ROGUE FOREST: IMPLEMENTATION OF PROCEDURAL GENERATION EVENTS FOR GAME ENGAGEMENTS.

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ROGUE FOREST: IMPLEMENTATION OF PROCEDURAL GENERATION EVENTS FOR GAME ENGAGEMENT.

AMIRUL SYAFIQ BIN ABDUL HALIM

This report is submitted in partial fulfillment of the requirements for the Bachelor of [Computer Science (Game Technology)] with Honours.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2020/2021

DECLARATION

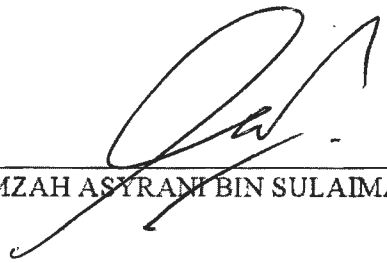
I hereby declare that this project report entitled

[ROGUE FOREST: IMPLEMENTATION OF PROCEDURAL GENERATION EVENTS FOR GAME ENGAGEMENT.]

is written by me and is my own effort and that no part has been plagiarized without citations.

STUDENT : AMIRUL SYAFIQ BIN ABDUL HALIM Date : 24/6/2021

I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of [Computer Science (Game Technology)] with Honours.



SUPERVISOR : HAMZAH ASYRANI BIN SULAIMAN Date : 24/6/2021

DEDICATION

Praise to Almighty Allah S.W.T

To my supervisor, Dr. Hamzah Asyrani bin Sulaiman,
Who always give attention and motivation to me in term of guiding me throughout the development process of this project.

To my beloved parents, for the encouragement and great support when comes to motivation and words of encouragement through tough times.

To my beloved friends, who have support, guiding and testing my project to be completed on time and give more improvement to my project for future assessment.

And finally, not to forget, to the University Teknikal Malaysia Melaka that giving me the opportunity to enhance and improve my skills and resources to make this project possible.

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Grateful to Almighty Allah S.W.T and his blessings for giving me strength and ability to complete this project in time provided with great satisfaction.

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Huge appreciation for my beloved parents for the encouragement and great support when comes to motivation and words of encouragement through tough times.

Also, thanks to my friends, who have support, guiding and testing my project to be completed on time and give more improvement to my project for future assessment.

And finally, thanks to University Teknikal Malaysia Melaka that giving me the opportunity to enhance and improve my skills and resources to make this project possible.

ABSTRACT

This project is about the development of a Rogue-like genre game that uses the implementation of procedural generation events in the game development process for game engagement. This simple game aimed not just to capture the attention and game engagement of the users on the procedural generation events in the game but also to capture the attention of the small developers to familiarize themselves with the procedural generation methods in creating the levels and terrain computationally. This simple game is developed to study the extend and promote the use of procedural generation events in game development. The development of this game is based on the Game Development Life Cycle and the Rogue-Like-based architecture and also the Unity3D software was used in the development of the project since it is free and easy to use especially for small developers. The objective is to study how the procedural generation events work in game development and how the procedural generation games impact the game engagement of the users. The project was expected to expose the method of procedural generation on how it works and to evaluate the game engagement of the users on the procedural generation game.

ABSTRAK

Projek ini adalah mengenai pembangunan permainan dengan genre Rogue-Like yang menggunakan pelaksanaan acara penjanaan prosedural dalam proses pengembangan permainan untuk penglibatan permainan. Permainan sederhana ini bertujuan bukan hanya untuk menarik perhatian dan keterlibatan pengguna permainan pada acara penjanaan prosedural dalam permainan tetapi juga untuk menarik perhatian para pembangun permainan kecil untuk membiasakan diri dengan kaedah penjanaan prosedural dalam membuat level dan rupa bumi secara komputasi. Permainan sederhana ini dikembangkan untuk mengkaji pembangunan dan mempromosikan penggunaan acara penjanaan prosedural dalam pembangunan permainan. Pembangunan permainan ini didasarkan pada Kitaran Hidup Pembangunan Permainan dan seni bina berasaskan Rogue-like dan juga perisian Unity3D digunakan dalam pengembangan projek ini kerana ia percuma dan mudah digunakan terutama untuk pembangun permainan kecil. Objektifnya adalah untuk mengkaji bagaimana penjanaan prosedural berfungsi dalam pembangunan permainan dan bagaimana permainan penjanaan prosedural mempengaruhi penglibatan pengguna dalam permainan. Projek ini diharapkan dapat memperlihatkan kaedah pembuatan prosedural tentang cara kerjanya dan untuk menilai keterlibatan permainan pengguna pada permainan generasi prosedural.

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LIST OF ABBREVIATIONS

FYP - **Final Year Project**

LIST OF ATTACHMENTS

CHAPTER 1: INTRODUCTION

1.1 Project Background

This project is a Rogue-Like game where the game is about the implementation of the procedural generation events including the levels, challenges, and the weapon used. The main idea behind the Procedural Content Generation (PCG) is that game content is not generated manually by human designers, but by the computer executing a well-defined procedure. (Hendrikx, 2013) This method will create a large amount of content and challenges to make the game more interesting. Furthermore, whenever the player proceeds to new levels or retry the game, new challenges will be generated to give the game more intense. The perspective of the game is on the top-down view where the player can see the path and the enemy positions. The game is developed using Unity3D with the use of its basic asset and Visual Studio 2019 for the scripting development. The game main focus is the implementation of the procedural generation in game development and the impact of the procedural generation game to the game engagement from the player of all.

1.2 Problem Statement

Most video games are created and built by arranging and designing the map and challenges manually. Instead, there is a method called procedural generation in game development. This method is used in developing a large number of challenges and terrains which are arranged algorithmically. This project able to expose the mechanics behind the procedural events and the game engagement of the players towards the procedural generation game.

1.3 Objectives

- To understand and implement the procedural generation events in game
- To develop infinite number of challenges in the game environment.
- To evaluate the player's game engagement in the procedural generated environment.

1.4 Goals and Genre

- This game goal is to provide entertainment using procedural generated events that manage to fulfill player game engagement
- the genre of the game is Rogue-Like genre which is a sub-genre for RPG games.

1.5 Game Features

The game is suitable for all ages usually for those who have familiar with gaming especially casual gamers since the game is all about entertainment that encourages game engagement towards procedurally generated games.

At the start of the game, the player will spawn on a platform arena where the player must hold out against multiple enemies. The player obtains scores when the player defeats each enemy. After the enemies in the area have been defeated, the player can proceed to the next level where the arena increased in size and the obstacle pattern has been changed automatically. The game is over when the player's health bar is depleted or when the player falls from the platform arena provided. After the game is over, the game will display the score obtained by the player through the game.

1.6 Conclusion

The final product is expected to be a full functioning and playable game with procedural generation events and familiar mechanics that give entertainment and also to the game engagement to the player.

CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter provides an overview of the previous research on the Procedural Content Generation (PCG) and Rogue-Like Game Genre. It also introduces the genre of the game proposed, reviews list of existing games that are related to the project, and project methodology.

2.2 Genre

The proposed game genre is Rogue-Like Genre. "What is a Rogue-Like?". (Kopczynski, 2017) defines that Rogue-Like is often seen as a sub-genre of RPG, but as RPG becomes the mainstream, Rogue-Like find it's own another way by protecting its traditions and staying in the non-mainstream area. The historical development (Dechterenko, 2015) mentions that the origin of the Rogue-Like genre descends from 1980 game named "Rogue" that is a roleplaying game with randomly generated dungeon and NetHack (1987) game which shared the same feature as the 1980 Rogue game. (Almgren, 2014) presents that the most common elements contained in Rogue-Like games are Procedurally Generated Content, permanent death, and character progression.

2.3 Existing Games

- Diablo (1996)

    - Diablo is an action role-playing hack-and-slash video game. The player moves and interacts with the environment primarily by the way of a mouse and other action, such as casting a spell are performed in response to keyboard inputs mentioned by (Craddock, 2013). The player can acquire items, learn spells, and interact with Non-Player Character (NPC) throughout the game. The game world of Diablo game however created using 2D isometric graphic and

takes the theme of fictional medieval-style era of dungeons and dragons which are generated procedurally according to an algorithm with random elements such as random dungeon layouts and random item or "loot" generation (Oliver Korn, 2017).

- Rogue (1980)

    - According to (Brewer, 2017) one of the earliest applications of Rogue-Like game is "Rogue" which was developed in 1980 by Michael Toy and Glenn Wichman at the University of California and the game is inspired by Dungeons and Dragons and Adventure. In the Rogue game, the player has to explore the procedurally generated Dungeon of Doom to retrieve the Amulet of Yendor. The grid of the monospaced fonts was used to represent monsters, items, and dungeon walls, as the use of ASCII was far less processor intensive than drawn graphics discussed more by (Smith G. (., 2015).

Both of the games use PCG to build the same Dungeon theme Rogue-Like game whereas both use the same game design where the player has to explore the labyrinth of dungeons and defeat the enemies along the path to reach the goal. (Shaker, 2010) found that other than use PCG for creating random dungeon layouts, it also can be used on random platform layouts, random cave layouts, random terrain generators, create maze layouts, and forest/city generators.

2.3.1 Comparison of Existing Games

In the comparison of both the game in 2.3 (Existing Game), both of the game uses PCG in term creating the random level layout, in the rogue game the ASCII is used to represent monsters, items, and dungeon walls. The game feature that is available on the Rogue game is the permadeath applied to the player. If the player has proceeded far into the game and the n the player is just simply dies, the player will restart the game as a fresh character (Brewer, 2017). On the other hand, the Diablo game provides even more game features such as the player able to learn and cast spells, and also able to interact with NPC. (Craddock, 2013).

In terms of Game Play, since the Rogue Game uses traditional ASCII the gameplay of the Rogue is mostly on the text-based UI. All of the game object elements are consisting of letters and numbers on a 2D grid that makes up the screen display space. (Smith A. J., 2014). On the other hand, the diablo game uses 2D isometric materials as the representation of the game object in the game. not to mention, the diablo game offers three classes of character – the warrior, the Rogue, and the Sorcerer.

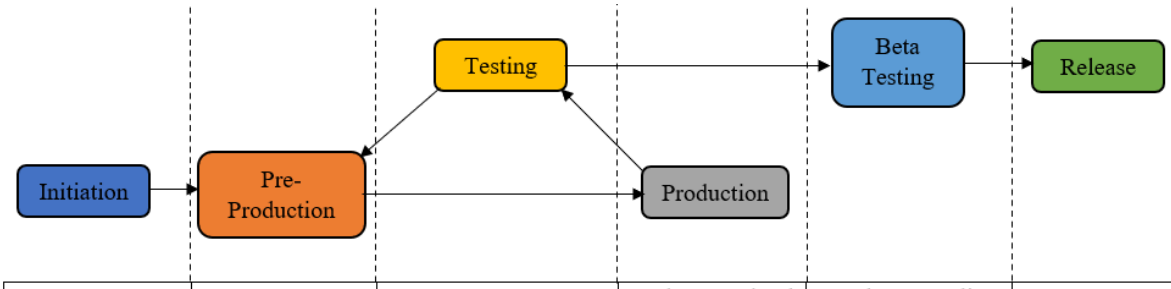
The Diablo game also offers Multiplayer mode which allows gameplay with the player more than one.

Finally, in terms of the game mechanics, the Rogue game and the Diablo game shared similar game mechanics but the Diablo game offers much more than Rogue game which is the Diablo game offer multiple character classes that can be different in term of the combat system and the learning and casting spells that give more complexity to the game mechanics offered by the Diablo game. in the Rogue game, the game mechanics that available is the permadeath mechanics which make the game realistic and the basic combat system of a sword-wielding player.

The proposed project which is the Rogue Forest shares the same PCG but rather than create a Dungeon theme, the proposed project will create a maze-like level with increasing in map size, random obstacle placements, and difficulty as the player proceeds through the game. the proposed game also has endless waves of enemies chasing the player wherever the player goes.

2.4 Project Methodology

The Game Development Life Cycle (GDLC) methodology was used in the development of this project. The GDLC is a framework defining stages and tasks performed at each step from an initial idea through maintenance of the completed game in the game development process. According to (Ramadan, 2013) the GDLC are almost similar to SDLC since the process is almost alike. The author also found that there a total of four different guidelines in the GDLC guidelines which are the *Blitz Games Studio GDLC, Arnold Hendrick's GDLC, Doppler Interactive GDLC,* and *Heather Chandler's GDLC* (Ramadan, 2013). So, referring to (Ramadan, 2013) the GDLC guideline that will be used in the project development is the most recommended which is the Proposed GDLC by (Ramadan, 2013).



Tiles	Obstacle Assets	Test Procedural Code	Code Procedural Algorithm	Evaluate Quality Assurance	Beta Release
Map Layout	Character Assets	Test Game Mechanic	Code Game Mechanic	Playtest Full Game	
Rough Sketches	Weapon Asset		Code Weapon Feature		

Figure 2.1: Game Development Life Cycle (GDLC)

There are six steps in the proposed GDLC by (Ramadan, 2013) which each will follow a specific step.

1. Initiation: In the starting of the game development, the first step that the developer will brainstorm the idea of the game that the developer wants to develop. Usually, the developer will create a rough sketch of what kind of game that the developer wants to build. The common criteria that the developer will think is what is the game about, rough sketch of gameplay, and the target audience. The output of this phase is the game concept and simple game description.

2. Pre-production: the first in the production phase is the Pre-production phase. In this phase the criteria that will be involve is the game design and creation of the game prototype. Game Design focuses on the defining the game genre, gameplay, game mechanics, storyline, technical aspects and its elements documentation in the Game Design Documentation (GDD). Then, a prototype will be made to access the Game Design and the whole idea. The output of this phase is game design that has been approve and documented in GDD.

3. Production: this phase is the core process of the game development which revolves around assets creation, source code and integration of both elements. The activities that are related to the production phase are

refining the structure with more complete mechanic and asset also balancing and adding new features to the game is related to the production phase.

4. Testing: in this phase is the internal testing of the game usability and playability of the game. Testing is a repetitive and interactive process of the same screen flow input and expecting the output from the user for quality for games. The output of the testing is bug report, change request, and development decision.

5. Beta: Beta testing is an opportunity for real users to users to use a product in a production environment to uncover any bugs or issues before a general release. This phase is usually involving third-party or external tester. The output for this phase is the bug reports and user feedbacks.

6. Release: this phase is the final stage and ready to released to public. Release phase is involving project launching, project documentation, maintenance planning, and game expansion.

2.5 Conclusion

To summarize, this chapter discussed the genre of the game, the comparison between the game project and the existing games, ans the methodology that is used in the development of the game.

In the next chapter, the project requirement, technical requirement and software requirement will be discussed.