Utilising Game for Promoting Cultural Heritage: A Proposal

Mohd Izani[1], Fauzan Mustaffa[2(✉)], Aishah Razak[2], and Abdulsamad Alkhalidi[3]

[1] Higher College of Technology, Sharjah, United Arab Emirates
[2] Multimedia University, Cyberjaya, Malaysia
fauzan.mustaffa@mmu.edu.my
[3] University of Sharjah, Sharjah, United Arab Emirates

Abstract. One of the fastest-growing trends in the digital media area is using games as an entertaining way to learn and explore subjects like history. After examining the potential of digital media applications in digital heritage, this paper explores the use of a game to explore the heritage site. We used our old 3D model of the fortress known as the A Famosa as our proposal to create a series of exciting and scalable online games simulations that seek to provide unique cultural experiences promoting world cultural preservation through emerging technology. The 3D model was developed in 2010 as an output of doctoral research and has never been used for any purposes until today. The subject matter received little attention in the academic domain. This game development promotes the cultural aspects of the historical site through a 3D game simulation of the fortress and is integrated with the knowledge and historical facts. The process discussed here focuses on its development. It will be designed as an interactive game simulation that allows users to play and simultaneously gain knowledge and explore history. Here we describe the early stage of the ongoing process of creating this online 3D game.

Keywords: Digital media · 3D game · A Famosa · fortress · Digital heritage

1 Introduction

Efforts have been made to obtain a conjectural layout of the lost heritage in Malaysia known as the Famosa fortress since 2007. The researchers established a 3D model [1] of the fortress based on various analyses, including site visits to multiple countries, old drawings and textual descriptions of the fortress. In 2012 a group of researchers gathered in Paestum, Italy under the scholarship of V-MusT.net. V-MusT.net is a Network of Excellence, funded by the European FP7 Network of Excellence focused on Virtual Museums. One of the activities was to propose a potential project for cultural heritage purposes. The team agreed to use the A Famosa 3D model for this proposal. A proposal consists of aims, methodology, management, reasons and other aspects discussed and proposed.

Various methods can be applied to engage and attract users to understand the history and cultural heritage subjects, including written materials, audio, video, interactive story

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and multimedia medium [2–4]. According to Dale's cone of experience model [5], written material such as text and lecture provides only audio inputs. These levels of experience provide a limited number of stimuli for the learners, who easily lose focus and concentration. In addition to that model, it claims that students can only remember 10 percent of what they read, but almost 90 percent when they perform a task. He also stressed that the 'sense' experience is often strongly involved [5]. We attempt to choose the most effective method to perform this task. We found that one of the means is to use a visual aid, in this case, game as an interactive digital media method. A visual aid is any picture, model, object, or device which provides concrete visual experience to the learner for [1] introducing, building up, enriching, or clarifying abstract concepts [6], developing desirable attitudes, and [7] stimulating further activity on the part of the learner [1]. Research and studies have shown that game is an effective, fun, and engaging methods and can play an essential role in exploring cultural heritage [7]. Champion [8] suggested, "In creating effective virtual heritage environments, these features of games could be used.

They could be designed around a task or a goal and include visual representations of the users and other significant characters. In addition, Sivanathan, Lim et al. [9, 10] described, "A game is an effective and engaging environment that is accessible anywhere, at any time, on-demand, at your leisure and to your liking. Game playing offers learners motivation to acquire new skills and/or enhance the current skill-sets to improve capabilities". With the various game styles, platforms and methods to deliver the content nowadays, making the right decision is likely complex. Since the game will be built based on top of a pre-existing 3D model, we opted to use an online 3D game using the Unity3D game engine as a game platform. Playing online games nowadays has become a significant cultural phenomenon [11].

Many projects [12–14] have utilised games as their core tool to promote digital heritage with various styles and methods. We take advantage of the internet and online community to be a part of the game design because these two domains have become a platform for the social purpose [11]. This paper proposes an online game to promote cultural heritage using a reconstructed 3D model of the fortress. The article is organised into several sections, namely: "The game background", "Inside the game", "Game development", "Discussion" and "Conclusion". The game background discusses the game's characteristics, management of the game development, data curation and value of the project. Inside the game, the section outlines the key aspects of game elements such as storyline, how the game works, features, functions and interactivity. The game development section explains the whole game development process, including pre-production, production and post-production stages. Finally, followed by discussion and conclusion.

1.1 Aims

There are four aims for this proposal, namely:

i. Promoting World Heritage in Malaysia
ii. Promoting International Tourism
iii. Promoting multidisciplinary scholarly knowledge about a complex Cultural Heritage

iv. Developing collaborative networks among universities and creating job opportunities for students and early-career researchers.

1.2 Why Game

Interest in using the game as a learning tool has recently increased [9]. We believe that game has its attraction, and it has been reported that the number of people who play online games counts more than millions [15]. Knowing these figures would be advantageous for promoting our cultural heritage project. There are many examples [16–18] of this successful use. Motivated by this, we outline several reasons for choosing games as a medium to promote cultural heritage as below:

i. The game storyline offers a stronger motivation to explore the virtual learning environment
ii. The ludic component makes the learning process more enjoyable
iii. Living a virtual adventure as a historical character may enhance the emotional involvement of the user and the attitude towards the cultural heritage

2 The Game Background

The game consists of several elements, including characteristics of the game, management, data curation and value of the project.

2.1 Characteristics of the Game

Based on the discussion, we outlined five characteristics of the game as below:

i. The game is online, using first-person and single-player options. The reason for choosing this is to avoid creating sophisticated character animation for the avatar.
ii. The central development of the game is for an educational and promotional purpose (the game is a pretext to gather information about the history of the fortress)
iii. The game is historically accurate but entertaining (Goal-oriented, treasure-hunting structure). The game is designed for the public and general users.
iv. Non-photorealistic graphic style (to avoid the misleading idea the visualisation is the "true" image fortress and to prevent disappointment in actual tourists)
v. Accessible language

2.2 Management

i. Small-medium budget (30–40.000 €). The funding will cover expenses of the pre-production, production and post-production process.
ii. Potential funders: universities, cultural institutions, UNESCO. Currently, our facilities are fully supported by the university, and we are targeting the cultural institutions and UNESCO since the subject is listed in the UNESCO world heritage sites.
iii. Estimated time: two academic years

iv. Developing a prototype that can be used to ask for further funding. With the advancement of new technology such as Hololens [19] and Oculus Rift [20] Head-Mounted Displays (HMD), we will further develop this for a more interactive and engaging game experience.
v. Employment of part-time students. This will allow the students to learn and participate in the game design process. Integration of this game design stage as a student project in the course syllabus will benefit students and faculty.

2.3 Data Curation

There are three considerations of the data curation for this game proposal. They are:

i. Recycling: the game will be built on top of a pre-existing 3D model fully documented
ii. Sustainability: the game will be developed using, as much as possible, standard formats. An extensive documentation will also improve the longevity of the work
iii. Both the scholarly work related to the 3D visualisation and to the developing of the game will be available for exchange and re-use for non-profit purposes within the scholarly community.

2.4 Value of the Project

The project offers:

i. Educational for the developers: collaborative project that involves students from many departments (History, Media Studies, ITC, i-Art History, Anthropology)
ii. Educational for the final user: knowing and exploring a piece of World Heritage, learning some of the reason of its relevance, according to different scholarly and cultural perspectives.

3 Inside the Game

The game consists of several elements, including characteristics of the game, management, data curation and value of the project.

3.1 Storyline

The story is about a conflict between two characters: A Malay fighter and a British soldier. It is based on the historical fact that the British needs to bombard the fortress wall. The Malay fighter will play his role in protecting the wall and defending the fortress from being bombarded.

3.2 The Aim

This game's player will use a Malay fighter to stop the British from bombarding the fortress. Each game level has different obstacles and difficulties that the player must face. The main aim is to defuse the bomb while fighting with the British soldiers.

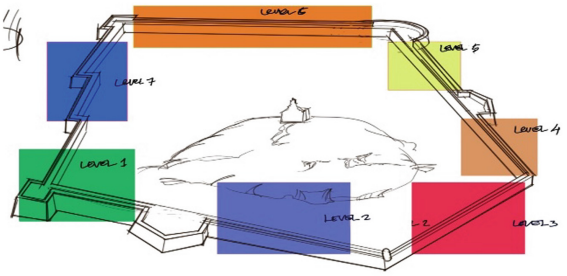

Fig. 1. Proposed level for this game

Table 1. Short cut keys for the template

Level	Number of enemies	Time limit (min)	Challenges to disarm the bomb
1	5	3	1
2	10	6	1
3	15	9	2
4	20	12	2
5	25	15	3
6	30	18	3
7	35	21	4

3.3 Level Design

There are seven game levels available for this game based on each area, as shown in Fig. 1.

Each level has a different level of difficulty and to stop the bombardment. The fighter must complete each level within the given timeline. Table 1 shows the number of enemies and the timeline to complete the mission. If the fighter completes each level, he will need to face several challenges to defuse the bomb (Table 2).

3.4 Game Flowchart

The flowchart of the game is illustrated (Fig. 2). Each level represents different difficulties. To proceed to each level until the final level, the player must complete each level. Failing to complete the current level will result in the player repeating the same level.

3.5 Game Elements

This game consists of several elements categorised into 3 categories; characters, scenes and props. Each of these elements has been studied and followed by the draft sketches.

Table 2. Task and Categories of Difficulties

Level	Task 1	Obstacles	
Level 1 to 2	Kill all the enemies	Collapsed fortress floor	Next level
Level 3 to 4	Kill all the enemies (Enemy numbers increased)	i-Collapsed fortress floor ii-Flying arrows	
Level 5 to 6	Kill all the enemies (Enemy numbers increased)	i-Collapsed fortress floor ii-Flying arrows iii-Falling fire ball	
Level 7	Kill all the enemies (Enemy numbers increased)	i-Collapsed fortress floor ii-Flying arrows iii-Falling fire ball iv-Rolling spiky ball	Finish

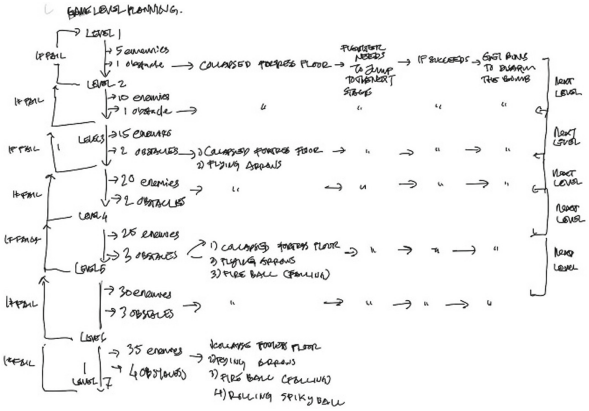

Fig. 2. Game flowchart

3.5.1 Character Design

In general, there are two characters in this game: the Malay fighter and the British soldier. Both of these characters are sketched and designed based on several references to match with local culture during that era. Figure 3 shows the British solder (on left) and the Malay fighter (on right). This reference will be used for 3D modeling process before being exported to Unity3D.

3.5.2 Scene Design

Since the 3D model of the scene has been established from our previous research, we did not spend time designing the scene. The scene is a 3D model that has been fully textured and properly arranged. The location of each spot is well presented, and we only need to enhance it by adding more props for game purposes, ie: grass, stones, bushes and sea. The 3D model of the fortress is shown in Fig. 4.

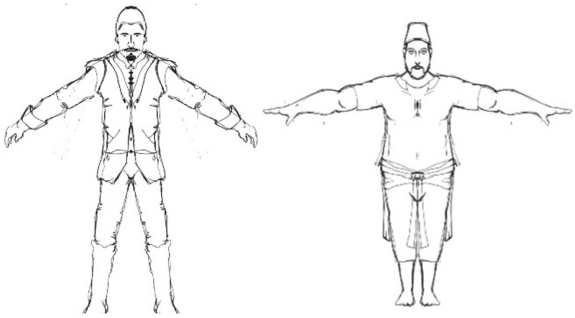

Fig. 3. Main characters in the game

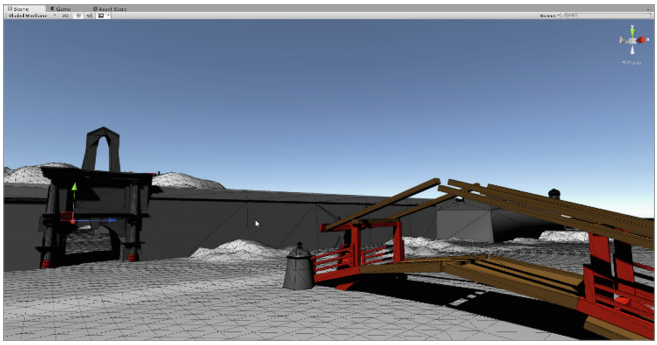

Fig. 4. 3D model of the scene with no textures

3.5.3 Props

Props are important elements in the game to enhance and make the scene more believable. In this case, we chose to use several props: grass, stones, bricks, plants, trees, buildings and houses. These props will populate the scene to ensure it looks realistic, as the scene was from the 16th century.

3.6 Starting the Game

The prologue ends with the sound of the gong that announces the closure of the fortress. The user will play a role of a Malay fighter who will defend the fortress to the end. A fighter is a Malay person who lives in the area of the fortress. There have been many attempts to destroy the fortress, but they were unsuccessful. Thus, nobody believes this one will be different—no one but the user. The fighter knows the danger is real this time and wants to enter the fortress anyway (risking his life) to rescue as many relevant artefacts as possible. If he succeeds, the artefacts will remain in the country where they belong and people will be able to admire them for many future years. The game starts from the main entrance of the fortress, where the route of the game will begin from the Middleburg bastion to the following bastions. Each bastion has its difficulties, as proposed in the flowchart. The British is a character who received the order to destroy

the fortress. He will destroy the fortress part by part. The fighter's task is to kill the enemies and stop the bombardment.

4 Game Development

The game development involves various processes, including pre-production, production and post-production. The game is currently under development, and most of the 3d models are ready to be used. The tools used for making this game are notepad, Photoshop, Unity 3D and 3DS Max.

4.1 Pre-production

The team spent quite some time on pre-production, including finding reference images, sketching and developing background, character design and planning the game storyline. These resources were used intensively for our primary game reference. The old drawings of this fortress from previous research were referred to ensure the whole scene has a strong context with the game. In addition, conceptual art (Fig. 5) also helps the team to visualise the game ambience. This includes getting references from the old Malay movies and photos. We collected all the textures for 3D models from various resources, including the internet, photographs, and books. Some of the textures have gone through the touch-up and manipulation process in Photoshop.

4.2 Production

The production stage is an integration between two pipelines known as 3D modelling and game development. We are currently in the production stage, where all the materials are gathered and referred for the 3D modelling process. This includes importing animated characters and testing the motion and interaction. The walk cycle path is also being created, and each part of the obstacle is programmed accordingly based on pre-production tasks. Currently, the team has accomplished the 3D model for a Malay fighter (Fig. 6), and the remaining 3D models will follow. For game development, we choose Unity 3D as the game engine due to its free version to start designing the game, multiplatform, supportive user group and ability to create multiplayer games. This game relies on game mechanics, which we define as how actions work in games, including animated objects

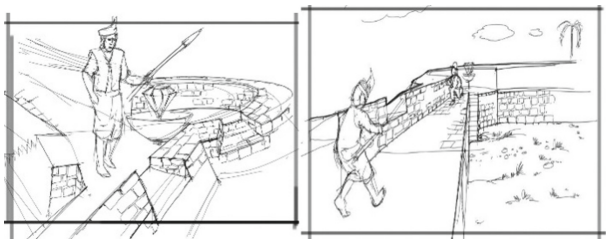

Fig. 5. Sketches used for conceptual art

Fig. 6. Final 3D model for Malay fighter

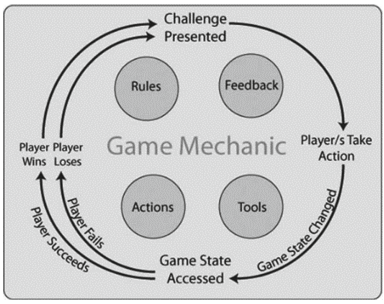

Fig. 7. The Game Mechanic Cycle [15]

and characters and interactivity between the player and the scene. Figure 7 shows the game mechanic cycle [15]. We are planning to add positive reinforcement for each level completed. Positive reinforcement allows the player to get rewarded once they complete the level successfully. In this case, the reward could be a better weapon and more energy for fighting to the next level.

4.3 Post-production

The post-production stage is dedicated to troubleshooting technical errors and resolving bugs, flaws and other problems that affect the game's playability. The game is still in the production stage, and the post-production stage has yet to begin.

5 Conclusion

In conclusion, introducing computer games for architectural heritage is a dynamic and practical approach to engaging the young generation to explore and appreciate the old heritage. Particularly in the context of education where users can benefit from game-based learning. It is insufficient to adopt only the traditional approach for architectural heritage appreciation. The paper explains our ongoing approach to exploring architectural heritage as a digital game. The model of the old fortress of Malacca known as the 'A Famosa fortress' has been used as a location for this game. A game has been designed

based on two characters, the Malay fighter and the British soldier. A player must fight the British soldiers to stop them from destroying the fortress. Each level of the game has its difficulties and information embedded, and a player must complete each level within the given timeline. The game is still in the production process, and a lot of technical tasks have to be accomplished. Similar projects [21–23] that utilised this emerging technology motivate us to integrate mixed media technology such as augmented reality and holograms to navigate and play the game more interestingly in the future. We believe that this effort is essential to support the sustainability of the cultural heritage. For future development, we will conduct a quantitative survey to evaluate the effectiveness of this game and collect users' responses from their experience.

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