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### RESEARCH ARTICLE

#### THE USE OF VISUAL SCRIPTING UNREAL ENGINE 5 IN THE DEVELOPMENT OF AN ANDROID-BASED FPS GAME "LEFT BEHIND"

**Ari David Fernandez and Joko Sutopo**

Informatics Study Program of Yogyakarta University of Technology, Siliwangi Street, North Ring Road, Sleman Regency, Yogyakarta, Indonesia.

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#### Abstract

The popularity of Android mobile games in Indonesia is very high, but the majority of the games available are from overseas. Therefore, local game developers need to improve the quality of their products in order to compete with games that already exist in the Indonesian market. The purpose of the preparation of this research is to develop a zombie First Person Shooter (FPS) game entitled "Left Behind" which was developed using the Visual Scripting method and is expected to be an inspiration for developers in pouring their work by making quality games. This Left Behind FPS game was developed using Unreal Engine 5 as a game engine and later the game can be played on an Android smartphone. Unreal Engine 5 is an opensource game engine that was released in 2022 so that it can present high quality graphics. In testing the application, it is proven that the use of high graphics can be run on Android devices smoothly.

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#### Introduction:-

The definition of a game according to Chris Crawford is an activity that involves interaction and has a certain achievement goal. In the game there are objects that support the course of the game, and there is an element of resistance or challenge that must be faced. Chris Crawford classifies games into several types, including board games, cards, athletics, children's games, and computer games. A quality game is one that generates active engagement from the user and presents just the right amount of challenge, not too little or too much. A person's behavior when playing a game can be different from when they are not playing, because when playing a game, they will feel involved in the world created by the game<sup>(1)</sup>.

Games have several genres such as Action, Fighting, RPG, Racing, FPS, and Adventure. However, the most popular among players are games with the FPS genre. FPS or First Person Shooter games are a type of game where the player is in first person perspective and acts as the main character in the game. First Person Shooter (FPS) features a first-person perspective where the player observes through the eyes of the game character. As opposed to a third-person perspective that shows the character from the back or side, which allows the player to see the entirety of the character they are controlling<sup>(2)</sup>.

In developing a game, the most important thing to consider is the selection of the game engine. Previous studies have developed FPS-themed games using the Unity game engine and supporting software such as Blender and Fuse

**Corresponding Author:- Ari David Fernandez**

Address:- Informatics Study Program of Yogyakarta University of Technology, Siliwangi Street, North Ring Road, Sleman Regency, Yogyakarta, Indonesia.

Mixamo. However, due to the low graphics capability of the Unity game engine, the resulting game has a less than optimal display<sup>(3)</sup>.

Unreal Engine is a game engine or application used to build a game released by Epic Games in 1998. Initially this engine was made for a firstperson shooter video game called Unreal. This first generation Unreal Engine was developed by Tim Sweeney, founder of Epic Games<sup>(4)</sup>. Unreal Engine 5 has the advantage of being able to process high graphics and is easy to understand for users who are not too familiar with coding<sup>(5)</sup>.

In addition to graphics, animation is also no less important in game development. Research on NonPlayable Character (NPC) behavior allows enemies to behave based on player interaction<sup>(6)</sup>. NPCs can do several things automatically such as chasing players, wandering, and attacking players. With NPC behavior like this, the game will feel realistic to the players<sup>(7)</sup>. In Unreal Engine 5, the NPC behavior can be developed through the Visual Scripting method. Visual Scripting or Visual Programming is programming where the program is displayed in a nontextual form. The main advantage of visual scripting is that it allows designers or developers to quickly see the relationship between each logical part without the need to dig into the actual code so that handling in bug fixes will be faster. Visual scripting in Unreal Engine is called Blueprint which is displayed in the form of Nodes. The nodes are connected to each other to form an event<sup>(8)</sup>.

The choice of platform will determine where the game can be played. Currently, the most commonly used device is an Android-based smartphone. Android is an operating system that uses Linux operations as its base and is an opensource mobile device that allows users to develop new applications on it. With the development of Android-based games, it is expected to increase player mobility so that players can play games anywhere and anytime. In addition, the price of Android devices is cheaper than other devices such as laptops or PCs<sup>(9)</sup>.

A research conducted a development that produced an FPS game with the theme of the battle of November 10, 1945. The game was developed using the Unreal Engine 4 game engine so that the graphics produced are more realistic. In addition, the development target on the android platform will facilitate the mobility of its users in playing the game<sup>(10)</sup>.

Based on this background, this research will use Visual Scripting contained in the Unreal Engine 5 game engine to support the development of the android-based zombie-themed FPS game "Left Behind".

### Method:-

In this research, there is a methodology used, namely the Multimedia Development Life Cycle (MDLC) developed by Luther. This method consists of six stages, such as Concept, Design, Material Collecting, Assembly, Testing, and Distribution<sup>(11)</sup>. By utilizing multimedia, users can experience a variety of experiences through various types of media, so that they can overcome boredom due to the variety of media used. It is also suitable for supporting self-learning activities and as a source of entertainment<sup>(12)</sup>. Stages of this research are shown in Image 1.

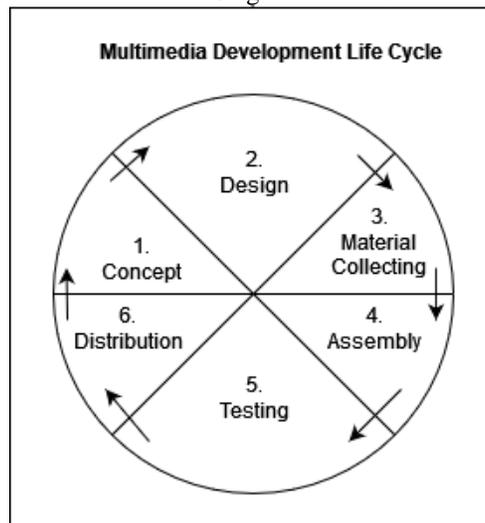


Image 1:- Multimedia Development Life Cycle.

### Concept

It is important to establish the concept of the game, especially in determining the genre, because with a defined genre, the process of developing game mechanics will become easier. In this research, the genre chosen is horror FPS with the target Android platform.

### Design

When starting the game, the system will display a menu containing 4 options namely "Play", "Credits", "Settings", and "Quit". When the player chooses "Play", the game will start. In the game, players will be faced with zombies that each round (wave) has a different number of zombies. The longer the player survives, the more zombies will appear. For testing, the number of rounds in this game is 4 rounds, and the game will stop when the player character loses or the player defeats all the zombies. When the player defeats all the zombies, the score or points that the player has earned during the game will appear. The score displayed is the result of how many rounds the player survives.

### Material Collecting

This stage is the stage where developers collect assets such as audio, video, or 3D assets that will later be used in game development. The audio used in the game is non-copyrighted audio downloaded from Youtube. The audio assets are shown in Image 2.

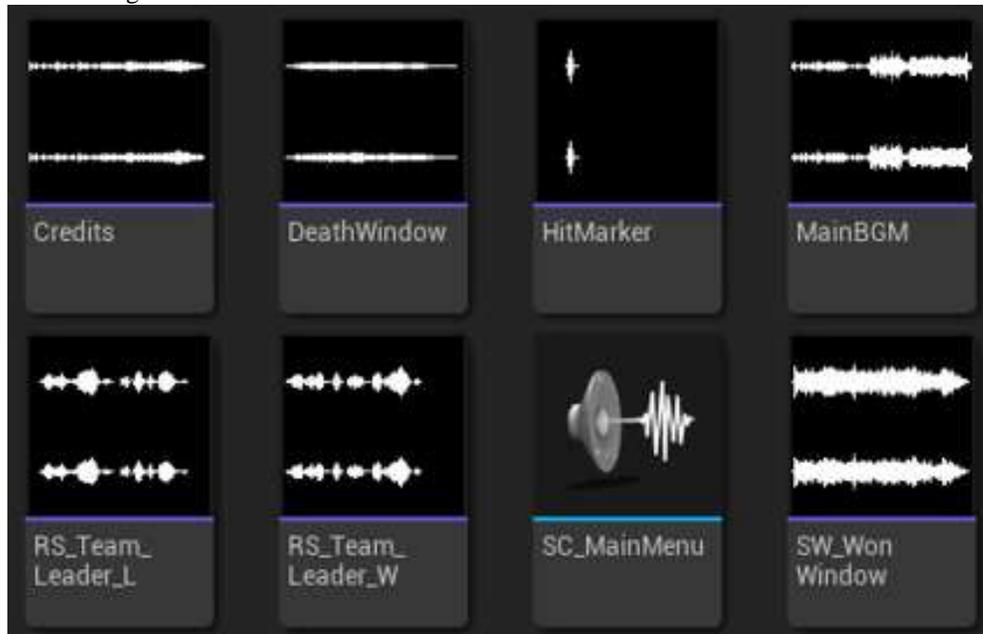
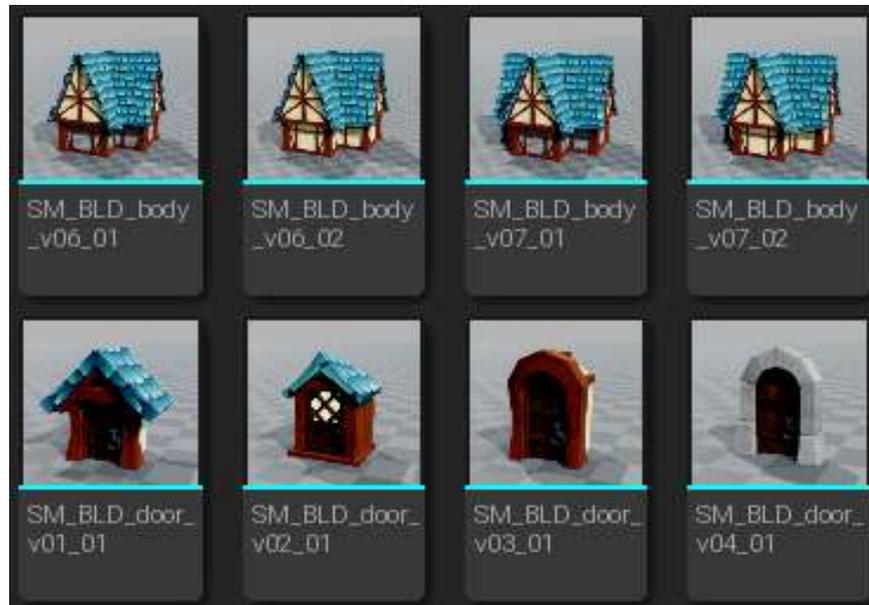


Image 2:- Audio Assets.

Video assets are obtained through editing using Movavi Video Editor software which is then extracted in Mp4 format. The video will later be used in the Credits section. Widget assets are obtained through the editing process using Photoshop software which is exported in png format and then imported into Unreal Engine 5 as a texture. In addition, the most important assets in game development are 3D assets. The 3D assets in the game such as buildings, weapons, and characters are obtained through the download process from the Unreal Engine Marketplace and Mixamo. The 3D assets are shown in Image 3.

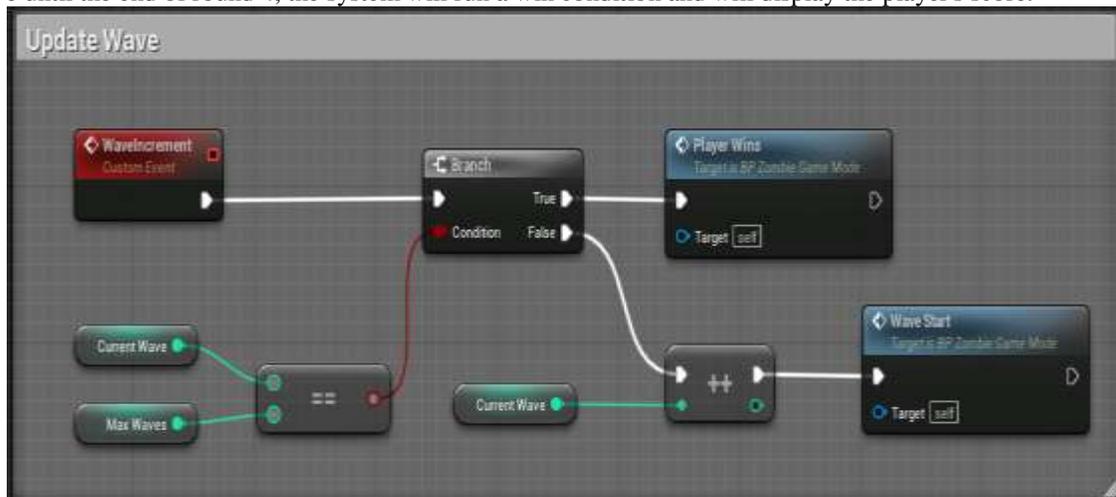


**Image 3:-** 3D Assets.

To further animate the 3D assets, an animation is required. The animation assets used in the game are obtained through the download process from the Unreal Engine Marketplace and Mixamo.

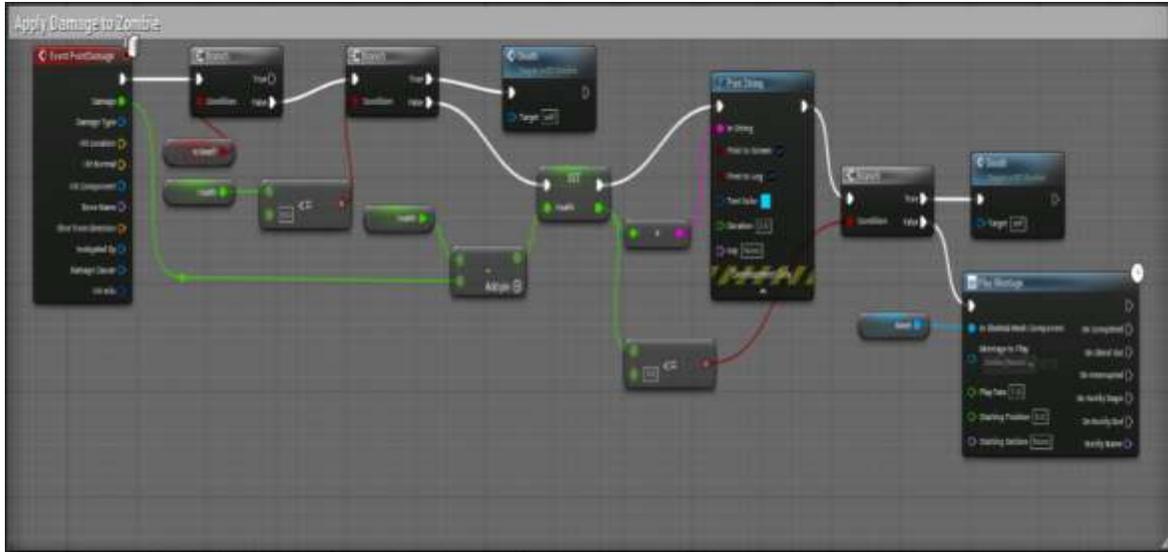
### Assembly

The assembly process or game creation is done using the Visual Scripting method. Visual Scripting is a method of creating a game that describes the program visually or using images rather than using text. Thus, fixing errors in the game can be done more quickly. Image 4 shows the creation of a game mode where each round (wave) the number of zombies will increase. In the first round, there are 2 zombies that appear, and each round the number of zombies that appear increases by 2 until the fourth round where the zombies that appear are 8. When the player manages to survive until the end of round 4, the system will run a win condition and will display the player's score.



**Image 4:-** Visual Scripting for Game Round Logic.

To win the game, the player needs to defeat the zombies. In Image 5, a logic is shown where the player can reduce the zombie's hitpoints by shooting the zombie. The number of zombies hitpoints is 100, when the player shoots the head, the zombie's hitpoints will be reduced by 60, but if the player shoots the zombie in other parts of the body, the zombie's hitpoints will be reduced by 23. When the zombie's hitpoints reaches 0, the zombie will die.



**Image 5:-** Visual Scripting for Zombie Logic.

In addition to players being able to hurt zombies, surviving zombies can also hurt player characters. When a player character gets too close to a zombie, the zombie will attack and reduce 26 of the player's 100 total hitpoints. When the player's hitpoints reaches 0, the player is considered lost and the system will display the Lose Condition menu.

### Testing

The testing stage is carried out when the game has been made, if an error or bug is found, the revision (troubleshooting) stage is carried out until the game can run properly and is considered complete.

### Distribution

Distribution is done to spread game products that have been made to users. This Left Behind game is distributed in the form of application files that are distributed via Google Drive.

### Result:-

Image 6 is a view of the main page or menu of the game. On the main menu, there are button options such as Play, Credits, Settings, and Quit. The buttons on the main page have different functions. When the "Play" button is pressed, the game will start, the "Settings" button is used to set the settings in the game, the "Credits" button contains the names involved in making the game and the "Exit" button is used to exit the game.

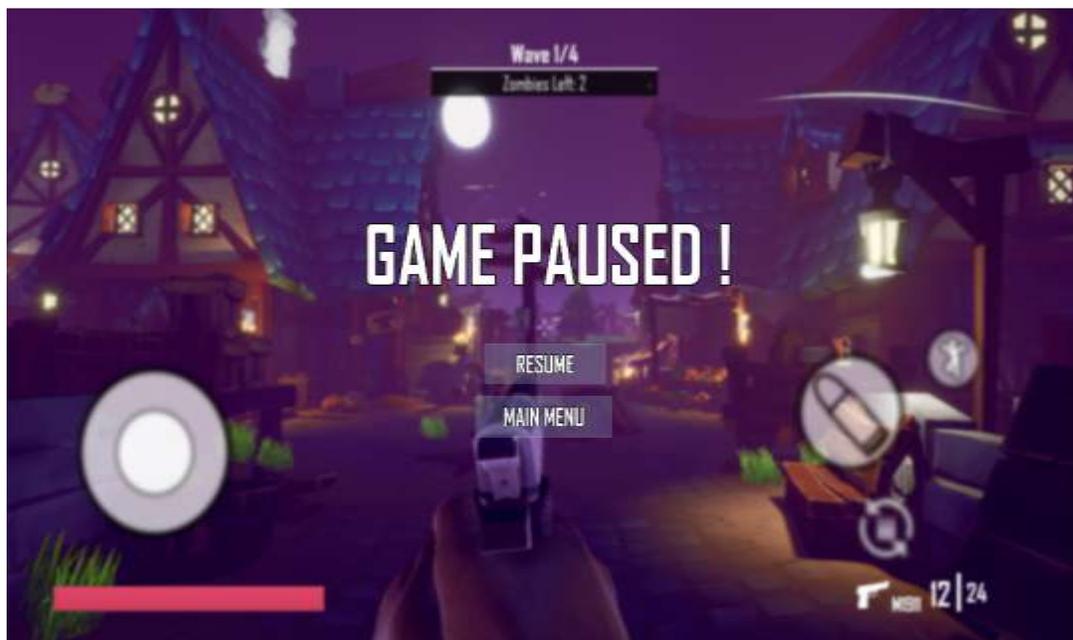


**Image 6:-** Game Main Menu Page.

Image 7 shows the game view. Players will be given an M1911 weapon to shoot zombies. When you want to pause the game, you can use the Back button on your Android. Image 8 below shows a paused view of the game with the options "Resume" to continue the game, and "Main Menu" to return to the main menu.



**Image 7:-** Game View.



**Image 8:-** Game Pause View.

Image 9 below displays a Win Condition. Win Condition is a condition in which the player successfully wins the game. This condition occurs if the player manages to defeat all the zombies in the game. When this condition is met, the system will display the points or score earned during the game. But when the player loses, the system will display a Lose Condition as shown in Image 10.



Image 9:- Win Condition.



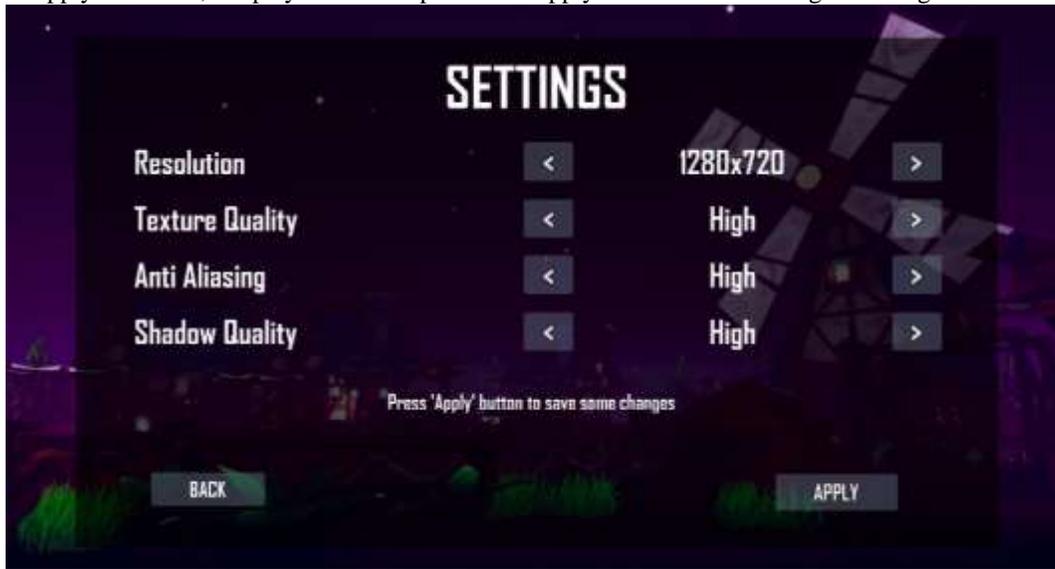
Image 10:- Lose Condition.

Image 11 shows a credits display containing the names of the developers who participated in the development of the game. The display is shown in the form of a video containing dynamic text and music that plays during the display.



Image 11:- Game Credits.

Image 12 is the settings view that contains in-game settings such as resolution, texture, anti aliasing, and shadow quality. To apply the effect, the player needs to press the "Apply" button after making the changes.



**Image 12:-** Game Settings.

**Implementation:**

Testing was conducted using an Android device with the results shown in table 1 below.

**Table 1:-** Application Testing Results Table.

No	Features	Expected results	Results that occur	Status
1	Main Menu	Playing background music, all the play, settings, credits, and quit buttons worked perfectly.	Playing background music, all the play, settings, credits, and quit buttons worked perfectly.	Success
2	Play	Players can shoot and defeat the available zombies. The increase in the number of zombies and rounds works well.	Players can shoot and defeat the available zombies. The increase in the number of zombies and rounds works well.	Success
3	Pause	Players can press the "Back" button to pause the game.	Players can press the "Back" button to pause the game.	Success
4	Win Condition	The player successfully survives and defeats all the zombies then the system displays the message "Mission Accomplished".	The player successfully survives and defeats all the zombies then the system displays the message "Mission Accomplished".	Success
5	Lose Condition	The player runs out of hitpoints and the system displays the message "Mission Failed".	The player runs out of hitpoints and the system displays the message "Mission Failed".	Success

6	Setings	Settings for resolution, textures, anti aliasing, and shadow quality can be set and applied in the game.	Settings for resolution, textures, anti aliasing, and shadow quality can be set and applied in the game.	Success
7	Credits	Displays a video with the names of the members who participated in the development of the game.	Displays a video with the names of the members who participated in the development of the game.	Success
8	Quit	Exit and close the game.	Exit and close the game.	Success

In the test results above, it shows that the Left Behind FPS game has run as expected so that the game can then be disseminated so that users can enjoy and provide feedback to developers.

### Conclusion:-

Visual scripting integrated with Unreal Engine 5 allows developers, programmers, and beginners to create Android-based FPS games with a combination of visuals and programming languages. By using the visual scripting available in the game engine, the resulting game is able to run according to the design and flow that has been designed before. With the ease of use of visual scripting, developers are expected to be able to create games that have better and better quality. The game that has been produced is not only limited to one map, but can have several maps. In addition, further development and research will involve the use of games that can be run on various platforms, including computers and not limited to Android.

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