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DATABASE FOR RESTORATION OF CULTURAL HERITAGE OBJECTS

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Abstract

At present, it is very important to create on line databases for heritage objects (their characteristics and incurred treatments). Information provided by this database complete the analytical documentation of the objects to be restored. Our research group has elaborated such a database lasting for clear evidence of the performed interventions and the actual state of conservation, to ensure the possibility of exchange of information between researchers in the field, and to provide a friendly interface for limited time access and security of data. This paper presents results consistent with objectives.

Keywords: heritage, database, restoration

1. Introduction

Most of the cultural objects are sensitive to environmental conditions such as: humidity, temperature, light, etc. Conservation-restoration interventions include examination and appropriate treatment for preservation and enhancement of the object.

Diagnosis involves identifying and implementing technology to track the object. Technical examination assesses potential risks to the conservation of property and the necessity of an intervention. In order to know the current status of component materials, their origin and their degree of impairment, there are made chemical, biological, physical and other analysis.

The suggestion and the choice of the subsequent treatment will be based on the structure and sensitivity of different factors of degradation. For the good conservation of heritage objects it is initiated a database that will contain specific types of damage of iconostases, book documents, textiles, musical instruments, leather, parchment, degradation mechanisms, new data on the conditions of degradation under the action of endogenous and exogenous factors.

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This paper renders the initiation and development of a database for basic and applied research in the field of restoration/preservation of national cultural heritage in the current international context.

2. Theoretical background

2.1. The main features

The main features considered in database design are:

1. *Independence of stored data*. Divide the data describing the level of use. This provides immunity to the application programs during the changes that take place in the database.
2. *Low redundancy*. In general the data are stored in one place, so as to ensure the elimination of redundancy. However for reasons of optimizing response time it is accepted a certain degree of redundancy.
3. *Security*. Restrictions may be applied for data security, protection from unauthorized access or destruction of confidential data in case of extraction.
4. *Data query*. Ensuring data accuracy at any time during system operation. Network collapse or improper handling may affect the data. A database must ensure the integrity of data, can restore previous versions of the error situation.
5. *Transparency*. Possibilities of using data without the user's knowledge, the database in its entire complexity.
6. *Languages applications*. The existence of powerful languages that allow the retrieval of data expression form of conversation, as complex criteria for selecting information and indication of editing rules as general information is requested.
7. *Diversity criteria*. Unlike classical processing systems, where one uses a single addressing criterion which the file organization is based on, the access of a database can be performed using a lot of criteria for retrieval.
8. *Multiuser facilities*. Data can be accessed and even edited from several components of the computer network by multiple users [1, 2].

2.2. Level of data organization in the database

Data in a database are divided into three levels, depending on the category of personnel involved:

- *conceptual level (overall*) - expresses views of database manager concerning the data. This level corresponds to the conceptual structure (schema) of database, which provides a description of all data in an independent application that enables data management.
- *logical level* - expresses the application of programmer's views on the data. At this level it is provided a description of the data corresponding to a particular application program.

- *physical level* - which expresses the system engineer's vision on the data. Scheme corresponds to the internal database which provides a physical description of the data memory.

2.3. Activities provided by the Database Management System (DBMS)

DBMS provides the following activities:

- *identify and describe the structure of the database* - is achieved through a proper language, data definition language (LDD), according to a specific data model;
- *loading data base data* - is achieved through proper language commands, data manipulation language (DML);
- *access to data* - is achieved through specific commands for data manipulation language. Access to data is related to query and update operations.
- *Query* is complex and involves visualization, consulting and editing output statements (reports, lists, retrieving off).
- *Upgrading* involves three operations: add, change made by the integrity of respecting restrictions BD and clear.
- *database maintenance* - is done by commercial DBMS itself;
- *database reorganization* - is the facility for updating the data structure and access strategy change. Is executed by the database administrator.
- *data security* - data confidentiality refers to the authorization and data access control, data encryption.

2.4. Working technologies

The main technologies used by the system developer are: HTML 4.1, JavaScript 5.0 and ADO (ActiviX Data Object) 2.5. The information from the database are used to create a web site. In order to produce the HTML web site the following steps were made: files of the same type are grouped into subfolders for better functioning of the site [3].

The main keywords are: tags, elements and attributes. *Tag* is a command that the browser interprets as an element. *Element* is a tag and an *attribute* completely personalized that modifies HTML element. JavaScript 5.0 is used to define elements of the website. This is a simple programming language and can specify the response to different actions such as opening a page or deleting a component from the form. The simplest application is the one that causes the progress of a message.

ADO (ActiviX Data Object) 2.5. is used for efficient applications in accessing databases. ADO can connect to a database, execute orders and process results. Moreover it represents the best solution for working with databases in MySQL database access without permanent connection, and providing control and flexibility on updating data.

2.5. Interfaces

There will be two interfaces: one for the database administrator who will maintain, modify the digital content of it and another one for regular users who will consult the digital content. Both interfaces are protected from the interventions of domestic users and in case of copying.

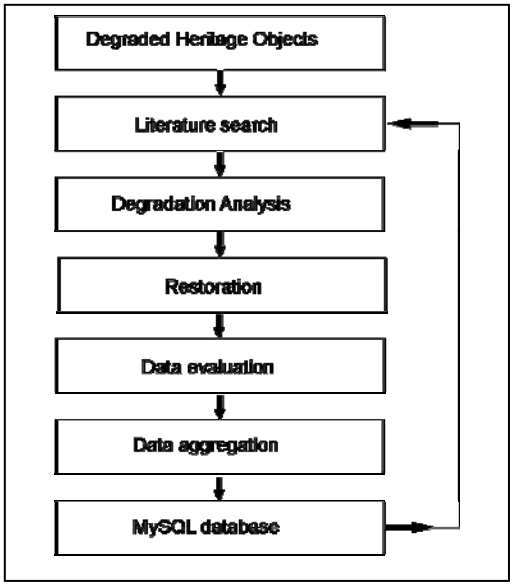

Figure 1. Development schema of the database.

2.6. Database development

Database development [4] involved six main steps: literature search, degradation analysis, restoration, evaluation date, time aggregation, and finally exporting the data to *MySQL* database (Figure 1). The data obtained after analysis and effective research work are manually entered into the database.

2.7. Statistics

To see areas of interest on the website we installed a web counter.

A web counter or hit counter is a computer software program that indicates the number of visitors, or hits, a particular webpage has received. Once set up, these counters will be incremented by one every time the web page is accessed in a web browser.

2.8. Data encryption

Encryption is the translation of data into a secret code that cannot be read without the use of a password or secret key. Unencrypted data is called *plain text,* whereas encrypted data is called *cipher text*.

Some encryption schemes use a *symmetric key,* which means that a single key is used both to encrypt plain text and to decrypt cipher text. This form is considered less secure compared with the use of *asymmetric keys,* where a pair of keys is used — a *public* key and a *private* key. What the public key encrypts, the private key can decrypt, and vice versa. The names come from the expected use of the keys: the public key is given to anyone with which an enterprise does business, and the private key remains confidential and internal to the enterprise. Here are some guidelines to follow regarding encryption.

Encryption keys should be a minimum of 128 bits in length. The longer the key, the more secure it is considered to be (within reason). However, longer keys lengthen the decryption process, so there is a trade off.

The loss of an encryption key should be treated with the same seriousness as the loss of the data that it was used to encrypt.

Sensitive data should be encrypted whenever are permanently stored. The data considered sensitive is a judgment call that should be made by the business people who own the data, not by the database administrator. In general, however, any personal data that can be used for identity theft should be considered sensitive.

All data which are not considered public knowledge should be encrypted whenever transported electronically across network connections that are not otherwise encrypted [5].

3. Database implementation

MySQL database is used for web interface and allows us to build efficient interfaces. This type is multi-user, multi-user access and centralized on the server (Figure 2).

The website allows the administrator to add the information after logging. After adding, the data can be accessed by users immediately after compiling the page. All other data can be accessed and updated by the administrator.

An important aspect of the database is the protection mechanism, so administrators can select and implement appropriate policies to control access to the database. In *MySQL* there are two ways you can log in: user database and operating system.

The user who made the database may perform any operation on resources, but because of this, using *MySQL* mechanisms allows the administrator to specify which users have or not access. Each system is made up of the so-called protected resources (e.g. tables, protected attributes of tables).

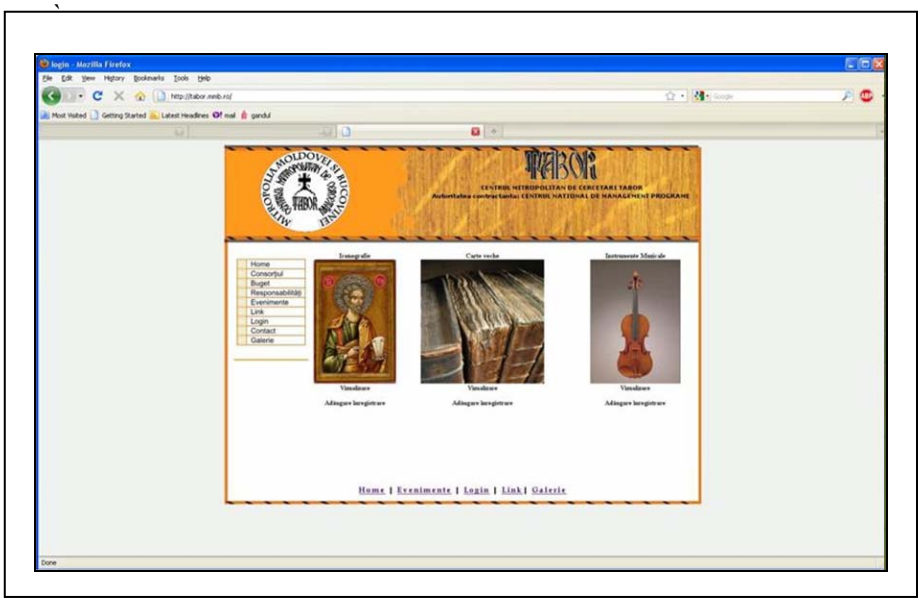

Figure 2. The website.

The *MySQL* database scheme can be defined as a collection of objects; scheme contains tables, indexes, privileges and asertii and is defined by the following syntax:

creation scheme [scheme name] [[Authorization] Authorization] (Definition Scheme elements)

The deadline for the approval of the scheme is the owner user name; scheme name will be omitted if it is adopted as the name of the scheme on behalf of the user who executed the order.

In *MySQL* tables consist of a lot of attributes and a lot of constraints, the syntax for defining tables being shown below:

(Field Attribute name [Default Value] [Constraints] (, Attribute Domain Name [Default Value] [Constraints]) [, Other Constraints])

Each database table is defined by its name (*Table Name*), by its attributes (*Attribute Name*) and there is a high potential to satisfy the constraints attribute values. In defining tables or fields, set can be explicitly used, besides the default user. The order to achieve a user on a predefined area is:

Domain creation Domain Name Domain as Basic

[default value]
[Constraints]

In order to define the scope, the domain is characterized by a name and an elementary field, or an empty lot of constraints and a default value.

Search in *MySQL* is an important issue due to the specific properties and there is no other of obtaining results. Syntax defined by a database query through select instruction has the form:

select ExprAtribut [[as] Alias] {, ExprAtribut [[as] Alias]}
from Table Name [[as] Alias] {, Table Name [[as] Alias]}
[where Condition]

A database application will consider only the lines belonging to the cartesian product of the tables listed in the clause *from* and will establish guidelines that satisfy the condition expressed in the *where* clause.

The result of an application execution is a table that has one line for each selected line by the *where* clause and the results of the evaluation table columns, *ExprAtribut* expressions that appear in *select* clause; the columns can be renamed using an *Alias* that appears right after the expression, but with this expression the tables can be redefined, too.

	Field	Type	Collation
☐	**Current No.**	int(10)	
☐	**Piece name**	text	latin1_swedish_ci
☐	**Inventory No.**	int(10)	
☐	**Support**	text	latin1_swedish_ci
☐	**Working technique**	text	latin1_swedish_ci
☐	**Physico-chemical degradation**	text	latin1_swedish_ci
☐	**Physico-mechanical degradation**	text	latin1_swedish_ci
☐	**Biological degradation**	text	latin1_swedish_ci
☐	**Previous interventions**	text	latin1_swedish_ci
☐	**Location**	text	latin1_swedish_ci
☐	**Photo1**	text	latin1_swedish_ci
☐	**Photo2**	text	latin1_swedish_ci

Figure 3. Database structure.

To have access to as much information as possible about the website, the user will have to create an account by completing an online form with personal data, then he will get an user name and a password to log in every time he/she accesses the page, being able to access a faster search menu.

The website allows access to the database through various commands (Figure 3); the user can get information (Figure 4) on:

- the object's name,
- the support,
- the technique used in painting,
- physical and chemical degradation,
- biological degradation,
- any intervention that has been performed.

Current No.	Piece name	Inventory No.	Support	Working technique	Physico-chemical degradation	Physico-mechanical degradation	Biological degradation	Previous interventions	Location
1	The Holly Virgin and Infant Jesus	593	Wood	Tempera	- Crack support - Scratch	Degradation through the matting and yellowing of ...	Xylophagous attack stopped	Background repainted and halos	Museum of Literature
2	St. Nicholas	1456	Wood	Tempera	– Break with lack of support – Crack support	- Degraded varnish - Deposits of dirt adhesion	Xylophagous attack stopped	Partial reinforcement of layer sheet pictorial	Museum of Literature
3	Pantokrator	1522	Wood	Tempera	– Underlying fracture – Cracks of wood with peeli...	– Degraded varnish – Deposits of dirt adhesion	Xylophagous attack stopped	Chromatic integration of the gaps without bringin...	Museum of Literature
4	The Holly Virgin and Infant Jesus	1657	Wood	Tempera	– Bound missing – Gaps in the pictorial layer	– Degraded varnish – Chromatic alterations	Xylophagous attack stopped	Excessive cleaning	Museum of Literature
5	The Holly Virgin and Infant Jesus	1699	Wood	Tempera	– Gaps in the pictorial layer – Detaching Trends ...	– Degraded varnish – Chromatic alterations	Xylophagous attack stopped	– Excessive cleaning – Uneven cleaning	Museum of Literature
6	St. Nicholas	1701	Wood	Tempera	– Gaps in the pictorial layer – Detaching Trends ...	– Degraded varnish – Chromatic alterations	Xylophagous attack stopped	– Excessive cleaning – Uneven cleaning	Museum of Literature
7	St. Prophet Jeremiah	1706	Wood	Tempera	– Numerous gaps in the older pictorial layer	-Degraded varnish – Adhering dirt, smoke	Xylophagous attack stopped	Uneven Cleaning	Museum of Literature

Figure 4. Sequences from the database.

Besides the above information, one can view online other characteristics including the image of the selected object (Figures 5 and 6).

In order to facilitate rapid use of the entered data, users have a fast and efficient search method. Heritage objects are grouped into several categories: musical instruments, old books and paintings; for each of them different features are presented (for example, various media - painted glass, wood; moreover there are details about the types of degradation working under exfoliation scratches etc.).

Figure 6 shows the selection of the database object (inventory number equal to 2025). Firstly, the inventory number and the location have been introduced. The system has displayed immediately the characteristics associated to the object. Then, if requested, two front and back images of the identified object are provided.

```
SELECT *
FROM `muzeul_lit`
WHERE `denumire_piesa` LIKE 'Maica Domnului cu Pruncul'
LIMIT 0 , 30
```

Current No.	Piece name	Inventory No.	Support	Working technique	Physico-chemical degradation	Physico-mechanical degradation	Biological degradation	Previous interventions	Location
1	The Holy Virgin and the Infant Jesus	593	Wood	Tempera	- Crack support - Scratch	Degradation through the matting and yellowing of ...	Xylophagous attack stopped	Background repainted and halos	Museum of Literature
4	The Holy Virgin and the Infant Jesus	1657	Wood	Tempera	– Bound missing – Gaps in the pictorial layer	– Degraded varnish – Chromatic alterations	Xylophagous attack stopped	Excessive cleaning	Museum of Literature
5	The Holy Virgin and the Infant Jesus	1699	Wood	Tempera	– Gaps in the pictorial layer – Detaching Trends ...	– Degraded varnish – Chromatic alterations	Xylophagous attack stopped	– Excessive cleaning – Uneven cleaning	Museum of Literature
14	The Holy Virgin and the Infant Jesus	1833	Wood	Tempera	– Gaps in the pictorial layer – Detachments of l...	Thick and very degrading varnish which obstructs ...	Xylophages attack stopped		Museum of Literature
15	The Holy Virgin and the Infant Jesus	1922	Wood	Tempeta	– Gaps in the pictorial layer – Detachments of l...	– Degraded varnish – Deposits of adherent dirt ...	Xylophages attack stopped	Carelessly repainted with white and blue	Museum of Literature
24	The Holy Virgin and the Infant Jesus	2001	Wood	Tempera	– Fractured medium – Lack of support	– Degraded varnish – Deposits of adherent dirt	Xylophages attack stopped		Museum of Literature

Figure 5. Selection of the database objects which have the name 'The Holly Virgin and Infant Jesus'.

Users can search a particular type of degradation in the database and obtain information on the objects affected in this way and about how this problem was resolved.

4. Conclusions

The databases used in the field of cultural heritage restoration and preservation are very large. Such databases are complex because they contain very diverse designed information requiring a large amount of work for the collection and systematization of data.

```
SELECT *
FROM `muzeul_lit`
WHERE `nr_inventar` =2025
LIMIT 0 , 30
```

Current No.	Piece name	Inventory No.	Support	Working technique	Physico-chemical degradation	Physico-mechanical degradation	Biological degradation	Previous interventions	Location
25	The Holy Virgin and the Infant Jesus	2025	Wood	Tempera	- Gaps in the pictorial layer - Scratches and	- Degraded varnish - Deposits of adherent dirt ...	Xylophages attack stopped	Uneven cleaning	Museum of Literature

(a)

(b)

Figure 6. Selection of the database object (inventory number equal to 2025): (a) – front side of the icon ; (b) – back side of the icon.

The databases in this field are very important in order to keep the technical information and collaboration between research centers but also in order to educate the public.

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