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Societies, Institutions, and Networks

Call for Papers

Using an interactive, 3D web platform to present the main monuments of Crete and their evolution in time

Conceptual models offer the ability to capture several concepts, and more importantly their often complicated relationships, in one single view. When applying this method in order to represent a geographical region's past, this would mean an emphasis on the dynamic structure of the cultural phenomena represented and not on a formalistic evolutionary catalogue of data and de-contextualized information. Especially when dealing with complex and deep hierarchies or intangible notions, a conceptual model can offer an additional level of perceptual understanding. We use the Conceptual Modeling Language (ConML) in our proposed application for the presentation of the main monuments of Crete as a tool for organizing, manipulating, and communicating the large amounts of data such a project entails. Conceptualization and abstraction of information through different levels of detail allows the application to be light and easy to use. Moreover, the ability to switch between different historical periods offers a comparative study of the monuments evolution in time. Thus, we aim at a dynamic representation from the user of Crete's, an island characterized by the Mediterranean's rich and polyvalent historical development, culture.

Keywords—Cultural heritage; conceptual modeling; visualization; abstraction; 3D

I. INTRODUCTION

Crete is the largest island of Greece, located to the south, famous for its rich cultural history, which dates back to the Middle Paleolithic age, 128,000 BC. Crete was the center of the Minoan civilization (2,700-1,420 BC). Since then, a large number of monuments has been documented throughout the different historical periods, the most important of which are the following seven (7):

a. Minoan

b. Hellenistic

c. Roman

d. Byzantine

e. Venetian

f. Ottoman

g. Modern

Our goal is to design an online platform open to the public for the promotion of the cultural heritage of Crete, through a simple, user-friendly intuitive environment. Our prime challenge has been how to manage such a large amount of information over the internet, in a transparent, light and simple way for the end user, in addition to offering the ability to compare data over time, during the historical periods. In order to achieve this we have been using the notion of Conceptual Modeling along with the principles of Model Based Information and Object Oriented Databases. The idea is simple: instead of having all information to its full extend available up front, we break it into nodes, levels of abstraction, called "Levels of Detail", providing the minimum information needed at each given time. Information is stored on each object, each monument, along with its different Levels of Detail. The Levels of Detail that we are using in this platform are the following five (5):

a. Prefectures

b. Cultural provinces

c. Settlements - Towns

d. Building complexes

e. Buildings - Monuments

The conceptual diagram on which this platform is based can be seen on Figure 1.

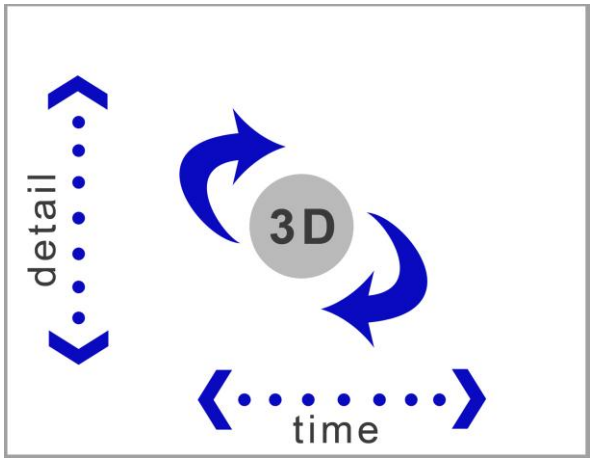

Fig. 1. Conceptual diagram of the platform

II. THE PLATFORM

The platform is comprised of the main, central space, where the 3D models are presented, and two scrollable sidebars, one horizontal and one vertical. The horizontal one controls time, and allows the user to switch between the seven historical periods and the vertical one controls the level of detail, allowing the user to switch between more or fewer abstract modes. At the same time, the user has the ability to navigate in real time in the main space around the models, using pan, zoom in/out, rotate, etc. Only when the user reaches the fifth Level of Detail, that of a single monument, he/she has access to all the

available related information, which depending on the type of monument could be:

- Photographs
- Architectural drawings (of the existing and/or the restored monument)
- 3D model (of the existing and/or the restored monument)
- Walkthrough animation (of the existing and/or the restored monument)
- Video of the area as it is today
- Maps of the area
- Related documents with more information
- Related links to other websites
- Keywords. Use of keywords allows a cross-reference function independent of the 3D models.

The philosophy of the monument presentation is intended to address mainly non-experts, therefore it follows a more abstract and simplified view of information. It should be easy to use for a visitor who does not have a deep knowledge about Crete and its civilization and would like to be informed at a glance what to visit and where. On a second level, the visitor can focus more on a group of monuments and prepare for his/her visit acquiring more specific information, stored "on" the monument's model itself. The application is currently based on Adobe Flash in order to provide maximum compatibility with most of the major web browsers, to be light and easy to use and to avoid installation of other software. At the same time we are investigating whether technologies such as Unity 3D or SpiderGL9 can provide as a more suitable environment to work with.

The proposed application could take advantage of other related research projects which have rigorously documented and categorized the monuments of Crete, such as the "Digital Crete: Mediterranean Cultural Itineries"7 (http://digitalcrete.ims.forth.gr), which was implemented under the framework of the Greek Operational Program Information Society (Action 1: Education and Culture, Measure 1.3: Documentation, Management & Promotion of Greek Cultural Heritage) (http://www.infosociety.gr).

III. USING THE CONCEPTUAL MODELING LANGUAGE (CONML)

There are a number of languages suitable for conceptual modeling, such as CIDOC CRM or UML. The reason we chose ConML (GONZALEZ, PARCERO-OUBIÑA 2011) is because ConML is easy to be utilized by non-experts in information technologies, is simple and can prove to be expressive in complex domains such as those in the humanities. In order to begin building our conceptual model, first we have to define our main classes: the class "Object of Interest" and the class "Representation". The fundamental argument on which our model is based is: "every Object of Interest is represented through a Representation". The Objects of Interest can be one of the following five (5) classes, which are Subclasses of the "Object of Interest" class: "Monuments", which can be part of a "Building Complex", which can be part of a "Settlement", which can be part of a "Cultural Province", which can be part of a "Prefecture". Each of these five (5) Objects of Interest can have attributes, such as "Description", "Links" and "Keywords". They must all have a common attribute though, the "Historical Period", which therefore becomes an attribute of their abstract class, the "Object of Interest". The data type of the attribute "Historical Period" is enumerated type and can take a value of one of the following seven (7): Minoan, Hellenistic, Roman, Byzantine, Venetian, Ottoman and Modern. Since one Object of Interest has to belong to at least one Historical Period, but could also belong to more than one, the cardinality of "1…*" is placed next to the name of the attribute. The class "Representation" has the following subclasses: "Photo", "Drawing", "Video", "Map", "3d model", which have various attributes such as "Exterior", "Interior", "Resolution x", "Resolution y", "Color", "View", "Reality", according to their type. Their common attributes become attributes of their abstract class, the "Representation", and are the following: "Analog" (type: boolean), "Copyrights" (type: text), "Year" (type: number), "Description" (type: text) and "File Format" (type: enumerated).

IV. CONCLUSIONS

The primary contribution of the proposed platform is the ability to capture time in a comparative format. Nevertheless, the fourth dimension is exploited here in a more abstract way than other scientific approaches (KULITZ, FERSCHIN, MATEJOWSKY 2010), (MYLOPOULOS 1992) since realism and full detailing is not the goal of this application. Furthermore, its advantages are: the user friendly interface which is addressed towards non experts and its ability to continuously expand with new material regarding either new monuments or new information for existing monuments. Some of the issues we are currently working on are:

- Subjectivity due to abstraction. When information is abstracted, the role of the person who decides which information should be secluded is a key role since it could possibly skew the end result.
- Uncertainty due to lack of information.
- Use of multiple semantic links.

- Interoperability / expansion. The proposed application could serve as a central platform which could be joined by other applications which focus on a more detailed, photorealistic monument representation.

- Building Information Modeling (BIM). What can we learn from the structure of information used today in BIM?

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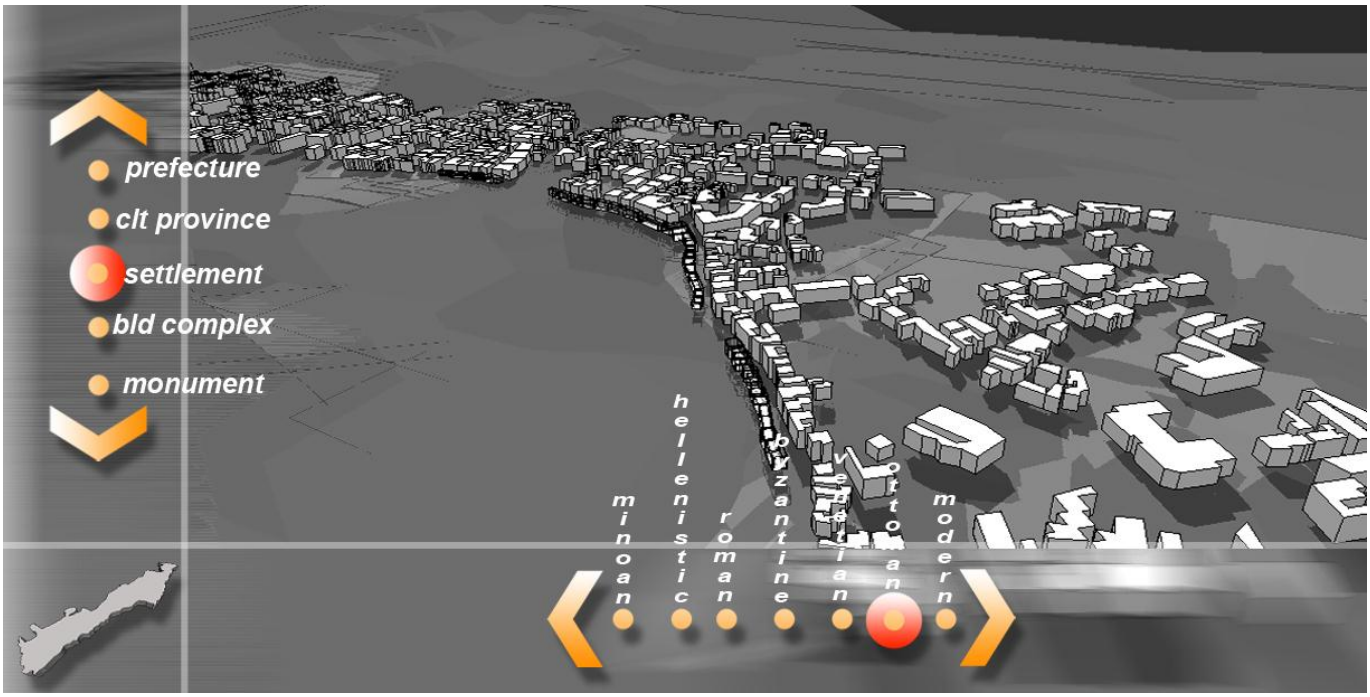

Fig. 2. User Interface of the platform

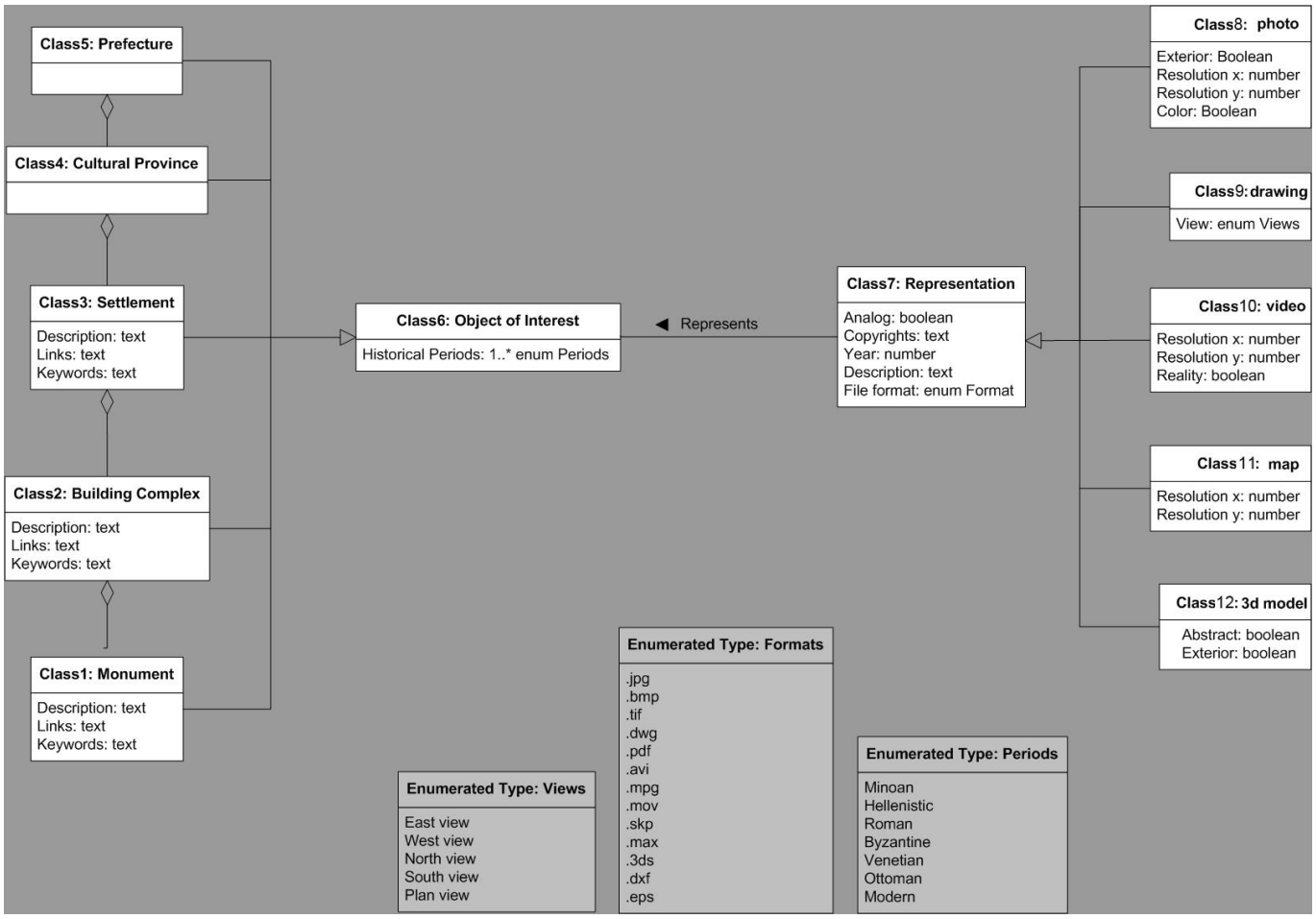

Fig. 3 Conceptual model using ConML