

Facilitating VR Museums Web Presence

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Abstract

The paper presents an environment that enables museum curators to catalogue and publish on the web exhibits in multiple languages and media including 3D, video, images. The system is extendable to accommodate new media types, languages, exhibits, information categories, etc. Visitors have the potential to formulate dynamic personalised exhibit collections using search mechanisms provided by the system.

1 Introduction

The technological advancement of the past few years has made the World Wide Web accessible to new audiences, enabling thus organisations with an Internet presence to reach a far wider public. Among these organisations museums have realised the potential of the new medium, and an increasing number of museums make the decision to maintain a website in order to provide useful information and attract new visitors. Hermitage (Mintzer et al., 2001) and Louvre (site accessible at web address: <http://www.louvre.fr/>) are among and ever increasing number of museums that offer a wealth of information for their online visitors.

2 Museum Requirements

Accessible through the Web, the museum website is able to fulfill a new, augmented set of museum requirements, the main points of which are the following:

- *Support diverse target group.* Museum visitors in most cases form a quite diverse group, as they originate from a variety of educational, cultural and economical backgrounds and have different interests, educational needs, available time and cognitive abilities. The content of the website should be able to cater for as great a part of their needs as possible and multilingual and multicultural issues should be addressed.
- *Offer rich museum content.* The website should include a rich multimedia content, featuring high quality photographs, sound, video, 3d graphics, in order to offer to the visitors the experience of a virtual visit and contact with the permanent collections and temporary exhibitions of the museum.
- *Facilitate content maintenance.* The website content should be up to date with the museum exhibitions and periodically altered, so as to encourage visitors to re-visit the site and view the new information. Furthermore, since there exist museums with limited resources that cannot afford to employ permanent IT personnel, maintenance of the web site content should be carried out by non-IT personnel.

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- *Balance content quality vs. response time.* A suitable compromise has to be found between the quality of the transmitted information and the download time and the appropriate multimedia formats should be used, in order to make the museum content accessible to all users.
- *Provide suitable access paths to the information.* The virtual museum content should be properly categorized and organized, offering information with various levels of detail, to facilitate search and retrieval of museum information such as exhibits, photos, etc.

So far, a number of studies have been carried out on the issues relating to developing web sites in general and specially for museums. Kohrs and Merialdo (Kohrs & Merialdo, 2001) studied techniques for personalising content in the context of the web and tested these techniques in the context of museum web sites. Takahashi et al (Takahashi et al., 1998), describe a paradigm for unified and global access to heterogeneous and distributed multimedia contents of museums, while Marucci and Paterno (Marucci & Paterno, 2000) give an example of a museum on the web which does not disorients the user, and Hong et al. (Hong, Chen & Hsiang, 2000) describes two methods for querying the exhibit database. In the rest of the paper we present our approach to developing a portal for distributed museum databases along with an application for cataloguing museum exhibits.

3 System Specifications and Architectural Design

In the framework of the 'Virtual Museums' a project funded by the Greek Secretariat for Research and Technology, an environment for the development of a dynamic, multimedia, multilingual website along with the application for its maintenance has been implemented and installed in participating museums. The system aimed to cater for the requirements presented in the second section. To this end, the application designed displayed the following properties in relation to the museum requirements:

- *Target group diversity.* The database schema allows for the storage of different information for a variety of target groups.
- *Rich museum content.* The database schema can handle a variety of mediums (video, 3D, audio or images) and the administration is able to add new medium types as they become available.
- *Content maintenance.* Content management is carried out by a content management tool, allowing users to create, insert, update and delete all types of information related to a museum, starting with general data such as museum aim and history, collections and contact information, as well as exhibits and exhibit associated information.
- *Content quality vs. response time.* For each exhibit and for each medium type (i.e. 3D, video, etc.) the administrator can utilise three levels of quality, depending on the end-user's connection type (modem, isdn, or better). The end-user is able to select the preferred quality before downloading the data.
- *Information access paths.* Currently museums use an approach where exhibits are categorised according to a number of axes/properties and their corresponding values. A user may then search for an exhibit based on the properties. For example, a user may search for exhibits, which are made of clay, belong to early Cycladic chronological era and come from the island of Paros.

The architectural design of the system should be flexible enough to allow it to be installed either as a stand-alone application, or as multi-user application where each museum is able to store its data in a centrally located repository. Furthermore, in either case the museums can utilise a common portal for their Internet presence. This is the architecture depicted in Figure 1, where each museum has a local repository containing general information as well as exhibits, and there

exists an Internet Dissemination Server, which reads data from the corresponding database and creates the web page to be send back to the client that made the request. This type of architecture has a number of advantages. Firstly, it guarantees a common interface with the same look and feel for all participating museums. Secondly, since all changes in the web interface are carried out in one place it is easier to maintain. Finally, the single point of Internet presence facilitates the application of security policy, where all museum repositories can reside in a secure Intranet.

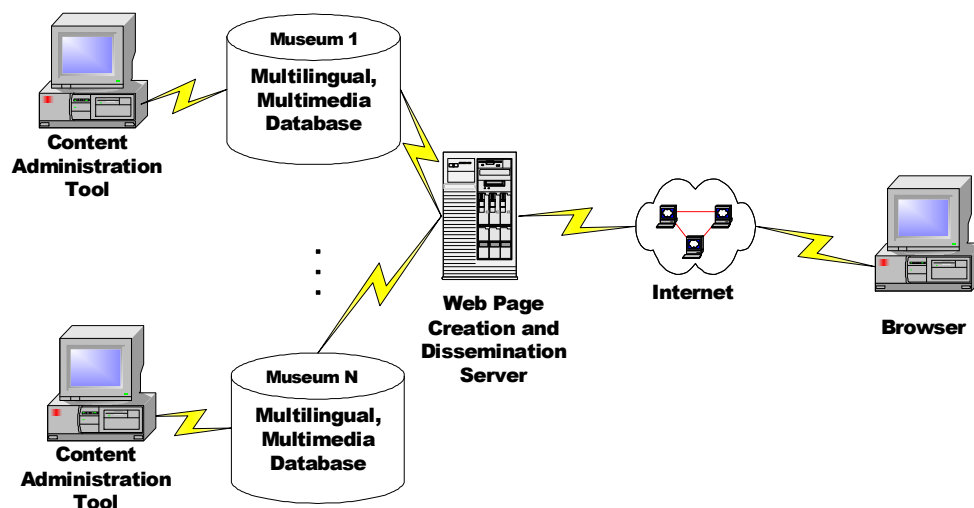


Figure 1: System architecture

As depicted in the architecture the content for the creation of a web page may reside in one or more information repositories. The museum database contains both textual and numeric data as well as the paths to multimedia content. Information whose size is relatively small, such as short text strings, is kept in the database, in order to facilitate efficient storage and ensure augmented search capabilities. On the other hand, larger, non-searchable structures such as images, sound, video and 3D models are stored in the file system and only their position is kept in the database. The database holds all information necessary for the indexing of artifacts as well as information needed for their efficient presentation on the web, such as 3D models and images in various levels of detail and multimedia information (sounds, video). Images and 3D models are stored in three levels of detail, low, medium and high.

Web presentation is formulated dynamically since this approach offers advantages in contrast to the development of simple, static pages: (a) maintenance requirements are minimized because there is no need to manually alter web pages when new content is introduced to the database and (b) presentation of information can be tailored to the visitor's preferences. A visitor may search for exhibits that satisfy certain criteria or characteristics and the dissemination server will create new, personalised web pages reflecting user's preferences. For example, while navigating in a museum a user may ask for all urns that were found in Cyclades and were made of clay. An application running on the web server accesses the database in order to select the relevant information, creates the respective HTML pages, and presents them to the visitor.

The site administrator or the curator may also create pre-defined collections, offering visitors the capability of a "guided tour". This can be done either as a series of predefined web pages or through the content administration tool, as described later. Since the website is fully dynamic, if a

new exhibit is added in the database and it is designated as “publicly accessible” by the web administrator, it will automatically appear on the web site.

4 Implementation and Data Base Population

The system was implemented on top of an OracleTM database using Apache as a web server and PHP as a scripting language. Figures 2 and 3 illustrate the search functionality and the presentation of an exhibit. It has to be noted, that for museums that offer multilingual content the visitor may switch to the same page in any other supported language at any time.

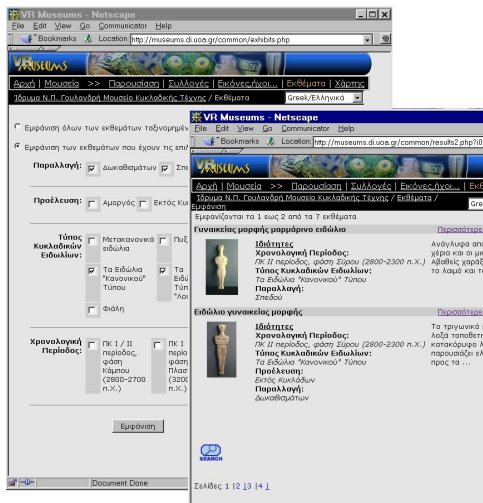


Figure 2: Search and Retrieve function

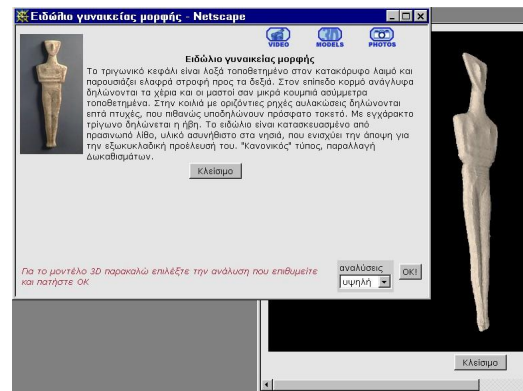


Figure 3: Presentation of exhibit

To facilitate the maintenance of the web content, a content administration tool was developed that permits the addition of new exhibits in the exhibit repository. The tool is a fully functional environment for cataloguing of museum artefacts, which was made according to the requirements of the participating museums' curators and is compliant to Computer Interchange of Museum Information standard (Computer Interchange of Museum Information consortium **CIMI**, <http://www.cimi.org>). When the curator adds a new exhibit to the catalogue, she may categorise it, add multimedia resources to it such as video, 3D models, photos, etc. If the curator selects to publish the exhibit on the web, it is made immediately available on the web site. The curator can also create collections of exhibits to facilitate the presentation of exhibits according to different properties.

In order to populate the database with digital content the following procedure was employed. First, each museum curator selected exhibits to be digitised. Museum curators were also responsible for preparing the accompanying textual resources. For the selected exhibits multimedia content was created depending on the object's properties and presentation needs. For most of the exhibits a combination of presentation mediums was applied, usually photos and videos or photos and 3D presentation.

For the creation of 3D objects one of the following three techniques was used: 3D photography, 3D scanning or 3D modelling. 3D photography produced good quality representation of the original artefact with a reasonable amount of effort. 3D scanning produced better quality and a more precise reproduction, however it required more effort from 3D photography and was used

mainly in cases where the other two techniques did not produce acceptable results. 3D modelling was used when the original artefact comprised of geometrical forms (as was the case with machines). 3D modelling allowed the creation of 3D objects that were an assembly of smaller parts and offered flexibility in their manipulation. For example, by modelling an engine, the designer may offer the user the possibility to assemble and disassemble it, providing a sense of enhanced interactivity.

5 Conclusions – Future Work

In this paper we presented a system that allows the cataloguing of museum exhibits along multimedia information such as images, audio, video and 3D objects and their consequent presentation on the web through a multilingual portal.

Although the project has finished, work is continuing with internal funding and has currently focussed on the design and implementation of extra functionality in the system. The new version of the system will support systematic cataloguing of exhibits, an important issue for indexing and retrieval of exhibits from museums like the zoological. Another research direction, which is currently under investigation, is the on-the-fly creation of virtual worlds, based on the user's preferences where the user will be able to navigate and manipulate the exhibits through the browser.

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