Raising Awareness for Digital Heritage through Serious Game

The Teos of Dionysos

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In this study, the serious game is conceptualized as a digital medium to convert archaeological knowledge into playable interactions via a case study in the ancient city of Teos. The Teos of Dionysos Game is a digital platform that allows players without specialist computer skills to explore the archaeological knowledge and experience an ancient urban setup. A mythological story about the God Dionysos has been verbally and visually transcribed and adapted for four distinctive settings of this ancient site. The familiar realm of an interactive space, navigated by intuitive behaviours in a game setting, conveys archaeological data, allowing players to build an empathic understanding of ancient architecture. Diverse stakeholders have already tested a mobile game prototype in a workshop, which explored whether those without a prior historical background can advance their existing knowledge through activities that aim at providing entertainment.

Keywords: digital heritage, serious game, puzzle, mobile game, public awareness

INTRODUCTION
Heritage is defined as something of value that is, or should be, passed from generation to generation. Digital heritage is “created digitally, or converted into digital form, from existing analogue resources (National Library of Australia 2003, p.13). Today, the terms “virtual heritage”, “digital cultural heritage” or “new heritage” are used interchangeably across fields, and represent a common theme in different research fields, academic programs, conferences and workshops. A similar converging trend can be seen in traditional arts, design, humanities and social sciences, which are all increasingly moving towards large-scale digitization. A growing reservoir of data is accumulating in the digital field via new digital tools. New concepts of digital preservation have
progressively emerged from a need to acquire, store, research, communicate and exhibit cultural heritage data. Although the new possibilities provided by digital technologies are nurturing heritage studies, it is also important to make effective use of these technologies to convey this data in a comprehensible way to the various population profiles.

Video games have a twofold relation with digital cultural heritage. First, video games are cultural forms of digital culture, and thus themselves are a part of digital heritage to be preserved (Barbier, 2014; Barwick et al., 2011). Second, videogames are an emerging medium for disseminating cultural heritage. Videogames provide novel possibilities for the presentation of archaeological research to alternative audiences, allowing gamers to interact with a designed set up that immerses them in a digitally modelled environment. An archaeological research-based game environment immerses the user in an architectural environment, providing a virtual sensory experience that enables the processing and comprehension of the architectural and archaeological information. In our case, video games enhance the expressive abilities of archaeologist, making their research comprehensible and incorporating multiple perspectives and alternative narratives. 3D representation of heritage has been widely used since the videogame technology was introduced into the field of archaeology. Although historical references have been widely used in various games (i.e. Apotheon, Assassin’s Creed, etc...()-, ‘disneyfication’ has been strongly criticised in the field of archaeology. Thus, it is very important to ensure correct representation of the archaeological and architectural information, as well as the historical accuracy of the props used in game design when attempting to utilize video games as an alternative narrative medium for disseminating archaeological information at a popular level. However, as well as maintaining accuracy, it is also important to build a game that can engage people, and encourages them to learn through experiencing ancient problems and their solutions, and empathizing with those that faced them (Gee, 2009).

In this respect, this serious game represents a pedagogical tool for testing learning outcomes related to archaeological and historical knowledge for interested non-professionals. This paper shows the potential of utilising video game research in the preservation of cultural heritage through the design, implementation and testing of the game the Teos of Dionysos. This effort also reveals a community of practice deeply involved in digital-making.

PROBLEM DEFINITION

The Digital revolution allowed access to unlimited information, with boundless availability, and yet much of this information seems to have questionable coherence when compared to traditional sources. The new generation, namely the millennials and post-millennials, are accustomed to building a separate virtual existence in the digital world. Therefore, their attention and interests have been changed by mutual global interactions as an alternative to books and other written sources of information, which nevertheless remain as a conventional and reliable reservoir of knowledge. This pedagogical challenge is also an opportunity for new methods of creating and distributing accumulated/novel knowledge. We believe that game-based learning (GBL) can significantly enhance learning for a multitude of users from varied educational backgrounds in diverse application domains (Aydin et al., 2016; Holland et al., 2016; Mortara et al., 2014). In the heritage domain, an effective serious game is often characterised as having three different forms: the static setup in a public space such as a museum, the augmented visit at the actual heritage site, and the standalone application for mobile devices.

In this study, the serious game is conceptualized as a digital medium to convert archaeological knowledge into playable interactions via a case study set in the ancient city of Teos, one of the most important cities of Ionia, at various stages of occupation. This paper presents and discusses the initial stage of the Digital Teos Project, an interdisciplinary research project which investigates and digitally an-
imates the excavation area, through a static public setup at the excavation site, an augmented immersive revisit through AR/VR devices, and a mobile game application (Figure 1). Within the scope of this paper, our focus is on a mobile platform puzzle game entitled the Teos of Dionysos. The project begins with the translation of existing excavation data into virtual environments, whereby the archaeological area and buildings are modelled and presented through digital techniques. This is a preparation for the design of a serious gaming environment, as well as a digital support for ongoing archaeological work. Concurrent to the storyline of the proposed game, level design follows a series of parametric and modular layers, in the form of challenging puzzles, exploring architectural construction techniques in a detailed and historically accurate way. These elements are designed and abstracted following the language of ancient architecture, highlighting a shape grammar as a coherent and holistic form generation tool (Coutinho, 2011). As well as providing enjoyment, the game arouses curiosity with educational and instructive aspects, i.e. a multidimensional objective of raising awareness of the features of an archaeological site, its historical background and associated mythological stories.

LITERATURE REVIEW

This is a collaborative approach involving historical scholarship and video games; the former provides material for the games, while the latter provides a new representation medium for the heritage.

Regarding the former, it is quite common for games to attempt to reconstruct buildings and cities of the past, corresponding to the walkthrough of the game. Apart from a few notable exceptions, such as Civilization Series (1991), The Age of Empires Series (1998) or The Assassin’s Creed Series (2007), most widely-know games based on historical events are designed with only limited or selective contributions from archaeologists and historians (Wainwright, 2014). The resulting lack of historical and structural coherence tends to lead to chronological errors, inaccurate representations or inaccurate perceptions of the societies.

As an example, Apotheon, a platform game in 2015 by AlienTrap, has a setting in mythological ancient Greece. The design language of the game is inspired by the black figure pottery style of classical Greece. By doing so, the player becomes a character as portrayed on an ancient Greek vase while moving through different mythological scenarios. While it is important to acknowledge a number of chronological and mythological inaccuracies, the developers have nevertheless created a setting based on ancient material culture, bringing the sensorial experience of this landscape to wider audience in a unique way [3].

Even though formal historical scholarship provides the core material source for the games, these games can become the digital source of reference for a wide and non-specialist audience. The practice of using games to increase consumer engagement in Museums or experimental archaeology is a contemporary global trend. For instance, Tate Gallery has launched TATE Worlds in 2015. The application facilitates the “Minecraft” gaming platform to create a series of 3D maps based on a number of key artworks. Players can enter the galleries and step into the paintings and works of art to explore the worlds behind the paintings [2]. As another example, Morgan (2009) has rebuilt Catalhoyuk in digital environment to investigate a number of topics. One of these concerned the reconstruction of ovens found extensively on the site. Morgan was able to experiment with these ovens and buildings in “Second Life” in order to test the effects of smoke on living conditions (Morgan, 2009). Similarly, “The Rome Reborn Project” employs hypothetical reconstructions of Rome to test the validity of the virtual ancient city. The serious game “Roma Nova” investigates the feasibility of using this technology to support archaeological exploration, leading to historically accurate descriptions/understandings of societal aspects of an Ancient Roman life (Anderson et al., 2010). Besides discussing the serious game platform, which has non-entertainment
purposes, Anderson et al. (2010) present 3D content creation pipelines which demonstrate how information technology can play a key role in archaeological analysis. However, expanding heritage awareness among the general public remains an issue for exploration, as it is not adequately addressed or demonstrated in the above mentioned examples.

**METHODOLOGY**

In the effort of developing the Teos of Dionysos Game, an interdisciplinary team of designers, architectural historians and engineers has combined resources to design and implement a mobile platform game based on a historical site (Figure 2). Using virtual reconstructions of the buildings and sites and archaeological data, the game focuses on allowing the user to play by solving puzzles based on ancient mechanics in a historical setup. Exploiting the mythological story of the God Dionysos, it combines an atmosphere mystery with the enjoyment of the game. In this paper, the theoretical discussion is supported by an actual case study, a description of a workshop in which diverse stakeholders tested a mobile game prototype. The workshop explored whether people without a prior historical background could advance their existing knowl-
edge through activities aimed at enjoyment. The game is an initial step of the multi-layered Digital Teos project, aiming to utilize digital technologies to convert specialist archaeological knowledge into a form that can be experienced and comprehended by the non-expert.

The game provides tools and methods for creating an accurate reconstruction of a historical site, enabling the re-enactment of the spatial experience of the original dwellers’ daily life. This execution followed four concurrent steps.

First, the architectural setup was reconstructed based on orthographic drawings of the archaeological remains, restitution drawings, rules and grammar of the building elements. The historical buildings were translated into a shape grammar to create a modular system of sprite sheets to be used in all layers of the game. To achieve a more holistic approach in reconstructing this historical era, further research was conducted to gather data on clothing, lifestyles, tool mechanics, material details and landscape.

Second, the game was given a mythological narrative in order to develop a gameplay. A mythological story of the God Dionysos was verbally and visually transcribed and adapted on four distinctive settings of the ancient site: The temple of Dionysos, the theatre, the cistern and the south harbour. Gameplay enables the player to visit the city as an ancient citizen. The familiar realm of an interactive space navigated by intuitive behaviours of a game setting allows the player to build an empathic understanding of ancient architectural information through the directly interacting with the archaeological data. In this way, unfamiliar archaeological knowledge and the inevitable steep learning curve it requires is transformed, making the information more attractive and easier to digest.

Third, a distinctive visual language was designed and produced by a team of graphic designers. The team created sprite sheets of the built and natural environment, furniture, ornaments and artefacts, as well as typefaces for the visual language components of the game.

Finally, two senior software engineering students organized the programming phase with concurrent feedbacks and revisions. They guided the designers on the particular requirements for game assets, i.e. avatar and game setup, and then compiled these assets in the Unity Game Engine. The programmed scripts gave life to the game assets, determined the game mechanics and created the overall user experience.

The development team used the Super Tilemap Editor [1] tool to create the level designs. This tool enables a dialogue between the level designer with no prior programming knowledge and the developers. First, the non-programmer level designer in the team drew the levels by hand, then, guided by the development team, this tool was utilized to decide the locations of platforms, props, pickable items, mechanical structures and other game elements to create the levels. The development team created custom scripts to develop the Dionysos character as the game avatar controlled by user. In addition to standard actions, such as walking and jumping, the avatar can also shapeshift and become a leopard, a bull or a dolphin, all of which have different abilities to solve the puzzles presented in the game (Figure 3).

PLAYTESTING AND SURVEY
We conducted playtest sessions in May 2017 at the Faculty of Fine Arts and Design, at Izmir University of Economics with 14 (10 female) undergraduate students. Participants played the whole game on tablets and mobile devices. We interviewed participants about their experience and asked them to complete a survey with nine questions about their gaming backgrounds, seven about their background related to archaeology and games, and 14 general questions about the archaeological information delivered in the game.

The majority of the respondents (92%) stated that they play video games. Surprisingly, female participants were more interested in playing the game and filling the questionnaire, with 71% female. Participants had a fairly uniform distribution in terms
of the year of their undergraduate studies, and time spent on video games, which ranged from zero to over 14 hours per week. Overall, the respondents covered a wide spectrum from hard-core gamers to more casual players, some having several pieces of dedicated gaming equipment (dedicated PCs or laptops, consoles, etc.), while others mainly played browser or smartphone games. Participants reported playing a variety of games, i.e., roleplay games, action adventure, simulation, racing, etc., with puzzle games being the most common genre. They stated that they found the most enjoyable aspects of games to be the character, the story and the graphics.

When asked about archaeology and games, around one fifth (21.4%) reported playing archaeology-related game. When it comes to the inclusion of archaeological aspects in a game, the majority indicated that they did not find archaeology very enjoyable, and they did not regard games as representative of actual archaeology. One even described archaeology as being as “boring as all science”. One comment was that archaeology, based on facts, is at odds with games, usually based on fiction. It appears that many gamers seek to play games for fun, and regard the gamification of archaeology as unnecessary. One of the participants even complained that archaeology was already overused in games. These responses suggested that serious games related to archaeology may face resistance and lack of interest from gamers, unless the game is generally appealing and enjoyable.

Despite their general lack of interest in the area, participants reported enjoying our game due to its appealing graphics, gameplay and puzzles. Furthermore, their survey responses show evidence of learning archaeological information in the process. The third part of our survey had general knowledge questions related to concepts that the game aimed to teach. The game delivered such information through inscriptions that popped up an information panel when the player walked near, and through visual references such as level elements and backgrounds. A high percentage of correct answers were provided to these questions. For 12 out of the 14 questions, there were a choice of four answers. For all except one, the rate of correct answers was over 50%. This may indicate that while participants did not have a strong interest in archaeology, they learned a certain amount of archaeological information. This validates the idea that serious games may be a viable platform for teaching archaeological knowledge and raising awareness about archaeology.
CONCLUSION
This paper discusses the serious game as a pedagogical tool for preserving, distributing and sharing knowledge on heritage through an alternative digital medium for non-familiar users. It provides a description of an experimental phase of the Teos of Dionysos Game, in which historical information acquired from archaeologists, and from mythological stories, was converted into game graphics using a scenario developed by game-designers. The overall design pipeline was converted into a mobile platform game by developers. There are three significant outcomes of this project, yet to be explored. Firstly, the serious game, we believe, is an exciting medium for the location of and the exploration of original historical and archaeological sites and associated stories. Second, it is a valuable digital tool for preservation and representation, which, by nature, brings the opportunity to reach a mass global audience. Finally, as a future research direction for designers and programmers interested in human-digital interaction, it would be valuable to test the experience with various user groups from diverse cultural backgrounds.

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REFERENCES

Barbier, B 2014, 'Video Games and Heritage: Amateur Preservation?', Hybrid, 1, p. 1


Wainwright, AM 2014, 'Teaching Historical Theory through Video Games', The History Teacher, 47(4), pp. 579-61

