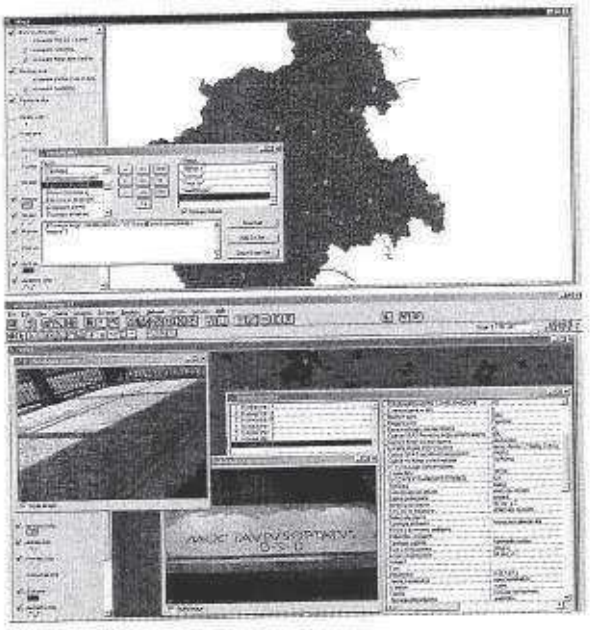

Figure 5: Example of first level of query

These five possibilities have the purpose of giving possible examples for navigating the complex system of data, which includes geographical information, information on the location of the sites where the mosaics were discovered and where they are conserved, the characteristics of the mosaic itself, in all of its cultural and decorative aspects, as well as information relating to access to the mosaic and other cultural and tourist attractions in the area where it is located.

5. CONCLUSIONS

The project has sought to establish methods for monitoring and administering Piedmont's mosaic heritage; it constitutes a significant factor in the cultural development of the "territorial system" in which it is located, thanks to the creation of conceptual and logical models which have been described. In this sense, these models have been devised in close relationship and involvement with the initiatives carried out over the territorial area and with a view to their use by a broad range of users. These itineraries must be planned by authorities who possess knowledge of the territory in which they operate, as well as technical skills, and also the ability to use the GIS instrument or web GIS.

Future developments of the system will involve the competent authorities, in order to include their polices in terms of promotion of resources and cultural development of the regional heritage, with a view to creating cultural circuits in which mosaics are to be found. A further outcome relates to a possible networking of the Gis system by transforming it into a WebGis project, thanks to which the general user can have

access to data, creating personal navigation routes for information and viewing.

This does not exclude the possibility of further developments and further possibilities for navigation and querying, but it has been sought to provide a picture of what is now the principal potential offered by the Territorial Information System, from a "simple" cataloguing instrument to a sophisticated support system for programming strategies for territorial resources.
This concept is relevant above all with regard to the cultural development section, in which the information, provided in thematic form, can offer vital support in policies for developing the territorial heritage.

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