Designing Platformer Game using GameMaker Studio

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Abstract

Most people who design and make video games for a living have experienced that game development is less pretty than it seems. Timelines to meet, bottlenecks in production, pressure from video game publishers, and endless workweeks are just a few of the many challenges that arise during the development cycle. However, few who venture into game development know that culture and customs test one's sincerity and determination, but the drive to produce video games that look, feel, and play beautifully keeps them going. In this study, we learn how to make games with GameMaker Studio. The games that you make are simple, namely maze and platformer games. The game's object is to move the object through the maze to reach the endpoint. In this example, the player is Pitung, and the endpoint is to exit the yard through the gate. The walls of the labyrinth were made of walls and a few thick trees that made it impassable. Besides that, if you encounter dogs and Dutch soldiers on the road, Pitung will return to find another way.

I. Introduction

Games are any activity carried out for the sole purpose of pleasure and without conscious purpose. Every activity that brings pleasure is a game. For example, people dance, play musical instruments, act in dramas, play with puppets, and also play others.

There are many game definitions, but in this book, games, namely games are included in categories that include Chess, Morris 9 Man, Checkers, Halma, Go, Parchisi, Monopoly, Scrabble, Skat, Rummy, Bridge, Memory, Jack Straws, Domino, and, and so forth. The game in question is a game that has a rule (rule game). [1]

A. Platformer Games

Platform games, or platformers, are a genre of video games and a subgenre of action games. In platformers, players control a character who must jump, climb on platform barriers, and avoid obstacles [2]. The environment is often an unconventional terrain with various elevations to overcome. Players sometimes have to control the height and distance of the jump so that the character avoids falling to death or failing to pass obstacles. A common element in this game genre is the button to jump, but now there are several alternatives, such as sliding the touchscreen. Other acrobatic maneuvers can include swinging on objects such as plants and hooks or bouncing off a springboard. [3]

Platform games originated in the early 1980s, where they often depicted a person climbing as much of a ladder as jumping. With the development of 3D, this game describes jumping on platforms as an integral part of the gameplay and began to be used after the genre was founded, no later than 1983. This genre is often combined with elements of other genres, such as shooter elements, adventure elements, or role-playing elements.

While generally associated with console games, there have been many important platform games released for video arcades, as well as for mobile game consoles and home computers. Platform themes range from cartoon-like games to science fiction and fantasy.

The platform game requires the player to direct their character across the platforms to reach the destination while facing enemies and avoiding obstacles. The games are presented from a side view, using two-dimensional movement, or in 3D with the camera placed behind the main character or in an isometric perspective. Typical platforming gameplay is very dynamic and challenges the player's reflexes, timing, and dexterity with controls.

This genre's most common movement options are walking, running, jumping, attacking, and climbing. Jumping is central to the genre, although there are exceptions, such as Nintendo's Popeye (1982). In some games, the jump trajectory is fixed, but in others, it can be changed midair. Falls from considerable heights often result in damage or death.

In addition, many platform games contain environmental obstacles that kill the player character on contact, such as lava pits or bottomless pits. Most games of this genre consist of increasing difficulty, which may also be punctuated by encounters in which the character must defeat hazardous enemies to progress. Usually, the order of the levels is predetermined, but some games also allow the player to navigate the world freely or may feature a different path to take at a certain point. Simple logical puzzles to solve and trials of skill to overcome are other common elements within the genre.

A more modern variant of platform games (most commonly 3D scrolling), called "runners," has the main character always moving forward at high speed. At the same time, the player must steer properly so as not to fall or crash into obstacles and make it to checkpoints in time. Due to their relatively simple controls, these games work well on mobile devices and have become popular in recent years.

B. Si Pitung

Si Pitung was born in Pengumben, a slum in Rawabelong (near modern Palmerah Station), to Bung Piung and Mbak Pinah (van Till, 1996). He was the fourth son born to the couple. His real name is Salihoen. Based on oral tradition, the name Pitung comes from pituan pitulung (Javanese for "group of seven"). As a child, Salihoen studied at the Hadji Naipin Islamic boarding school. Apart from learning to pray, he also received training in pencak silat and situational awareness. [4]

The story about Si Pitung begins after the money from selling his father's goat is stolen in Tanah Abang. His father forced him to compensate for the loss. Then Si Pitung chased the thief, and this incident made him known as a champion or a brave person. Later Pitung invited his friends to rob Hadji Sapiudin, a wealthy landlord who lived northeast of Batavia, on 30 July 1892. The police suspected that the robbers used firearms to threaten homeowners and neighbors. However, some say that Pitung only stole money from rich people who had worked with the Dutch colonial authorities.

According to the Olanda Indies daily, on 18 July 1892, a schout (a kind of policeman) in Tanah Abang searched Pitoeng's house in a village in Sukabumi. During the search, a black coat, police uniform and hat were found. These items were allegedly used by Pitung and his friends to rob a village. Si Pitung's actions received attention from A.W.V. Hinne, a policeman stationed in Batavia from 1888 to 1912. Hinne wanted to arrest Pitung and had arrested him once. However, Pitung managed to escape with the help of his friends. Folklore associates the escape with Pitung's magical powers.

Finally, Hinne succeeded in killing Si Pitung. According to a report in the Dutch language Locomotief, the historical Pitung was ambushed and killed by Hinne and several of his assistants. Several Indonesian stories suggest that Pitung's family had been caught and tortured to get him out. A detail found in folklore, but not in records from this period, is that Hinne shot and killed Pitung with a golden bullet. Pitung is buried in the cemetery in Sukabumi (now part of Jakarta). When the city began to develop, most of the cemeteries where Pitung was buried were rebuilt with the Telkom Indonesia head office. The house, which originally belonged to a wealthy merchant named H Syarifuddin, who Si Pitung robbed in 1883, was made into the Si Pitung mu-

seum [4]. The land and house building were purchased by the Provincial Government of DKI Jakarta from H Syafiruddin to be used as a Betawi cultural heritage [5].

Challenges are created by setting clear goals for players to achieve. If a plan is clear and achievable, it no longer creates challenges and loses its power. In either game, a few extra actions make saving the object's life the ultimate goal of the game. However, you won't feel challenged anymore because you need to figure out what to do about this new goal! Even once you figure that out, it's hard to keep track of how many objects you've saved, so the thrill of the challenge will only last for a while. The game has two main objectives for the player: saving a number of objects and beating the highest score.

II. RESEARCH METHOD

The development of this game using the Game Development Life Cycle is the process of creating a video game. Development is done by game developers, who typically range from a single person to a large business person. Game Development Life Cycle (GDLC) is a game development method with stages that are carried out systematically to build a digital game and consists of several stages, as shown in Figure 1. The development process is carried out by game developers, usually between one person and the game industry [6].
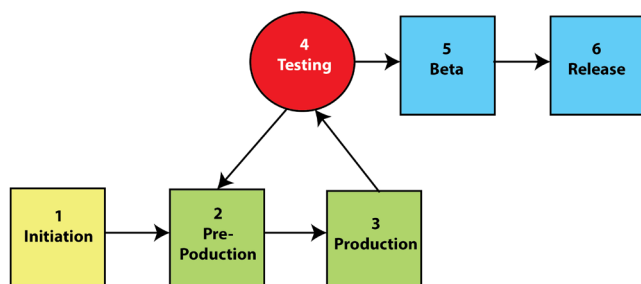

Figure 1 Game Development LIfe Cycle [6]

III. RESULT AND DISCUSSION

A. Initiation

At this stage, several activities are carried out, namely:

- Determine learning concepts by paying attention to learning objectives, audiences, and learning content. The purpose of developing learning games is related to the gap between the current conditions and the learning objectives. Another factor to consider is whether the content presented in learning is enrichment or a complete subject. Likewise, does the infrastructure where education is carried out support the implementation of game-based learning?
- Determine the game concept, including the components to be used in the game, interactivity, and the media used to run the game.
- Determine the concept of a development team with competencies according to game development needs. Game development is an activity that involves many people with different competencies. It is almost impossible for an institution to have complete resources with professional competence. However, institutions must have minimal resources that can handle game development.

Table1 Concept

No	Item	Description	Note
Learning			
1	Topic	Si Pitung	
2	Objectives	For learning enrichment	
3	Audiences	Elementary School	
4	Content	Get to know Si Pitung, the Betawi youth against the Dutch	
Games			
1	Learning game	Maze, platformer	
2	Component	Image, animasi, button, sound, score	
3	Media	Smartphone	
4	Platform	Android	
5	Size	1024 x 768 px	
Genre			
1	Genre		
2	Forms of character	People, nature, thing	
3	Style of character	Realism	
Development Team			
1	Producer	Project leader	
2	Writer	Storyline writer	
3	Lead Designer	Designing the overall game concept	
4	Lead Programmer	Creating game programs	
5	Artist	Creating storyboard	

- Determine the game genre with the character style used. The game genre and character style are related to the audience's characteristics because the game must be interesting for those who play it.

A complete and clear concept will make it easier for the next team to work well. Table 1 helps to complete the concept stage.

B. Pre-Production

1. Opening

"The Machete of Si Pitung" definitely makes a strong first impression. As the sun rises over a brightly colored cartoon style city, an energetic traditional intro song. The kind of music that makes you want to go out and be a hero, and ha; it makes you want to use hero as a verb. There are buttons that will be used to select game items such as Start and Exit, z shown in Figure 2.

Figure 2 Game opening display

There are introductions, tutorials, or character motivations, which players should know before running the game. There was a small log here, and a 'little' bird that flew away as he approached. He also found a lighthouse, with many goats and signs, and an inviting door.

C. Production

1. Room Platformer

After defeating the guards and police, Pitung entered Hinne's house. The house is huge with many rooms. He used his machete to kill the police guarding the house, but he had to be a dog. After all the cops were killed, he tried to find the room's exit to save himself. If Pitung can escape,

the game will end, and the sign "YOU SUCCESSFUL" will appear. However, if he gets stuck in one of the holes, or is killed by Hinnie, then the game will end, and a "YOU FAILED" sign will appear.

2. Score Setting

1. If you meet a soldier (guard), Si Pitung kills him, and because he can kill soldiers, he gets a score of 10.
2. If you meet a dog, the game returns to the start, and the score becomes 0.
3. If Si Pitung hits dynamite, the game ends, and he moves to another room with the sign "YOU FAILED." Because the game ends, the score becomes 0.
4. If Si Pitung hits the boss (enemy), the game ends, and he moves to another room with the sign "YOU FAILED." Because the game ends, the score becomes 0.
5. If Si Pitung reaches the door, the game ends, and he moves to another room with the sign "CONGRATULATION, YOU WIN." In addition, because you can pass through the last door, you get a bonus score of 200.
6. If Si Pitung has not reached the door while the timer has run out, then return to level 2, and the score will be 0.

When you want to create a character or object for a game, you must first start it as a sprite and use it for the object. Sprites as the visible part of an object. To make this game, several images have been prepared to make sprites, can be downloaded at https://bit.ly/3WBCj1v

- Si Pitumg - which consists of several images, namely playerPitung.png, characterStand.png, characterJump.png, and characterRun.png
- Hinnie as boss - represented as image boss.png
- Soldiers or guards - which consists of several images, namely guard.png, guardWalk1.png, guardWalk2.png, guardWalk3.png, and cguardWalk4.png,
- Yard - represented as the image grass.png
- Shrubs - described as image bushes
- Dynanite - represented as image dynamite.png
- Dog - represented as image dog.png
- Door - represented as image door.png

- Currency - represented as the image coin. png

In this section, you will create a game platformer with GameMaker Studio. The game aims to move objects by jumping to reach the endpoint. In this example, the player is Si Pitung, and the endpoint is the exit to the yard. If he meets soldiers on the way, Si Pitung will kill him and continue killing all the guards. However, the game will return from the beginning if a dog encounters it. Meanwhile, if you hit the boss, Si Pitung will be killed, and the game ends.

3. Creating Sprite

When you want to create a character or object for a game, you must first create it as a sprite and use it for the object. Sprites as the visible part of an object. For making this game, five images have been prepared, which are used to create sprites, namely:

- Pitung standing - which is named characterStand.png
- Pitung run - which is named characterRun. png
- Pitung jump - which is named characterJump.png
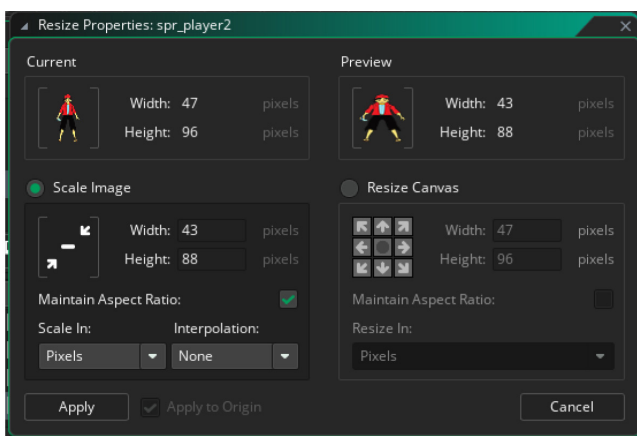- Boss - which is named boss.png

Figure 3 Resizing Sprites Pitung character

4. Moving Objects and the Effects of Gravity

This section explains how to create player and wall objects. Player objects can move left and right. If it hits a wall, it will stop. To make the player object move, you can do the following:
1. Create a new object by right-clicking Objects > Create > Object in the Asset Browser window. In Object Properties, create a name obj_player2. Click No Sprite and select spr_player2.
2. In the same way, make obj_playerRun and obj_playerJump.
3. Create room_platformer. Then drag obj_player2, obj_wall, obj_hole, obj_guard, obj_dog, obj_enemy, and obj_door into the room as shown in Figure 3.
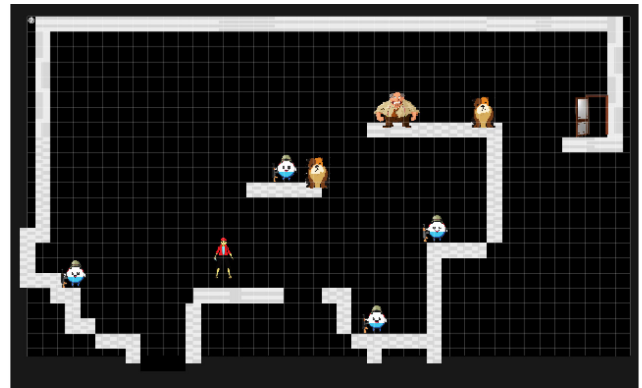

Figure 4 Room_platformer

5. Creating Events

This section adds ultimate interactivity to the game. For that, you need to create an event on the required object.
1. Double-click obj_player2 to open the object, then click Add Event > Create, and create code in the Code Editor as follows:

```
hsp = 0;
vsp = 0;
grv = 0.1;
walksp = 4;
```

The code explains that horizontal speed (hsp) = 0, vertical speed (vsp) = 0, initial gravitational velocity grv = 0.1, and walking speed = 4.
2. To run the game, you can use key-left (move left), key-right (move right), and key-space (move by jumping). Click Add Event > Step > Step, and create code in the Code Editor as follows:

```
// get player input
key_left = keyboard_check(vk_left);
key_right = keyboard_check(vk_right);
key_jump = keyboard_check_pressed(vk_space);

// get player movement
var move = key_right - key_left;
hsp = move * walksp;
```

```
//horizontal collision
if (place_meeting(x+hsp, y, obj_wall)) {
   while (!place_meeting(x+sign(hsp), y, obj_wall))
{
         x = x = sign(hsp);
   }
hsp = 0;
}
```

6. Create Barriers and Goals

This section explains how to create goals and obstacles. For example, target sprites are created as spr_enemy, while barriers are spr_hole and spr_guard. To do this, you can do the following:

1. Create a sprite by right-clicking on Sprites in the Asset Browser window, then clicking Create Sprite. Next, create a sprite name by typing spr_hole.
2. Click Import to import the hole.png file.
3. Right-click on Objects in the Asset Browser window, then click Create Object. Name it obj_hole, then select the sprite spr_hole.
4. Repeat steps 2 - 4 to create an obj_guard object using image guard.png.
5. Repeat steps 2 - 4 to create an obj_enemy object using the enemy.png image.
6. Open the room, then add obj wall, obj_enemy, obj_guard, and obj_hole. Obj_hole is not visible because it has been set not visible. Next, arrange all objects in the room, as shown in Figure 5.11.
7. Open obj_player2, and create a collision between obj_player2 and obj_guard. Add code to the Step event as follows:

```
if place_meeting (x, y, obj_guard){
   with instance_place(x, y, obj_guard){
       instance_destroy();
   }
}
```

8. If there is a collision between obj_player2 and obj_enemy, then the game ends and moves to the next room where there is a message "Congratulations". For that, add the code to the Step event as follows:

```
if place_meeting (x, y, obj_enemy){
   with instance_place(x, y, obj_enemy){
         instance_destroy();
         room_goto_next();
   }
```

7. Closing Scene

1. Create a new room by right-clicking Rooms > Create > Room in the Asset Browser window. Next, create a room name, namely room_end with a size of 1280 x 720 pixels by specifying Width: 1280, Height: 720 in Room Settings. In this room will be placed background, button Start and Exit.
2. Create a spr_backEnd sprite from backEnd.jpg.
3. In room_end create a background from the spr_backEnd sprite.
4. Create the spr_btnPlayAgain sprites from btnPlayAgain.png.
5. Create an obj_btnPlayAgaint object using spr_btnPlayAgain. Then create an event by clicking Add Event > Mouse > Left Pressed, and create code in the Code Editor as follows:

```
room_goto(room_front);
```

6. On room_end, drag obj_btnExit and obj_btnPlayAgain. Then createb text "Congratulation", as in Figure 5.
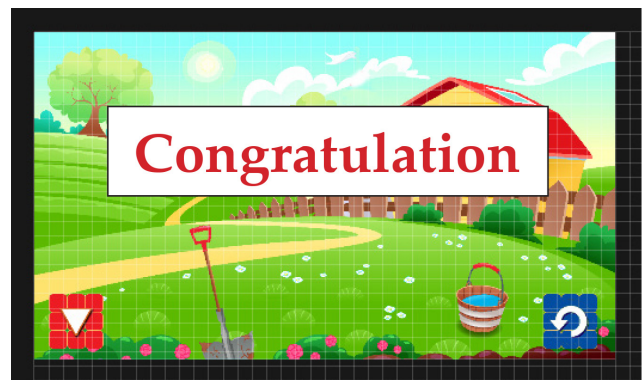

Figure 5 Closing scene

IV. CONCLUSION

Designing a platformer game using Game-Maker Studio based on the iconic Indonesian folklore figure, Si Pitung, has been a captivating and rewarding experience. Throughout the development process, we have immersed ourselves in the rich cultural heritage of Indonesia and brought this legendary character to life in a captivating gaming world.

GameMaker Studio provided us with the necessary tools and resources to create a visually stunning and engaging platformer game. From designing the character animations to crafting the challenging levels, every aspect of the game design was meticulously crafted to offer players an immersive and enjoyable experience.

By integrating elements of Si Pitung's folklore into the gameplay, we were able to not only entertain players but also educate them about this remarkable historical figure and the values he embodies. The game takes players on a thrilling journey through the vibrant landscapes of Indonesia, giving them a taste of the country's diverse culture and traditions.

Moreover, the development process itself has been a valuable learning experience. We have honed our game design skills, improved our programming abilities, and learned how to create a cohesive and well-balanced gaming experience. Collaborating as a team, we combined our strengths and ideas to breathe life into Si Pitung's world and deliver a game that does justice to his legendary status.

V. Future research

Future research in game development could focus on creating the Si Pitung platformer game for mobile devices. As mobile gaming continues to grow in popularity, adapting the game to be accessible on smartphones and tablets would open up new opportunities to reach a broader audience.

Developing the game for mobile devices would require optimizing the user interface and controls to ensure a seamless and enjoyable gaming experience on smaller screens. Implementing touch-based controls and responsive design would be essential to make the gameplay intuitive and engaging for mobile users.

Additionally, mobile devices offer unique features such as gyroscope and accelerometer, which could be leveraged to enhance the gameplay experience. Integrating these features would add an immersive element to the game, allowing players to interact with Si Pitung's world in innovative ways [7].

Moreover, mobile platforms provide opportunities for social integration, such as leaderboards, achievements, and multiplayer functionality. Implementing these features would encourage player engagement and foster a sense of community among players.

Furthermore, future research could explore the potential of augmented reality (AR) or virtual reality (VR) technologies to enhance the game's immersion and interactivity [8]. Bringing Si Pitung's world into the real environment through AR or diving into a VR experience would take player engagement to a whole new level.

The mobile version of the Si Pitung platformer game could also pave the way for educational and cultural outreach initiatives. Integrating educational elements about Si Pitung, Indonesian folklore, and history into the game could provide players with valuable insights while they enjoy the gaming experience.

To achieve these goals, future research could explore cross-platform development frameworks or partnerships with experienced mobile game developers. Conducting usability testing and player feedback sessions would also be critical to refining the mobile game and ensuring it meets the expectations and preferences of the target audience.

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