# Producing Cultural Narratives in Greece: Towards a Multi-Storytelling Approach

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*Abstract*—In this paper we discuss the design and technological issues we faced in order to implement digital content, following specifications defined by Greek Cultural Institutions during the decade 2000-2010. We focus on projects aiming at the production of narratives for use in user-centric, context aware interactive platforms.

*Keywords*—*Digital Cultural Heritage; Interactive Design; User Experience Design*

## I. INTRODUCTION

During the decade of 2000, 104 Public and semi-Public cultural institutions, such as Museums, Archaeological sites, Archives and Libraries, were financed under the Greek Information Society Framework in order to digitize their collection and valorise the resulting digital content in various ways. We've participated in the implementation of several valorization projects for the account of multiple institutions, producing a number of digital products including: multimedia titles, web sites, e-learning platforms, computer games, cultural content archives, databases, etc. Independently of the collections' content, context of use (on-line, off-line, indoor or outdoor applications) or technology adopted (augmented reality, computer vision, stereo 3D animation, physical computing, etc.), most of the valorization projects included the production of narratives. These narratives were integrated within a global design approach, specified by the cultural institutions, but presented several production challenges. Multilingual content, interoperability, user experience, technology concerns, are some of the design issues to take into account during the implementation of cultural narratives.

This paper describes the design and production challenges for cultural narratives integrated in three seminal projects. The first project was ARCHEOGUIDE, an Augmented Reality Multimedia Guide, tested as a functional prototype in Ancient Olympia, implemented by a European Consortium supported by Research and Development Funding from the European Union (2000-2002) [1]. The second project, *Watch-Out! The Eyes of the City* was an artistic interactive installation proposed by Maurice Benayoun, produced in the context of Athens 2004 Olympic Games, and financed by Athens 2004 Organizing Committee [2]. Finally, we accompanied the adventure of building the New Museum of Acropolis, producing the web site of OANMA, the Organization for the Construction of the New Museum of Acropolis, then implementing digital content for two stereo 3d animation films and two edutainment titles for children, containing non-stereoscopic versions of the films and computer games related to the films' content.

In the following sections of this paper we will be analyzing the design elements for each project: scope, target audience, content design, interfaces, user experience, technology, strategy.

## II. ARCHEOGUIDE

### A. Scope: Telling the Story of Ancient Olympic Games

The purpose of this project was to offer personalized augmented reality tours of archaeological sites. It used outdoor tracking, mobile computing, 3D visualization, and augmented reality techniques to enhance information presentation, reconstruct ruined sites, and simulate ancient life [1].

In the context of a Research and Development project, only a few narratives were produced telling the story of the excavations in Ancient Olympia, the story of the temples and related buildings, and the story of the athletic games taking place in the stadium and other Olympic premises.

### B. Target Audience

Several user profiles were designed to accommodate the needs of archaeologists, curators, teachers, pupils and tourists. Non-participatory user design models were implemented, anticipating user needs rather than interviewing tourists and archaeologists, two profiles that were actually implemented in pilot phase for evaluation purposes.

### C. Content Design

Multiple user profiles militate for multiple textual narratives, written and narrated in several languages. English and Greek versions were produced for the pilot phase, and then transferred to all delivery platforms. Accurate 3D models of the main temples were implemented thanks to extensive archaeological reports for each temple from the Restoration Services of the Greek Ministry of Culture. High and low resolution images of the temples were produced for use in several display devices. Animations with 3D avatars simulated athletic games in the stadium (javelin and disk throws, running races, etc.). For evaluation purposes, all temples were

represented in their glorious form (5th century BC) assuming homogeneity in their construction. In reality, the columns of the temples were not identical, as were constructed thanks to donations: one donator could afford a wooden construction while a more fortunate one would prefer marble as construction material [3].

Fig. 1. ARCHEOGUIDE System Architecture
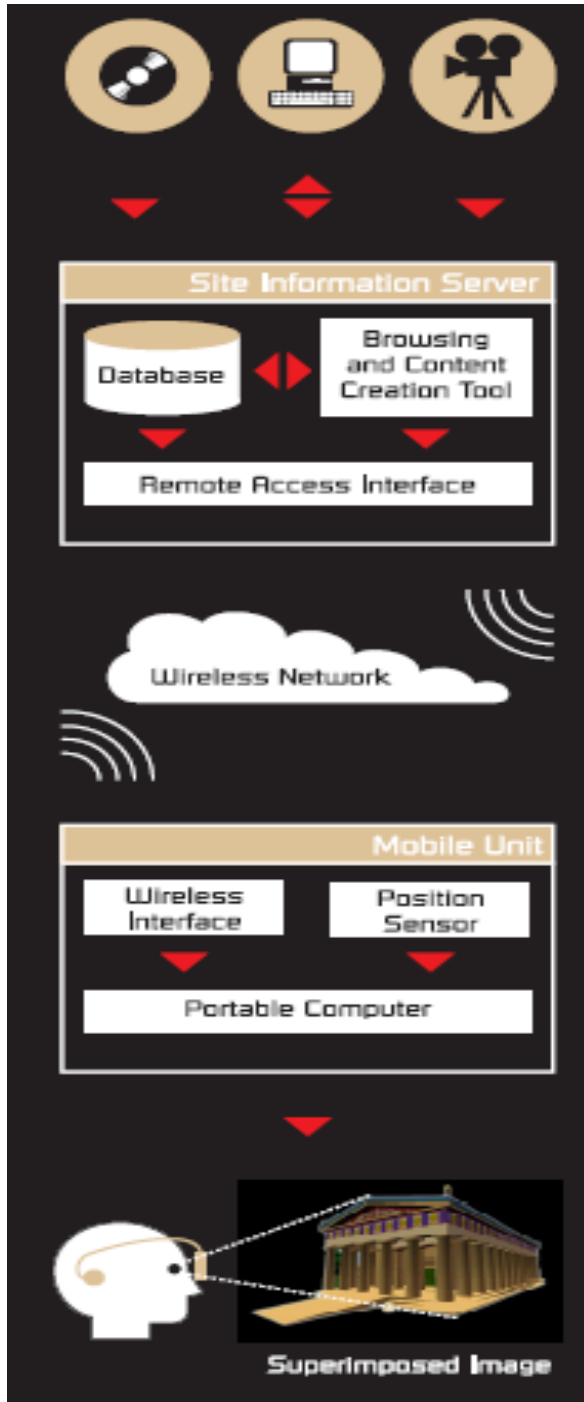


## D. Interfaces

User-friendly interfaces were designed and implemented: Binoculars permitted the superposition of high-resolution images of ancient temples to video images of the ruins in predefined observation points on site; Light Weight Head Mounted Displays offered the possibility to move in a predefined trajectory while enjoying medium quality superposed views; Tablet computers enhanced with position detection devices presented 3D reconstructions of the Olympic site from the point-of-view of the visitor providing also a navigation menu to access multimedia information from the Ancient Olympia Museum's database; Palmtop computers equipped with position detection devices displayed pre-rendered high resolution views of the site and access to the Museum's database.

## E. User Experience

The majority of users were considered travellers in ancient time and space, exploring the site from a subjective point-of-view using the interfaces described above. In terms of interaction with the site they were free to wonder within the actual ancient area for a limited period of time, mainly depended on the batteries autonomy (2 hours approximately). In comparison, the main visitors' path in Ancient Olympia lasts in about 1 hour. The main drawback that hugely restricted user experience and was impossible to overcome in the first prototype concerned the heavy client system (20 Kg) that every visitor had to carry in a bag. Expert users of the system had access to the authoring functionalities of ARCHEOGUIDE, provided in the server part of the system.

## F. Technology

The system's architecture was that of a client/server information system using wireless communication protocols and portable devices including sensors, computers etc. (see Fig. 1). To enhance video views through augmented reality techniques, the consortium implemented position and orientation detection algorithms using computer vision techniques, informed by Geographical Position Detection devices, orientation devices, and image databases [1].

## G. Strategy

ARCHEOGUIDE was designed as an Integrated Multimedia Authoring, Documentation, and Presentation system. It provided Multimedia Content Scalability for presentation over a range of mobile devices. It contained metadata descriptions for cultural content documentation. It was implemented on mobile augmented reality platforms suitable for automatic and interactive operation. The system was based on intuitive Human Computer Interaction techniques suitable for users with minimal or no computer skills. It ensured realism and scientific accuracy regarding its Augmented Reality presentations. Lastly, it supported accessibility features that were implemented on the basis of personalized Augmented Reality tours for children and visitors with special needs.

## H. Evaluation

Unique at its time, ARCHEOGUIDE set the standards for all user-centric, context-aware platforms related to Cultural Heritage applications.

In term of Augmented Reality technology, evaluation tests in Ancient Olympia demonstrated that visitors consider acceptable to follow a concrete path and that lightweight AR binoculars were far user-friendlier compared to Head Mounted Displays [4].

## III. WATCH-OUT! THE EYES OF THE CITY

Athens 2004 Olympic Games symbolised the return to the birth place of Olympiads for the third time in the History of Modern Games.

To foster the idea of celebration, a special service of the Athens 2004 Organizing Committee produced nine interactive playgrounds in selected areas of Athens. The purpose was to enhance the feeling of celebration and expand it to all visitors of Athens during the Olympic Games.

Fig. 2. Big Brother's Eyes in Olympic Athens



## A. Scope: Playing Games in Olympic Games

*Watch-Out! The Eyes of the City* by Maurice Benayoun was designed as a provocative action against the fear of authoritatian surveillance that was amplified by the mass media before and during the Olympic Games. The artist modified a previous version of the project presented in Seoul. The main purpose was to send warning messages to the world (to the audience through large projector displays) while an Orwellian eye secretly observed the passers by (see Fig. 2).

To send a warning message, one had to exhibit a number of actions directed by his/her curiosity. By putting his/her eye on the opening located at the center of a specially designed to attract attention 'warning box', similar to those used in public works, the user initiated a series of events.

Following the artistic concept of the Orwellian eye, the user's eye was captured by the camera inside the box and in turn would become a video projection. Therefore the same user was also the one that at a later time would have been observed as the "authoritarian" observer himself/herself. This circular situation was to ridicule the hypothesis of monitoring in an Orwellian world.

In addition, warning messages sent by other users through SMS were superimposed to the image of the eye that was in turn projected on large scale displays attached at the fronts of commercial stores.

## B. Target Audience

The installation was to explore the inherent human qualities of inquisitive thinking such as exploration, investigation and learning, all related to the behavioural and emotional states of curiosity. Every visitor of the Athens 2004 Olympic Games was considered a possible user and therefore should have benefited from the interactive installation.

## C. Content Design

The project had two main types of content to handle: real-time captured imagery and text messages.

The visuals were captured in real-time by the system that was installed inside the box. The captured video was also processed by real-time non-photorealistic filters and streamed with a small delay to the remote projectors.

The text messages were handled by two servers, an SMS server and a web server. Text messages could be written in virtually any language but prior to their registration with the system database they were controlled by an operator in order to avoid blasphemy, racial discrimination and sexual allusions.

## D. Interfaces

The box was the main interface with the system. Once the user put his/her eye to the hole, he/she sees a black monitor soliciting his action by displaying the sentence "send a warning message to the world".

The messages were sent asynchronously to a 4-digit mobile number or through a web site dedicated to the system. While watching inside the box, the eye of the user was filmed in close up by a small hidden video-camera. Video-projectors displayed the captured and processed imagery superimposed by the text messages.

## E. User Experience

In daytime, the user could pass by the box without noticing the existence of the hole nor the black step destined to assist children (see Fig. 3). The system sets the video-projectors on when the stores were closing at nine-o-clock in the evening.

Most passersby noticed the existence of the installation at night. The area around the box was crowded and groups of people interacted with the system in good mood.

Certain persons assigned themselves as spectators of the screen showing the image of the eye superimposed by warning messages.

Fig. 3.    Day time interaction



Fig. 4.    Playing at Night



### F.  Technology

*Watch-Out! The Eyes of the City* was initially designed for wireless communication between the various components of the system (main system and clients). Unfortunately, the trials on site revealed that the morphology of the place and the networking technology at the time was prohibitive for high bandwidth wireless communications. We had to install network cables all over the area.

Two of the cables were aerial connecting the box with the main store and the main store with the second one. In total three commercial stores accepted to display images projected from the box, installing the necessary cables and video-projectors in their premises. Power supply for all components was supplied by the commercial stores just before closing at nine-o-clock.

The database for warning messages was accessed through an internet connection from a computer hidden inside the box. The mixing and superposition of the eyes' images and warning messages was operated by the same computer automatically. Special algorithms were coded for database retrieval and the mixing of video and text signals. Further discussion on technological issues can be found in [2].

### G.  Strategy

Athens 2004 Organizing Committee launched an international competition for interactive works. The selection of nine propositions permitted the animation of nine central areas of Athens and their transformation in playgrounds. Tourists from all over the world had the opportunity to interact with artistic installations and enjoy the playful atmosphere in these areas.

### H.  Evaluation

300,000 visitors interacted with the system installed at Kapnikarea's place. The playful ambiance around the system surpassed the organizers' expectations. Thanks to unexpected users' behaviours, Maurice Benayoun realised that, once delivered to the public, a work of art belongs to the public. This was especially true for interactions exploiting the small delay between the video recording and the screening of the eye in the store display. A few users that interacted by looking at the hole managed to go back rapidly and watch their own eye superimposed by warning messages.

A relatively dense document discussing production issues during the operation of the interactive installation may be consulted in [5].

## IV.  DIGITIZING ACROPOLIS OF ATHENS

In the beginning of the decade 2000-2010, a vast digitization program was specified by the Greek Ministry of Culture under the Information Society framework. This framework continues to run at present time. It finances information and communication technology projects including projects from the Cultural Sector. The goal of the digitization program was the production of digital databases from the archives of Public and Private Cultural Organizations with important collections of cultural works. 104 organizations participated in the first call for projects, including Museums, Archaeological sites, Film Archives, and National Libraries.

The Information Society Framework specified also the implementation guidelines for successful digitization projects. Prior to the first call for projects, the Information Society Organization, in charge of the implementation of the related Framework, published several studies on how to digitize content (sound, text, images, video, 3D models, etc.), document with metadata,  stock in appropriate standard formats, and market online.

The most useful document for Cultural Organizations was a Report on Best Practices from International Digitisation Projects that is still a reference for cultural projects in Greece [6]. Based on these documents, Cultural Organizations could apply for funding, having the obligation to follow a systemic approach, delivering functional databases, e-learning platforms, web sites, digital memorabilia, video and interactive works, etc.

Deliverables such as video and interactive projects were considered to be part of the valorisation of the project. Not surprisingly, the guidelines on how to tell a valorising story were left to the applicants for funding.

Under the Information Society Framework, we've been producing several cultural projects. We narrate hereafter a typical project undertaken by the Acropolis Restoration Service. We focus on the production of digital content for two stereo 3D animation films and two edutainment titles for children, containing non-stereoscopic versions of the films and computer games related to the films' content.

The overall project consisted of a bunch of digital educational products, including the above mentioned off-line products and two online products: one web site and one e-learning system.

### A. Scope: Telling Stories of Athenian Glory

Once decided on the pedagogical scope of the project, the Acropolis Restoration Service selected two existing educational kits to transfer in digital form. The first project was entitled "Let's go to the Acropolis", narrating the Building Program of Pericles and surveying older constructions and temples in Acropolis of Athens. The second project focused on the components of "an ancient temple", narrating doric, ionian and corinthian styles.

### B. Target Audience

Children accompanied by their parents or their teachers were expected to form the audience of the stereo 3D films, projected in the Virtual Reality Theater of the New Museum of Acropolis.

Potentially all visiting children could discover in school the corresponding kit, containing a DVD with a non-stereoscopic version of the films seen in the VR Theater and computer games evaluating children's knowledge via a puzzle type game.

### C. Content Design

Accuracy in digital representation was the main concern in content design. Digital models, colours, textures, etc., were supervised by Archaeologists.

The most difficult form to digitise was the surface area of the rock of Acropolis. It was digitised from a scale-model created under the supervision of Manolis Korres, the Architect in charge of the restoration of Parthenon. The scale-model was exhibited in the Museum of Acropolis and the digitisation had to be done during the closing hours of the Museum taking special precautions.

The form of the temples was documented by the Acropolis Restoration Service. It was the first time undertaking stereoscopic representation of the temples which should be projected with stereoscopic video-projectors.

Camera movements in stereoscopic screens must be slow in panoramic views and centred when travelling towards the filmed object. Concerning the computer games, they had to reproduce the physical games included in real children's kits.

Fig. 5. The existing physical Museum kit to reproduce



Fig. 6. The physical model of the rock of Acropolis provided with the physical kit



### D. Interfaces

Passive stereoscopic displays were chosen to accommodate screenings of the films in groups of spectators wearing polarized glasses. The stereoscopic screenings last approximately 12 minutes in the Virtual Reality Theater of the New Museum of Acropolis. At the time of the implementation of the project the Theater was not built yet. To test stereoscopic sequences we had to use the screening room of the provider of the system in their premises.

A simple interface imitating the physical kit was designed for the educational games which evaluated kid's performance in constructing the Acropolis puzzle after viewing the films. A simple laptop computer was used to play the games.

### E. User Experience

Thanks to special care taken by the director of the stereoscopic films, the spectators did not experience motion sickness symptoms.

### F. Technology

Apart from the screening technology described earlier, the project was implemented using 3D Studio Max and Softimage animation packages. The 2D computer games were implemented using Adobe Flash software.

### G. Strategy

Acropolis Restoration Service chose to reproduce its existing pedagogical tools in digital form. This effort continues until now helping thousands of pupils understand the glorious times of Ancient Athens [7].

## V. MULTI-STORYTELLING

We've seen that most of the projects included the production of narratives. These narratives were integrated in a global design approach, specified by the cultural institutions, but presented several production challenges. Multilingual content, interoperability, user experience and technology concerns, are some of the design issues to take into account during the implementation of cultural narratives.

We've seen also that storytelling guidelines were left out of the scope of the Information Society Framework. We propose hereafter to review options for storytelling based on the above-mentioned case studies.

### A. Scope: Telling Cultural Heritage Stories

Most of the Cultural Institutions in Greece produced pedagogical material prior to the digital information age. The first stories told in digital form were simple reproductions of existing stories such the ones narrating the building program in Acropolis through the centuries.

Curators also realised that many physical artefacts stored in the Museums were not accessible by the audience for various reasons. Digitisation of the artefacts provided the possibility for digital exhibition of these objects. New stories should be writen to unveil the history of the digital exhibits.

The digitisation effort has its own story to tell. The usual making of a film found its digital companion. Many narratives were produced just for documentation purposes, in order to explain how to digitize cultural heritage collections.

### B. Target Audience

Museum curators are used in telling pedagogigal stories in order to attract broader audiences in permanent and temporary exhibitions. But expert users are not satisfied by simplified narratives.

In many cases,, expert stories are hard to tell and often difficult to keep up to date. For instance, each excavation in Ancient Olympia provides new data for Archaeological studies. Digitising different reproductions of the temple of Hera in various chronological periods may constitute a valuable tool to narrate the history of the temple. The digital restoration of the temple is more eloquent and totally feasible while the physical restoration of just one column by the German Archaeological School of Athens in 2004 requested many years of research and trial and error approach.

### C. Content Design

Sometimes stories are hidden in content design. All menus on the web site of OANMA were handwriten in Greek and English characters by Professor D. Pandermalis, the actual Head of the New Museum of Acropolis.

To accommodate narratives in multiple languages in writen and oral form constituted a very demanding task. Design specifications for the Digital Museum of Acropolis currently specify a bilingual web site, but some narratives are planned to be implemented in six languages, including arabic and chinese texts [8].

### D. Interfaces

Existence of multiple users profiles exemplifies the need for customisation of the interface. Different users should access different narratives. Some users may ask for more participative experience.

### E. User Experience

Users are guided in the digital content thanks to the travel metaphor model. Multiple trajectories are proposed by the Author to engage users in more or less attractive and immersive experiences.

Engaging with the content may be a gaming experience such as the puzzle to solve in "Let's go to Acropolis" game. It may also be a playful attitude with narcissistic residues watching its own eye like the artistic installation discussed earlier. Authors will have to accommodate such customisable engaging zones to their narratives.

### F. Technology

Media technology inspires storytelling. During the Athens 2004 Olympic Games, the shot put took place in Ancient Olympia, despite the fact that this athletic event was not contested in the Ancient Olympic Games. It was originally planned to hold the discus throw challenge at the Ancient Olympia Stadium, but later it was discovered that the field was not large enough to accommodate the range of modern discus throwers, and therefore would have posed a danger to spectators.

In Archeoguide's athletic events no such dangers exist. The 3D animations of Ancient Olympic games were rendered for the eyes of the visitors only, respecting anyway the historical reality (shot put is not simulated in Archeoguide).

### G. Strategy

Strategic options, such as the choice between multiple media narratives or the adoption of an integrated system for authoring, documentation and presentation of the content, are crucial for storytellers. Perhaps we should let users tell their stories, perhaps we should let them participate in the design of the narratives via participatory design techniques.

The New Museum of Acropolis participated in CHESS, a Research and Development project using participatory design, in parallel with the preparation of the call for implementation of the Digital Acropolis Museum [9].

CHESS provided improved functionalities in comparison with ARCHEOGUIDE, giving interesting hints for user's customisable storytelling [10]. Digital Cultural Heritage Design will have to provide guidelines for multi-storytelling features in the near future. The Digital Acropolis Museum may offer an exciting platform for experiment.

## ACKNOWLEDGMENTS

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