Design and Development of Duan Wu Festival 3D Game

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Abstract— Due to globalized and borderless world, people tends to forget their cultural festivals and probably unable to understand the significant message from those festivals. It is believed that by using game, young generation may somehow learn about past culture and festival. This article describes the process of designing and developing a 3D game of Duan Wu Festival which attempts to embed cultural values into its game play. It reviews educational benefits of games and the development of this cultural 3D game may help young generation and general public to grasp cultural values from the Duan Wu Festival.

Index Terms—3D game, virtual reality, traditional culture, Duan Wu Festival.

1 Introduction

TRADITIONAL cultural is receiving lesser attention from public and their ethnic especially in Malaysia where we have multiple ethnic and cultural groups. People tends to forget their traditional culture and festival and unable to understand the important and message delivered from those festivals. One of the important festivals among Chinese ethnic is Duan Wu festival. This festival is also known as Tuen Ng and Dragon Boat festival. The festival is celebrated on the fifth day of the fifth month of the traditional lunar calendar. There are three important events in this festival. The first two events are eating the Zong Zi or sticky rice wrapped in bamboo leaves and taking traditional drinks. The third event is the competition of dragon boats.

Many game developers start developing educational game with educational purpose [2]. It is an alternative way as people can also learn while they are having fun [1]. This article describes the process of designing and developing Duan Wu Festival as a 3D realistic game. It explains how the cultural objects and storylines are integrated into the game play in order to educate the general public on the traditional culture which is Duan Wu Festival.

2 Background

Game is related to play where the metaphorical magic circle of play is a voluntary, contractual structure that is limited in time and space. This magic circle separates game from reality but often the boundary of separation is not clear. Hence, the definition of computer or electronic games may be referred as "in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome" [4]. Despite of being widely cited, this definition of game is considered less friendly towards learning as the emphasis is strictly on conflict, rules, and quantifiable outcome. Thus, game for learning version is defined as "a challenge that offers up the possibility of temporary or permanent tactical resolution without harmful outcomes to the real world situation of the participant" [5].

As the focus of this article is on learning outcomes specific to creating cultural awareness, we offer an extended definition of a game as "a contextual space in which players engage in doing voluntary tasks that represent their social roles in order to create the desired awareness". A game compounds a space that embodies situated play for specific tasks to be accomplished. The change of space requires a set of different tasks which increasingly challenging in parallel to increase on skills. In order for desired outcomes are to be part of learning process (and product), social roles designated should be able to comply with rules for real life situation.

3 Design and Development Process

This game was created with the idea of introducing a traditional culture - Duan Wu Festival to the general public to help them understand the background story and messages of Duan Wu Festival. Duan Wu festival is a first person view 3D game with a total of 4 levels plus a bonus level. Table 1 depicts how the cultural awareness is incorporated into the game play.

In order to incorporate cultural awareness to the game play, we try to map the cultural objective to the game play. From the game level 1 to level 3, player would explore the vast ancient Chinese village and beautiful

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TABLE 1. EMBEDDING CULTURAL AWARENESS INTO THE GAME PLAY

Level	Cultural Objective	Game Play
1	Identifying traditional food ingredients	Conversation with a non-playing character
2	Appreciation of ancient Chinese village	Player explores the surroundings of the ancient Chinese village to collect ingredients
3	Appreciation of bamboo forest	Player explores bamboo forest to seek for traditional food
4	Discovering traditional Dragon Boat race	Player participates in the traditional race
BONUS	Description on Duan Wu Festival	Player must successfully pass all levels to unlock bonus level

bamboo forest in search of ingredients to cook the traditional food served during Duan Wu Festival - Zong Zi. At level 4, player will participate in a traditional game called "Dragon Boat Race". After finishing all levels, an extra level will be unlocked and history of Duan Wu Festival along with the person who started this tradition, as well as the description of Zong Zi and Dragon Boat would appear.

3.1 Development Tools

This cultural game uses game engine as the main platform for environment setup and programming. For 3D modelling, we utilized the established 3D modeller to create the whole village, dragon boats, items, props and fish along with its animation. To make the game more realistic, we heavily used a photo editor to create realistic textures we needed. Furthermore, the user interface and the background of main menu were also created using the photo editor. Lastly, we used an audio editor to tweak the sound effect and surrounding sound for this application.

3.2 Modelling Ancient Building

Building modelling is performed to develop several building in the village including several traditional shops, a chicken house and a street sign as shown in Figure 1.

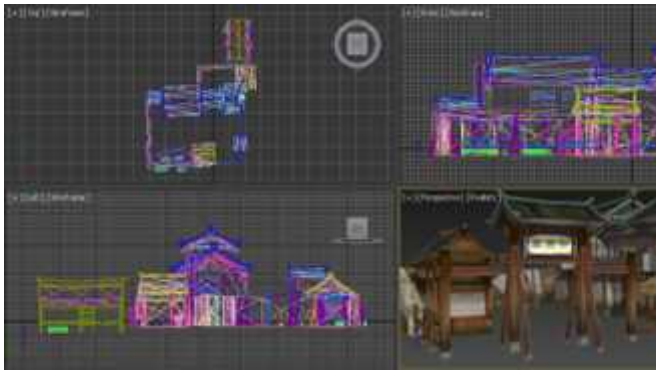

Fig. 1. Modelling of the whole village.

Since the village is the main 3D model, realistic textures were applied to this model. The polygon count of the models were saved to the minimal and compressed before importing the 3D model to the VR software.

3.3 Dragon Boat, Fish Modelling and Props

The dragon boat is one of the important features in this 3D game, hence the researchers put a lot of effort in modelling it, as shown in Figure 2, this model has a lot of curves and poly around the dragon head. To avoid potential lag in this application, simple coloured texture was used [3].

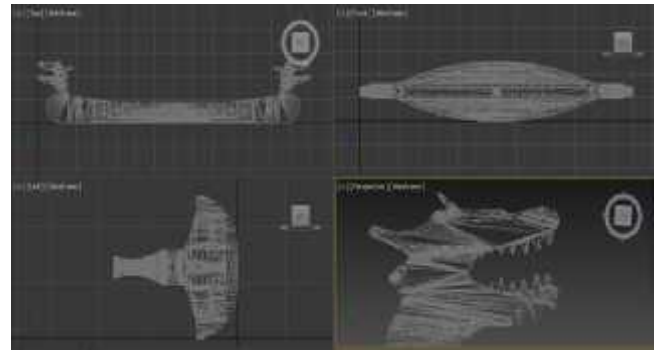

Fig. 2. Modelling dragon boat.

On the other hand, fish is the only model with its own animation. It has a bone tool that controlled the animation of the 3D model; allowing the fish to have a swimming animation. Several small objects as items and props were also developed in this game.

3.4 Game Environment Setup

Figure 3 illustrates a terrain created for the game environment. The terrain has a mountain surrounding a location reserved for the village, a small alley to the next level and the open sea far beyond the mountains. Lastly, the researchers add some fog effect, a pond, some trees

Fig. 3. Creating Terrain.

and a wind system to animate the trees.

This application has different lighting setup for different level. For level 1, this application has a simple directional light with its light source corresponding to the position of the sun in the sky. For level 2, the researchers also adjust the directional light to the position of the sun and change the colour of the light to orange-brownish to give a realistic sun setting ambience. For level 3, the main light source was dimmed and light up all the red lanterns for the night scene. For the last level, a simple directional light was used to light up the whole scene.

3.5 Script

To make this 3D game more interactive and playable, the researchers added scripts into the game objects. For the character control, the researchers adapt the pre-scripted first person controller with slight modification. The researchers also produced their own scripts for picking up, a dialog system with non-playing character, simple pop-up system, volume adjustment option, artificial intelligence for animals to move around, and the rhythm game system for dragon boat race.

4 Results and Discussions

The final output of Duan Wu Festival game was exported into an executable file. The file size is light (roughly 200 MB) and it can run smoothly even in a low-end personal computer and since the application can be played without any installation, Duan Wu Festival game is a portable and green game application.

4.1 Functionality

The functionality of all GUI and character control runs perfectly. Moreover, the font size scripted to automatically fit into any screen resolution. The game icon (a cute Zong Zi) is embedded as launcher for the game application.

Upon launched, the main menu will be shown as in Figure 4. From the main menu, the game player can choose either to exit the application, go to how-to-play menu and option menu or start playing the game.

The first level of the game is the Qu Yuan village in daytime (Figure 5). Player will need to talk to the mayor

Fig. 4. Main menu design inclusive of cultural objects.

to start finding the ingredients. After finding all the ingredients needed, player is allowed to enter the second level which is the bamboo forest to find the remaining ingredients.

The second level of the application is the bamboo forest with sun setting view. After collecting the last two ingredients, player will proceed to third level. The third level is Qu Yuan village but now it is in night time. After the player handed all the ingredients to the mayor, player is required to talk to the mayor again in order to move to the final level as shown in Figure 6.

Fig. 5. Qu Yuan village in day time reflects realistic environment.

The final level is the dragon boat racing rhythm game. In this level, player will need to press space bar in time whenever a Zong Zi entered the circle. If the player strikes correctly and in time with the rhythm of the music, player's dragon boat will move faster. The game will be finished when the boat reaching the finishing line. Next, player will be getting the main menu with the extra

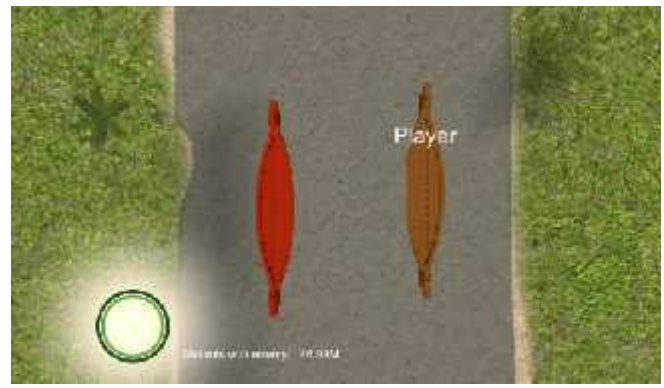

Fig. 6. Dragon boat racing rhythm game incorporates 2D game and cultural sound.

menu buttons being unlocked.

4.2 User Evaluation

An initial user evaluation was conducted with 4 postgraduate students undertaking Multimedia program. It comprises of two male and two female students from 25 to 30 years old. The students were allowed to play the game about five minutes. Participants were allowed to think out loud and gave feedback while using the application.

User may use the gamepad device to navigate in the environment. Users may perform game-style navigation such as jumping and moving forward, backward, left and right sides in first and second level (to look for Zong Zi ingredients). Meanwhile only spacebar button are available for the final level as described in previous section.

From the initial user evaluation, participants mostly commented on two main criteria, which are functionality and user experience. On the functionality, half of the participants agree that the game should include a control

setting features inside of the game because they did not noticed the control setting on the main page at all, while the other half already knew the default keys for all kind of computer games. Half of them also had difficulties to move around the village (in the first level) as the buildings in the village are too narrow to each other. Meanwhile, all participants demanded a function of overview map for both first and second level as they might get confused in searching Zong Zi's ingredients within the environment.

On the user experience, all participants agreed that the instruction given is not clear in the first level (e.g. Zong Zi's ingredient for "rice" should be called "Gluten rice") hence making the game a bit confusing. They also felt not comfortable in the bamboo forest (the second level) because they were required to walk in a straight line for a lengthy distance without doing anything other than pressing forward button. In addition, half of them also mentioned that the chosen background music for the third level is a bit scary because the music has a shouting voice. However, all of them seem to agree on good aesthetical value and also the significance of virtual heritage in enhancing their knowledge on Duan Wu Festival.

5 Conclusion and Future Work

This paper has described the design and development process of project Duan Wu Festival game. This 3D cultural game is created to invoke the awareness of the preservation of traditional festival and culture. Learning while playing is considered as informal learning and we believe this application will helps general public especially the younger generation to understand and appreciate Duan Wu Festival.

Future research and development includes evaluation of interaction between the users with the user interface. The evaluation may surface the interaction issues and to what extent the user is able to absorb information within the virtual game.

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