

Serious Games for Cultural Heritage: the GaLA Activities

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Abstract

The European Union is increasingly investing in new techniques for the acquisition, preservation and fruition of Virtual Heritage. In addition, Serious Games (games designed with an educational purpose) are an emerging way to engage the wide public with an amusing experience while stimulating learning.

In this paper we will describe the activities of the Special Interest Group on Humanities and Heritage within the GaLA (Games and Learning Alliance) Network of Excellence, devoted to the identification of best practices and guidelines for the successful design, development and deployment of Serious Games for Cultural Heritage.

Categories and Subject Descriptors (according to ACM CCS): I.6.8 [Simulation and Modeling]: Types of Simulation—Gaming I.3.7 [Computer Graphics]: Three-dimensional Graphics and Realism—Virtual Reality

1. Introduction

ICTs are providing powerful tools through which scientific and humanistic experts can synergize to build Cultural Heritage applications enabling a better understanding and appreciation of our present and past both from specialists and the general public. The technological advancement in acquisition, storing, processing, management and display of cultural material, especially of 3D content, facilitates the conservation, reproduction, representation and fruition of artifacts, sites and intangible goods in the form of Virtual Heritage.

Virtual Worlds have already been used with educational purposes, allowing the broad public to appreciate remote (in the sense of space or time) cultural content with an immersive experience. An example is a Virtual Museum application which offers the opportunity of: exploring in first person a remote site; manipulating fragile relics with no risk of damage; benefiting of additional multimedia information and cross-correlations among contents; appreciating virtual reconstructions of damaged remains; and much more. Although helpful, these techniques still lack of a powerful mechanism to engage the large public into compelling activities while learning. Such engagement or motivation is apparent in computer games: successful entertainment games keep

the player focused for long lasting sessions. For this reason, games with educational purposes, namely *Serious Games*, are becoming more and more popular.

There is an increasing awareness about the potential of Serious Games (SGs) for education and training in many disciplines [DGMVL10], but the European market of SGs is still in its infancy: mainstream game companies and publishers have yet to move into the emerging market for SGs, which is currently characterized by much smaller investments. The same holds for research on SGs, where we witness a lack of shared methodologies, guidelines and best practices on how to develop effective SGs and how to integrate them in the actual learning and training processes.

The Games and Learning Alliance (GaLA, www.galanoe.eu) is the Network of Excellence that the European Union has funded within the FP7 in order to address the fragmentation of the SG field. GaLA started in October 2010 and gathers the cutting edge European R&D organizations on SGs, involving 31 partners from 14 countries. The partnership includes universities, research and education centres, and developer industries.

One of the main outcomes of the project will be a set of guidelines on how to design and develop a successful

SG according to a given set of educational purposes. In order to meet this goal, GaLA covers both the technologies/sciences (e.g., Human-Computer Interaction, pedagogy, neurosciences) and the application domains. GaLA has identified six major domains, targeted by as many Special Interest Groups (SIGs), namely Business & Management; Engineering & Manufacturing; Health & Fitness; Security & Safety; Personal and Social Learning & Ethics; Humanities & Heritage. In this paper we will describe in particular the activity of the Humanities and Heritage SIG with a special focus on SGs for Cultural Heritage. We will describe a few case studies and drive some preliminary observations that highlight open issues for the Cultural Heritage and gaming communities.

2. SGs for Humanities and Heritage

Humanities and Heritage is a very broad domain. Currently, the SIG is focusing on games in the area of human sciences, and beside the disciplines typically addressed by formal education (e.g. history, geography, languages and art), this SIG is concerned also with games providing informal and multi-disciplinary education. From a preliminary analysis, we have classified this kind of games into three major categories: *Cultural Awareness*, *Historical Reconstruction* and *Heritage Awareness*. Serious Games in these fields allow the user to *play culture*, offering a new opportunity of access to Cultural Heritage content and engaging a wider audience through the appeal of new technologies and of game challenges.

The SIG activity is firstly devoted to understanding the needs and requirements by the various actors in the field; to this aim a questionnaire is currently being distributed. Secondly, in order to derive guidelines for a successful design, development and deployment of SGs in this area, the SIG has started cataloguing and assessing SGs in the domain, highlighting success stories with respect to both educational gain and fun. We describe some of the most interesting examples below.

2.1. Cultural Awareness

Games in this area aim to raise awareness of a different living culture. Past cultures are considered in the next category, devoted to historical reconstructions.

The ICURA game actually provides an insight about the Japanese culture [FSG*10]; in particular, the learning content is organized into three areas: language basics; behavior and etiquette; culture and society. The game has been designed with the intent of fostering an active construction of knowledge rather than providing information to be transmitted to the player. This aspect reflects in wide areas in the 3D environment which can be freely explored, items which can be manipulated and combined, and characters to interact with to fulfil tasks and advance in the game (see Figure 1).



Figure 1: *The ICURA 3D environment; image from [FSG*10].*



Figure 2: *Snapshot from the RomaNova game.*

2.2. Historical Reconstruction

Here two main genres fit: one is the cultural awareness of people of the past, where notions of archaeology, history, art, sociology and politics are involved. An example is the Roma Nova Project (see Figure 2). The aim of the project is to provide a distributed tutoring environment for children 11 to 14 year olds to support cross-disciplinary study, as part of an exploration and social interactive learning model. The model has been integrated with various modules including a serious game based upon the history curriculum in the UK, and current work is integrating text to voice software, virtual agents and haptics.

Similarly, the Priory Herbert Undercroft SG aims to teach the visitors of the Herbert museum in Coventry about the daily activities of the monks. The game was based on the accurate reconstruction of the Priory Undercrofts remains of the original Benedictine monastery in Coventry (see Figure 3), dissolved by Henry VIII Cathedral [DLPM11].

The second main genre in this category concerns the reconstruction of a specific event or process which happened in the past. Usually, it is important to involve the player ac-



Figure 3: Scene from the Prioory Herbert Undercroft.



Figure 5: Snapshot from Travel in Europe (TiE).



Figure 4: The Battle of Thermopylae game; image from [CMAK11].



Figure 6: The ThIATRO game; image from [FAGM11].

tively in this process or event (like in a role game) to understand and learn the causes and the development of the event itself. An example is the Battle of Thermopylae (see Figure 4), which aims to deliver the historical context and importance of the battle, the art of warfare of the opponents, their cultural differences and the strategic choices that allowed the Greeks to resist to the numerical superiority of the Persians for three days [CMAK11].

2.3. Heritage Awareness

This category includes games aiming at teaching or raising interest towards an inheritance from the past. In particular, we can discriminate between Architectural/Natural Heritage and Cultural Heritage.

Architectural/ Natural Heritage Awareness games offer an immersive, realistic reconstruction of a real place like a city or a natural environment to appreciate and learn the architectural, artistic or natural values of a site. The term *Virtual Cultural Tourism* games is also used in this case [BBDGP09b]. Travel in Europe (TiE) is a SG organized as a set of treasure hunts games across European cities of art, where the stages are set in relevant cultural points of interest in a 3D reconstructed city. At each stage, a trial is to be overcome, which consists in a task spurring one or more learning styles. Tasks

can be efficiently developed through an authoring toolkit, also for User Generated Content [BBDG10]. Availability of a large database of semantically annotated tasks leads to the possibility of a dynamic scheduling of tasks through an Artificial Intelligence Experience Engine (EE) [BBDGP09a].

In Cultural Heritage Awareness games the player gets in contact with the legacy of physical artifacts of a society, and learns about history, archaeology and art. *Virtual Museum* games belong to this category. An example of this kind is ThIATRO, *the immersive Art Training Game* [FAGM11] which provides a platform for 3D museum installations in a multi-user virtual environment and acts as a collaborative learning tool for art history and painting styles (see Fig. 6).

For both categories 3D environments are crucial to provide the player an immersive experience and navigation capabilities which maximize the feeling of *being there*. However, 3D is not the only mean for the audience to discover cultural heritage: 2D Augmented Reality could also be very effective. An example is the *Dessine-moi un Mammoth* (Let's draw a Mammoth!) game designed for the Gargas caves in the French Pyrénées [Num]. This application [DCC07, DAR*09] provides the gamer a unique and funny experience of prehistoric artistic features. The goal is to retrieve line drawings of animals made by experts onto a tracking board where real high resolution photographs of the engravements are displayed.



Figure 7: One of the Gargas caves AR games.

3. Conclusions

Good SGs tend to support situated cognition by offering a proper environment/context where the learning process can take place [VE06]. Players have to interact with objects in the environment to advance in the game and this mechanism triggers motivation and active construction of knowledge [FAGM11]. A 3D Virtual World makes the experience more interesting and compelling. However, unnecessary details might distract the players, while objects with a role in the game should attract their attention. A well designed environment should lead the players to the right targets letting them think they did on their own [CMAK11].

Believability is more important than realism: apart from the huge computational load required, an excess of realism could be counterproductive, while a credible environment is sufficient to guarantee the feeling of immersion and generate a willing suspension of disbelief. Nonetheless, the historical data must be accurate, and the main cultural artifacts must be faithfully represented (e.g. in historical reconstructions). In virtual museum applications it might be desirable that the real objects are acquired to retain the finest details; in virtual tourism applications the geo-referencing of salient sites, the accuracy in elevation and proportion of buildings, and the use of a reference 2D map are a good practice [BBDGP09b].

Achieving and maintaining engagement is accomplished by balancing many ingredients: an adequate reward mechanics, a compelling storyline, an alternation of CGI movies and interactive game sessions, empathy with the game characters to make the player feel part of the story, smart content organization and avoidance of overstraining the player with information, and, of course, an adequate technological setup to support motivation and presence [CMAK11].

As technology, virtual presentation of the Cultural Heritage is envisioned as one of the emerging applications to largely benefit from the Web 2.0 paradigm of the Internet use. As proved by the MOSAICA project, coupling cultural content with semantic web technologies not only allows users to collect, annotate and organize the content of interest collaboratively, but also to use this knowledge and apply their creativity for the benefit of all (www.mosaica-project.eu).

Beside the engagement and enjoyment, SGs have a key educational target [BBDG10]: detailed studies on the actual

pedagogical effectiveness of SGs will be further conducted in the project.

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