

PHILIPPINES FIRST: AN EDUTAINMENT 3D GAME FOR ANDROID MOBILE PLATFORM USING SEPARATING AXIS THEOREM (SAT) ALGORITHM

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ABSTRACT

Philippines First is a single player three-dimensional (3D) edutainment game for Android mobile platform. The concept of the game is to promote the Philippine tourism by providing interesting information about the different tourist spots around the country. The player will help the character named Jake to explore the different tourist spots in the Philippines. As the player helps Jake in travelling the different tourist spots, the player learns facts and trivia about the places. Philippines First consists of three stages that will be divided in each major island of the Philippines (Luzon, Visayas and Mindanao). Each stage has five destinations. In each destination, the character will roam around the environment, and he must talk to people to gather information about that tourist spot. To exit the destination, the player will enter through a portal which leads to the quiz. Iterative methodology was adapted to find errors at an early stage of software development life cycle. The proponents used this methodology to make the game development process flexible and easy to manage. Iterative methodology allowed the proponents to capitalize on the learning that was accumulated during the development of earlier parts or versions of the solution. The game was evaluated by 100 respondents in terms of functionality, reliability, usability, efficiency and maintainability. Respondents who tested the game find it educational and have discovered new information, as the game promotes mostly underrated tourist spots in the Philippines. The respondents liked the game interface. The attractive design of the game adds an appeal to the audience.

KEYWORDS – 3D Game, Android Application, Edutainment, Philippine Tourist Spots, Separating Axis Theorem (SAT) Algorithm

INTRODUCTION

In today's generation where technology is continuously improving, the development of mobile applications brings a large contribution in the computer market. Mobile games are the top gross paying applications in Google Play/App store. In comparison to various gaming consoles, mobile games are more convenient because users can play anytime, anywhere and often for free. Three-dimensional (3D) graphics have been an important feature in game development. 3D based content is often viewed as more attractive in games than the more abstract 2D graphics.

Edutainment, short for 'educational entertainment', is the process of entertaining people at the same time as you are teaching them something. Edutainment technology comes in many forms. An application can be categorized as edutainment if it has both entertainment and educational value. Edutainment is about more than just playing games, it captures and retains learners' attention, challenges them, engages and entertains them, and teaches them. Mobile devices and games make a great combination, not just for entertainment but for learning.

The proponents combined the aspect of mobile 3D games and edutainment to create a game that is tied with promoting the different tourist spots around the Philippines. The Philippines is beautiful, yet Filipinos know more about travel destinations in other countries than places in the Philippines. Despite the fact that Filipinos were born, raised, and have spent their entire lives in the Philippines, most of them are guilty of only seeing a small part of it. Philippines First is an edutainment game that aims to provide interesting information about the Philippine tourist spots.

LITERATURE REVIEW

I. KulTOURa (M. Limpag, 2017)

KulTOURa is a Philippine travel guide application developed in collaboration of the National Commission for Culture and the Arts, Department of Tourism, Smart Communications, and InnoPub Media. It was launched on June 19 to coincide with the birth anniversary of Rizal. It is a mobile application which aims to help travelers navigate tourist spots in the Philippines. The KulTOURa app works as a guide that provides information on heritage sites and other must-see destinations in the country to help tourists appreciate Filipino culture.

The application provides a reliable source of data gathering for the proponents' study. It features facts and trivia about the places in the Philippines obtained through Department of Tourism, which is the recommended source of the proponents' thesis panel for the game's information.

II. Jeepney Flash: An Edutainment Android Game (D. Dela Cruz, S. Flores, J. Mendoza, 2014)

Jeepney Flash is a 2D Android Game. The player drives a jeepney that roams around different places in the Philippines. The player needs to get passengers along the way. For every passenger, a question about the place will be asked. It gives trivia and knowledge to the player. This research project aims to provide a fun way of learning the places in the Philippines through an interactive game. In developing the study, the proponents encountered research questions like how to create an Android game, how to make the game entertaining and educating, how to make the graphics and the game design, and most importantly, what will be the purpose of the game.

This thesis serves as guide for the proponents' study as the game is also an Android edutainment game involving the different tourist spots in the Philippines. It enables the proponents to think of new ideas and improvisations.

III. Math Jump: An Educational Mobile Game (L. Tatu, 2013)

Math Jump is an educational game for 5 - 12-year-old children. The game features motion controls make solving math exercises fluid, let your mind flow as you test your multiplication skills, and race for the high score with your friends. The game has been developed with the pedagogical expertise of Finnish kindergarten teachers and it has been tested with children in the age group.

MathJump has the concept of edutainment that is a reliable resource for Philippines First. A multitude of game development tools were used in MathJump to develop a minimum viable product for the purpose of learning about the mobile educational game market. The iterative design, which is the type of methodology used in Philippines First, is documented in MathJump from different aspects with practical examples provided.

METHODOLOGY

Iterative methodology is adapted to find errors at an early stage of software development lifecycle. The proponents used this methodology to make the game development process flexible and easy to manage. Iterative methodology allows the proponents to capitalize on the learning that will be accumulated during the development of earlier parts or versions of the solution.

In performing the iterative methodology, the proponents' first step was going through initial planning to understand what the proponents would need to do for each step of developing Philippines First. The leader divided the work and assigned specific tasks for each member such as coding, UI design and 3D modeling. The next step was mapping out the requirements of the software. The proponents discussed the most efficient programming and designing software or tools needed in meeting the game's requirements. Generally, the proponents prepared for the upcoming stages of the development cycle. Once the planning is completed, an analysis was performed to nail down the appropriate logic that would be required in developing the game, such as what programming techniques would be used to achieve the goal of the game per level. Then the actual implementation and coding process began. Once the game has been coded and implemented, the proponents went through a series of testing procedures and debugging to identify any errors or

issues. Once all prior stages have been completed, the game should be possibly ready to present to the adviser and do an evaluation process. The proponents gave time to reflect on which areas needed improvement.

Philippines First is compatible with Android devices version Jellybean or higher. Unity was used as the software’s main game engine and C# as the programming language. Autodesk Maya was used for modeling the 3D objects in the game. Philippines First does not require any network connections since it is a standalone offline mobile game.

Game Architecture

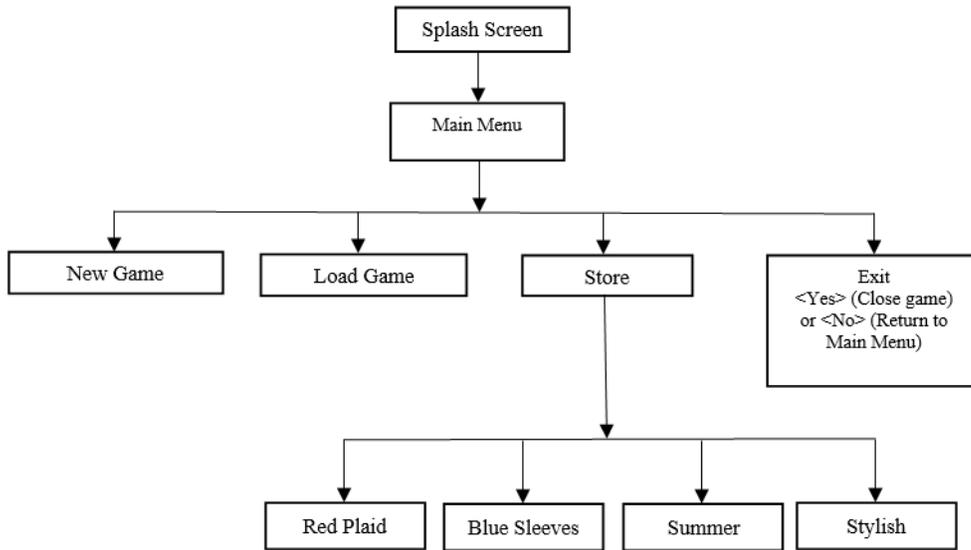


Figure 1. Game Architecture of Philippines First

Figure 1 represents the game architecture of Philippines First. The game will start with the splash screen which displays the logo of the proponents’ group name. The Main Menu displays the title of the game and includes buttons such as ‘New Game’, ‘Load Game’, ‘Store’ and ‘Exit’. New Game will create a new game starting from the introduction scene of the story. Load Game will load the level which the player left off. Store consists of different outfits and new character that can be purchased. Exit will close the game.

Levels

Philippines First consists a total of three stages that will be divided in each island group of the Philippines (Luzon, Visayas and Mindanao). Each stage has five levels – each level is a different destination located in that island group. The level of difficulty is based on the time limit and the number of questions in the quiz. 15 seconds is timed per question in Luzon, 12 seconds per question in Visayas and 8 seconds per question in Mindanao. There are 3 questions in Luzon, 5 questions in Visayas, and 7 questions in Mindanao. In every correct answer, the player will collect 5 coins that can be used to buy items in the Store such as new outfits and/or new character. For every wrong answer and failure to answer within the time limit, 15 coins will be deducted from the money and will repeat to question 1.

Algorithm: Collision detection using the Separating Axis Theorem (SAT) Algorithm

The Separating Axis Theorem (SAT) Algorithm is often used to check for collisions between two objects. It determines if there is a gap between two objects. If there is a gap, then the two objects are not in collision. If there is no gap, then the objects are in collision.

The proponents applied the algorithm in the game for the collision detection between the character and the coins scattered in the environment, and the different people in the tourist spots. When a collision is detected between the

character and the coins, the collected money will be added. When a collision is detected between the character and the people in the tourist spots, a message box will appear, showing information about the tourist spot.

RESULTS AND DISCUSSION

In order to get some ratings of the game proposed, the proponents introduced the game to some high school and college students through evaluation form using ISO model. The ISO/IEC 9126 standard describes a software quality model which categorizes software quality into six characteristics (factors) which are sub-divided into sub-characteristics (criteria). These criteria include functionality, reliability, usability, efficiency, maintainability, and portability. The fundamental objective of the ISO/IEC 9126 standard is to address some of the well-known human biases that can affect the delivery and perception of a software development project.

After the evaluation conducted with students, the results show that most of the respondents agreed that the system provides educational information, the software can perform the tasks required, the results of the software are what is expected from the input. Some of the respondents said that the system does not quickly respond to commands. This is because the game is quite lagging due to its large file size. Although the respondents can comprehend how to use the system easily using the tutorial feature of the game. The respondents can use the system without much effort, and said that the interface of the system looks good.

CONCLUSIONS AND RECOMMENDATIONS

Based on the interpretation of the data, the proponents concluded that Philippines First is a functioning and effective 3D edutainment game. Students who tested the game find it educational and have discovered new information, as the game promotes mostly underrated tourist spots in the Philippines. In addition, the respondents liked the game interface. The attractive design of the game adds an appeal to the audience. Overall, the respondents had a positive feedback regarding the game.

The proponents recommend for the future game developers to create a virtual reality (VR) version of the game. It is recommended to further enhance the overall gaming experience by making it more unique and to visualize the environment of the game better. It is also recommended to add more destinations since there are a lot more underrated tourist spots in the Philippines.

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