Abstract: This paper describes a data base management system developed for the organization and management of information acquired by non-destructive testing of artworks usually applied at the laboratory of the Physical and Chemical Methods of the Department of Conservation of Works of Art and Antiquities at the TEI of Athens. The structure and content of the system are presented, as well the interface provided to the user. The scope of the work presented in this paper is impressive, taking into account the complexities of creating such databases, enabling successful retrieval. The advantages of the system are the collection and comparison of the relevant information from the non-destructive techniques and the standardization of their conclusions. This information is particularly important for conservators because it could be used as reference and guidance to their research and conservation treatment.

Key-Words: database, non-destructive methods, artworks, entity relationship model, documentation.

1 Introduction
The value of the non-destructive testing in the examination and the documentation of works of art is undeniable. The results of the application of diagnostic methods like infrared reflectography, ultraviolet photography, X-ray radiography etc. contribute in the diagnosis and documentation of the state of conservation, the study of the construction technique, the identification of the materials used as well as the study of the deterioration mechanisms. This information is particularly important for conservators because it could be used as reference and guidance to their research [1], [2], [3].

The requirements for the systematization of the results acquired by the diagnostic methods, taking into consideration the continuously increasing amount of produced data, led to the development of an information management database system. There are few recent studies and database systems aiming at the management of the cultural heritage that refer to the organization and management of the physicochemical results obtained using non-destructive techniques. At least two of them can be reported. The first one is the “Eros” database
which designed to handle museum collection analytical data from the laboratory as well as from museum – restoration workshops [4]. The second one is “Ormylia’ s artworks’ documentation system” that cover the needs of the Ormylia’ s Research Center aiming at the management of the objects collection, the diagnosis and the conservation – restoration activities[5].

2 About the system
The present paper is referred to the development of a database management system that was designed in order to satisfy the needs of the Laboratory of Physical and Chemical Methods of Analysis in the Department of Conservation of Artworks and Antiquities at the Faculty of Graphic Arts and Artistic Studies of the TEI of Athens. The originality of the present work consists in the fact that this Diagnosis Management System (DMS) comprises not only the original photographic material followed by all relevant information but also the information coming out of the results and the conclusions of the diagnosis activities in a systematic and documented way.

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The main purpose of the system is to select and classify the most significant information coming out of a diagnostic method. All relevant elements to the application technique as well as the characteristic information which distinguishes this method from the others, determining thus its identity are also taken into consideration.

The needs of the users were the main factor that determined the information that would be registered and organized in the database management system.

In the present system the users were categorized in three teams.

- In the users that manage the information, namely they import it, they process or even they erase it from the system and this can be the personnel of the laboratory,
- In the users that consume the information and these can be scientists who have interest and right of reading the system information or the students and the professors of the Department, and
- in the administrator of the system

The information provided by the present system is related to the following diagnostic methods:

- Photography by raking light
- Macro photography
- Ultraviolet reflection and fluorescent photography
- Infrared photography
- Infrared reflectography
- Optical Microscopy

The system is referred to works of art such as paintings, icons and generally polychrome artworks such as miniatures, wall paintings and wooden artifacts.

It is not considered essential to be presented in this paper the research, the collection and the selection of the proper information fields as well as the design of the Entity Relational Model of the system.

The system was developed in MS Access Software, and in a sort time is expected to be upgraded and connected with the network database of the Conservation Laboratories of the Department.

3 The structure and the content of the system
The DMS manages the storage, classification, processing and retrieval of information. The information that is contained is categorized depending on its nature/ type and its subject. According to its nature it is separated in alphanumeric characters (letters and numbers) and in multimedia data (photos, diagrams, spectrums 3D animations and videos).

According to its subject the information is categorized in the following basic thematic units and information fields:

- Information necessary for the identification of an object: the recording code, the identification code in the laboratory, the category that the art object belongs to, the type or the title, the creator, the artist or the school that the art belongs to, the date of construction, the place of origin, the dimensions, the materials and the technique of manufacture.
- Information describing the frame in which the study of an object is undertaken (educational or research programs, services etc). The project has title/name, aim, date of beginning and expiry, the scientific responsible institution and person.
- Information describing the optical diagnostic method: the name, the equipment used (photographic equipment, lighting sources, lenses, film, filters etc), the experimental conditions, the date, the place and the persons in charge.
• Information that refers to the photographic results of the applied diagnostic method that is: the photo’s identification code, the type, if it is an original or a processed one as well as the processing procedure.
• Information describing the conclusions of the applied method concerning the different layers of the object (varnish layer, paint layers, preparation layer, support, wood, paper, textile). The description of the conclusions comprises the type, the extent, the intensity and the location in the object marked on a grid applied in the pictures. The types of conclusions are presented in dynamically open list box of field, are differentiated between layers when it is required and are described by values like “loss”, “scaling”, “overlay”, “scratch/ scuff”, “detection of initial drawing”. In these fields new values can be added in the list boxes. Also the fields “intensity” and “extent” are presented in dynamically open list box with predetermined values.
• Information that is reported in the bibliography, in technical reports and various relative documents. In these fields the type of the document (book, magazine, encyclopedia, newspaper, internet, proceeding of meeting, study, and report) is declared. The title of the document, the author or the writer, the year of publication, the place of publication, the publisher and additional information are accepted values as well.

4 The interface
The interface and the structure of this database satisfy the need for the non-complicated navigation and the easy access to the needed information. Each level consists of one or more forms that are simple dialogue boxes that help the user to interact with the application. These dialogue boxes actually constitute the interface and are an essential factor in the success and acceptance of a system [6], [7].

The first level consists of the initial form (Fig. 1). At this stage, four options are given to the user: to insert data, to recall data, to read the user’s guide and to quit the application (Fig. 2).

The information recall is realised using queries presented in the retrieval forms

Queries constitute an essential tool for every database management system [8]. Principally queries help users to access those entries that meet the criteria of their search. Queries are also used for the combination of data from different thematic units, providing in that way a uniform presentation of related data [8].

The queries that the system can afford to the user are of three kinds:
• Queries for general use. In these queries all of the available information of the database is presented, on lists, without criterion of search.
• Queries for specialized search. These queries contain one or more criteria of search. The criteria values are presented in dynamically open list boxes. In these queries the user can select one value, from a list proposed in the list boxes (Fig. 3) and finally,
• Parametric queries that were applied in reports with one or more small dialogue windows based on Boolean operator (and, or) [9]. In these cases the user is called to fill some characters form the key words that constitute search criteria at the corresponding dialogue windows.

The questions were categorized by thematic criteria. Queries are provided in identification information of the objects in lists that can be used as indexes. As search criterion can be defined:
• the objects code. In these queries are presented identification information of the objects, administrative information, and basic information of the examination methods, information about the project and information about bibliography is recalled (Fig. 4), (Fig. 5).
• the name of a method. In these queries are presented identification information of the objects in which a method is applied is recalled.
• the name of a method and an object code. The retrieval includes administrative information of the method and its application process (equipment, conditions), photographs and information on them.
• the type of conclusion. In this query identification information and reference at the diagnostic methods and their object of diagnosis is recalled (Fig. 3).

Information is presented in a report format suitable for printing. This information is related to the object, the methods and the conclusions.

5 The value of the system
There have been many benefits from the use of the database, as it has significantly contributed to the accomplishment of the projects run by the laboratory of Physical and Chemical Methods. The direct information, the users’ different accessibility levels and the system’s safety are
factors of major importance for the database’s efficient and smooth operation. Furthermore, there must be taken notice of the data retrieval speed, the combinational data retrieval, the storage space economy, the data standardization and the establishment of modules. In addition, the data integrity and independence are technical features associated with applications, which requires different data views and immunity against changes of their storage structures and technical accessibility [9], [10]. Finally, we have to note that the pilot application of the data base satisfies the Physical and Chemical laboratory’s needs:

- To save and organize data that is necessary for the documentation process
- To record information of many methods in the same system

Fig. 1., The initial form

Fig. 2., Data Insert Form
Fig. 3., Retrieval form-Artworks collection that present “Cracks”

Fig. 4., Retrieval form-Conclusions about the layer of the object

Fig. 5., Retrieval form-Conclusion for the varnish layer
To compare and correlate the information for statistical information
- To propose a standardization procedure for the recording of the information.
- To produce condition forms as the system’s output, since the database allows us to print reports.
- To ensure the valid guidance of the work team (consultative role).
- To classify and store information with a view to its long term preservation and set up complete historical archives.

References:


