Exploiting Pompei Cultural Heritage: The Plinius Project

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Abstract

Enlarging and improving the fruition of national cultural heritage is becoming a crucial goal for many nations, obviously including Italy, which owns the larger set of ancient findings of the world. The Plinius project[1] is part of this goal. In particular, it concentrates on the archaeological heritage of the Pompei site with a twofold objective. On one side, it aims at allowing different classes of users to enjoy and exploit the Pompei cultural heritage, by providing them with a suite of personalised tools, whose features address the different needs of the various user classes, ranging from the archaeologist to the casual visitor. On the other one, it intends to retrieve and reengineer the outcoming of a previous twenty-year old software projects, which stored and catalogued a huge amount of information about Pompei findings into a legacy system, based on an obsolete hardware architecture. In this paper we introduce the Plinius project by briefly describing its context of use, the user classes, the system architecture and functionalities.

Keywords: cultural heritage, authoring tool, multimedia database, system architecture.

1. Introduction

One of the advantages of recent multimedia technology is the availability of tools that allow one to easily and often remotely access the huge artistic-cultural heritage of the world. Moreover, specialised systems exist, namely authoring systems [10], that provide visual tools to help the user, i.e. the author, composing the multimedia application, while the system automatically generates the necessary code. In the cultural heritage area ad-hoc versions of authoring systems could be profitably used to set up, both virtual and real, exhibitions and museums, equipped with a certain number of multimedia guided tours, which may then be enjoyed by the visitors.
Realising a museum/exhibition-oriented authoring tool, simple enough to allow a non computer-expert user to easily set up an exhibition, a museum, or a virtual archaeological site, and experimenting it on a real case study, namely the Pompei archaeological area, is one of the objectives of the Plinius Project [3]. Plinius is a government funded project aiming at building a suite of software tools for a better exploitation of the cultural resources of Pompei archaeological area. The Plinius starting point is the information patrimony deriving from a previous project, Neapolis, that in 1989 led to the construction of a database (the Neapolis archive) containing a notable quantity of information (pictures, text, cartography) about Pompei. The Neapolis archive included different autonomous and interacting subsystems, including RA (that managed the cards containing all information concerning archaeological findings); DS (that managed the information about diaries of excavation); "Indirizzario" (containing denominations and destinations of use of the various buildings); PILAF (Pompei Incisions,

Lithography, Watercolour, epochal Photos); SIT (System Informative Territorial dealing with the cartography).

The paper is organised as follows: Section 2 presents the overall architecture of the Plinius system together with the structure of the underlying multimedia database; Section 3 summarises related work.

2. The Plinius Project

The Plinius project described in this paper is a three-year project, which officially started in 1999. However, it represents the enlargement and continuation of a previous smaller two-year project, whose results are a first prototype of the authoring system, the initial reverse engineering of the Neapolis database, and a first prototype of the visitor interface (see below).

2.1 Objectives and Users Classes

The main objectives of the Plinius Project are:

- offering ad-hoc services of search and navigation to researchers and scientists accessing in particular Pompei data, but also any other database containing cultural heritage related information;
- adopting advanced hypertextual, multimedia and virtual reality based techniques to set-up guided tours and interactive kiosks attracting the visitors;
- designing a cultural heritage oriented authoring system to help the author to create both virtual and real exhibitions.

The ultimate goal of the project is to offer a suite of tools that make cultural heritage data easier to manage for researchers and more enjoyable for people, also integrating into a uniform environment heterogeneous data coming from the Neapolis archives.

Given that the final product of the project will be a suite of interactive systems, we are following a "user-centred" design methodology [8], which requires the characterisation of both the user classes and the system context of use.

In particular, five user classes have been singled out:

- *Specialised users* (archaeologists, scientists, researchers), whose task is to carry out some deep analysis of the available data, in order to discover some hidden correlations. Plinius will offer them a set of query, navigation and data analysis advanced facilities to support their task.
- *Authors*, whose task is to set up a real or virtual exhibition, equipped with a set of guided tours. The Plinius authoring tool [3] gives an author

the possibility to define a structure, select a set of objects from the available database, and possibly impose sorting, grouping and placement rules. Then, the system generates the exhibition, trying to satisfy all constraints, both deriving from the structure (objective constraints) and specified by the author (subjective constraints). Finally, the author is provided with a suitable environment to define visit paths inside the structure.

- *Site administrators*, whose task is to maintain the database, analyse data concerning the visitors, check the correspondence between the real visit paths of the area and the virtual ones, etc. These users will have at their disposal a specialised interface, which will be developed during the final year of the project.
- *Visitors*, who just want to enjoy Pompei artistic/cultural heritage. They will be provided with interactive kiosks placed along the visit paths, with both an informative aim, i.e. displaying various kinds of data and news about places and artefacts, and an educational aim, to give precise didactic information and show virtual reconstructions and visits of monuments.
- *Remote visitors*, who want to access the available information via Internet. Plinius will offer them features in between the ones given to the visitors and those given to the specialised users, taking into account the limitations deriving from copyright issues.
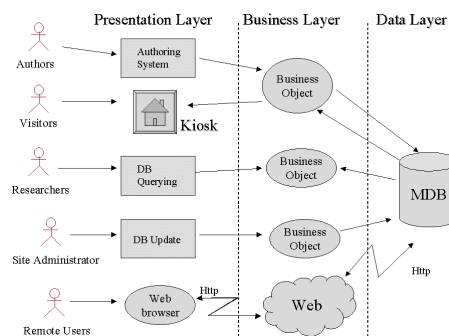

Figure 1: *System Architecture*

2.2 System Architecture

The overall system architecture, described in Figure 1, is based on a three-layered (namely, Presentation, Business and Data layers) client/server approach.

The Presentation layer is responsible of the user-system interaction; the Business (also called Application) layer, through a set of component modules, realises the interface between the Presentation and the Data layers, which is in turn responsible of the multimedia database management (see Section 2.3 for a description of the multimedia database).

The Presentation layer will provide the author with the authoring tool mentioned above, allowing her/him to build exhibitions and visit paths, that will be stored in the multimedia database and offered to the visitors through the interactive kiosks.

The site administrator will be the only one allowed to update the database (inserting new data about findings, paths, etc.), while specialised users will exploit several tools to access and analyse the data, which will also be partially available to the remote user.

It is worth noting the high modularity and openness of the architecture, which makes easy to incorporate new modules, based for instance on XML and Z39.50, to realise a fully interoperability between Plinius and other museum systems.

As for the implementation status of the prototype, the following functionalities are presently available:

- Simple or advanced search on archaeological findings and diaries of excavation;
- 3D navigation in a virtual Pompei;
- Virtual visit paths;
- Exhibit/visit construction through the authoring tool.

2.3 Plinius Multimedia Database

The Plinius database is the result of a process of reverse engineering and integration of the various Neapolis archives. The starting point of the analysis was the set of cards describing the findings, from these it has been possible to design an object-oriented database schema containing the main classes of interest: archaeological findings, buildings, artists, and documentary sources (see Figure 2).
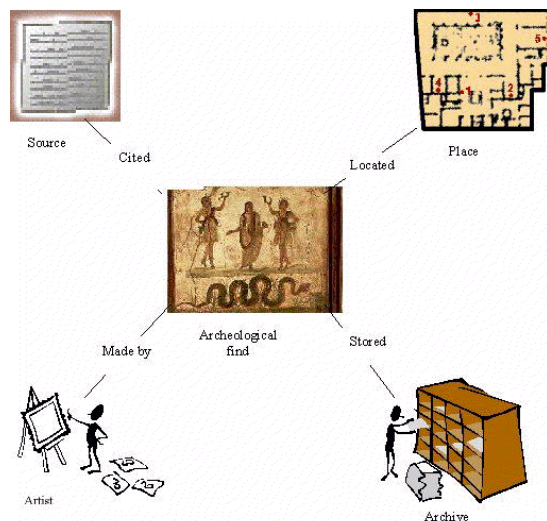

Figure 2: *Plinius Database Main Concepts*

The analysis of the Neapolis documentation, plus the cards and data specifications have identified `archaeological findings` and `buildings` as the fundamental classes of the system. Thus, such two classes, together with their properties, have been the starting point for defining the complete database schema, by following a top-down methodology [1]. For instance, from the class `archaeological finding` at the first level of abstraction, two classes, `finding` and `artist`, connected through a relationship, have been derived in a subsequent refinement, where the `artist` class is still an abstraction for a larger part of the schema, containing information about the environment, period and people involved in the creation of the artefact. Analogously, the class `place` abstracts the subschema concerning the locality of discovery; the class `source` stands for all data related with sources of information about the findings; and the class `archive` contains all information about existing paper archives related with the findings.

3. Related Work

The importance of the cultural heritage area as a crucial application area for multimedia systems is continuously growing. As a consequence, several multimedia projects, similarly to Plinius, aim at exploiting the artistic/cultural heritage of a nation.

Despite several virtual museums available on the Web, which are mainly simple applications of hypermedia navigation and tridimensional visualization, there are various interesting proposals of innovative systems. For instance, HyperAudio [9] is a notable example of adaptive tool for building museum visits which automatically fit both the different needs of the visitors and the spatial organization of the museum. HyperAudio shares with Plinius the idea of adapting the visit paths to the different users, while satisfying cultural and physical constraints. However, while Plinius provides the author with the ability of selecting and modifying such paths in any, real and virtual, exhibition and museum, and then offer them to the visitors, HyperAudio is based on a physical set-up of sensors in each museum of interest. Such sensors react to the signals of a special helmet carried by the visitor and then guide her/his visit.

"Safeguard of Cultural Heritage"[4] is a project promoted and funded in Italy by CNR, the National Research Council. It deals with the automatic acquisition and manipulation of 3D artistic objects. The main objective is to develop a complete set of methods and tools which permit to acquire the shape and colour information of 3D objects (statues, vases or jewels) and to represent them in a way suitable for multimedia applications (virtual museums, multimedia document). We are studying the possibility of integrating its results into Plinius, to build more realistic visit paths.

Other projects, like Aquarelle [2], GDM (Global Digital Museum) [11], MOSAIC [5], MOAC [6], G7-PILOT [7], propose different solutions to manage the artistic patrimony.

Aquarelle addresses the problem of the three-dimensional representation of artistic objects (sculptures, architectural elements, vases, etc.) in a Web-based environment, using non-specialistic, low-cost hardware and software. The basic idea is to dynamically build a 3D environment which is both interactive and suitable to contain a set of 3D objects which represent the result of a SQL query expressed via Internet.

GDM (Global Digital Museum) permits an easy access to several work of art stored in museums around the world. The system provides the user with a single virtual museum, equipped with uniform search and navigation mechanisms.

The MOSAIC project [5] aims at supporting the creation of virtual exhibitions selecting objects from existing on-line museums, institutions, etc.. Once fixed some parameters, like the subjects, the reference period, etc., the system will automatically locate the various sources of related information.

The MOAC (Museums and Online Archive of California) project [6] aims at solving the problems deriving from the geographic distribution and the limited access to the collections of unique materials that are located in libraries, museums and archives around the world. The idea is to create a global "virtual museum archive", thus providing access to collections held by archives, museums and libraries geographically distributed.

Finally, the G7-PILOT project has the ambitious objective of digitalizing and distributing over the Internet the overall world artistic/cultural heritage. In conclusion, looking at the overall state of the art, there are three main issues still to be addressed: complete digitalization of the various museum collections, to archive all possible electronic information (data, pictures, texts, bibliography, video, sound) for wide public and professional use; general agreement on data exchange and copyright issues; design and implementation of easy-to-use interfaces for cataloguing the museum contents.

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