

DESIGNING A MULTIPLAYER PUZZLE PLATFORMER GAME 2D CHO CHO CAT ON PC PLATFORM

Bimo Aryo Putra Pratama Baskoro¹, Jeanny Pragantha², Darius Andana Haris³

¹ Department of Computer Science, Tarumanagara University, Jakarta, Indonesia
Email: bimo.535190085@stu.untar.ac.id

² Department of Computer Science, Tarumanagara University, Jakarta, Indonesia
Email: jeannyp@fti.untar.ac.id

³ Department of Computer Science, Tarumanagara University, Jakarta, Indonesia*
Email: dariush@fti.untar.ac.id

*Corresponding Author

Submitted: 06-03-2023, Revised: 08-03-2023, Accepted: 09-03-2023

ABSTRACT

"Cho Cho Cat" is an online multiplayer puzzle platformer game on the PC platform. This game will be developed with Unity 2021.3.15f1 and C# programming language. To play this game, a minimum of two players and a maximum of four players are required. Each player requires a computer with a minimum Windows 10 operating system and an internet connection. This game has five themes and each theme has two levels. Each themes have different mechanisms. With the nature of this game, namely online multiplayer, level design is dynamic according to the number of players. The mechanics of this game are moving left or right, jumping, pushing boxes, and pressing buttons. The objective of this game is to find a key to open a door then moves to the next level.

Keywords: Cho Cho Cat, Multiplayer Online, PC, Platformer Puzzle, Unity

1. INTRODUCTION

In this digital era, playing games is a common activity for all age groups. This gaming activity can serve as a medium of entertainment to unwind after engaging in various activities, or it can be interpreted as a structured activity typically done for enjoyment. A game or a play is something that can be played with certain rules, resulting in winners and losers, usually in a non-serious context with the aim of refreshing.[1] Games can also be classified into various forms, and one of them is a video game, which is a combination of the use of television or display media as visual media and a console as the medium for translating data from a cassette or compact disc (CD).

The game to be designed, titled "Cho Cho Cat", is a multiplayer puzzle-platformer game for two to four players, with cats as characters. This game has several levels with varying degrees of difficulty and different mechanisms. The aim of creating "Cho Cho Cat" is not only to provide a means of entertainment and fill leisure time, but also to create a multiplayer puzzle-platformer game for two to four players that requires an internet connection to be played.

Referenced Game

"Shape Survivor" is a game created by students of the Information Technology Faculty at Tarumanagara University named Jhonatan Sunarjo with student ID 535160030. It is a two-dimensional Multiplayer Platformer game. In this game, players act as forms (Shapes) and become survivors. Players can play with other players using other Android mobile devices, all

connected to the same WiFi network, to collaborate in completing the existing stages. Shape survivor display can be seen in Figure 1. [2]

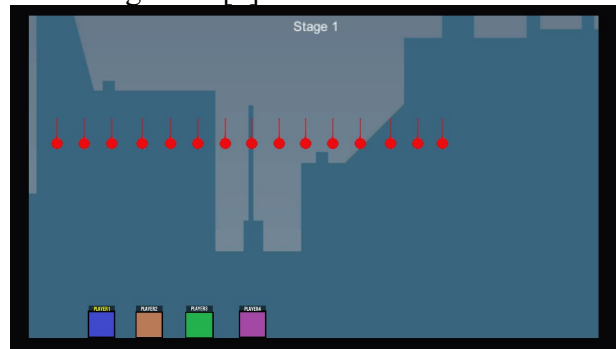


Figure 1 Shape Survivor

Source : Jonathan Sunarjo, Jeanny Pragantha, Darius Andana Haris, "Pembuatan Game 2D Online Cross-Play Multiplayer Co-op Platformer "Shape Survivor"", *Jurnal Ilmu Komputer dan Sistem Informasi*. Vol.9, No.1, (2021). h.4.

2. RESEARCH METHOD

Before a game is developed, a design method is needed as a guideline in the game development process and also to determine the scope of the intended game. In game development itself, there is no specific template that must be followed.[3] However, there are several things to consider, as follows:[4]

High Concept

The High Concept is a brief description of the game being designed. The high concept also guides the game development to keep it in line with the existing design. The game to be designed is a game in the puzzle platformer genre. Players character as cats will work together to complete stages by pushing an object, avoiding enemies, and so on. The following is the specification design of the "Cho Cho Cat" game:

- a. Game Title : Cho Cho Cat
- b. Genre : Puzzle, Platformer
- c. Game Language : English
- d. Target Players : Above 8 years old
- e. Number of Players : 2 to 4 players
- f. Display : 2D
- g. Game Engine : Unity 3D
- h. Programming Language : C#
- i. Control : Keyboard
- j. Platform : Windows 10

Gameplay

Gameplay explains what can be done in the game and how to do it. The "Cho Cho Cat" game is a multiplayer online puzzle platformer game for two to four players. The multiplayer system applied uses the Photon Pun Engine, where when a player enters the Main Menu there will be Find Room and Create room. After entering the room, players will select a theme from five available, namely Introduce, Time, Swim Cat, Ghost, and Cannon Shoot. Consistent with the selected theme name, the mechanism of each theme is different. There are two levels in each theme, each level has its own level of difficulty. Players will work together in completing the level and the objective of this game is to find a key to unlock the next level. The game is

considered complete when the last player to play has entered the exit door that has been determined as the endpoint of the game. There are several things that are also an important part of gameplay, namely:

a. Control Design

Control design explains the tools or ways to control things in the game. This game is played on a PC with a Windows operating system and uses a keyboard to move the character. The control of this game is quite simple because it is a 2D platformer genre, the movements are only limited to moving to the right, left, and jumping. The control design in the Cho Cho Cat Game can be seen in Table 1.

Table 1. Cho Cho Cat Control Design

Button	Function
A	Move to the right
D	Move to the left
W	Open and enter the already door
Space	Melompat

b. Character Design

Character design explains things related to the character, whether it's the main character or the enemy character. In the game "Cho Cho Cat". The character design in the game "Cho Cho Cat" is divided into two, namely the character owned by the player and the Non-Playable Character (NPC).

1) Main Character

The main character is Cho Cho, a cat which is also a player character. This character has four different color variants. The color can be chosen when entering the room. The colors of the cat are orange, white, gray, and brown. These colors are taken from common cat colors. The choice of the Cho Cho character can be seen in the figure 2.

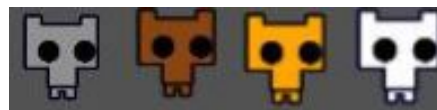


Figure 2 Cho Cho Cat Character
Source : [5]

2) Non-Playable Characters (NPC)

All NPC characters in the "Cho Cho Cat" game are enemies, cannot be eliminated by players, and can eliminate players. There are four NPC characters in the "Cho Cho Cat" game:

a) NPC Character Slime

The first NPC character is the slime character. Slime is a green character. This character can eliminate players by moving to the left and right.

b) NPC Character Pipe

The second NPC character is the pipe character. As the name implies, this character moves in and out of a pipe that can eliminate enemies.

c) NPC Character Jerry

The third NPC character is the jerry character. This character is light blue. Like the slime character, this character can eliminate players by moving to the left and right.

d) NPC Character White Ghost

The fourth NPC character is the White Ghost. This character can eliminate players, if one of the players does not look towards the white ghost character then the character will approach the player and eliminate the player. However, if one of the players looks at the white ghost character, the character will not approach the player.

c. Object Design

Object design explains the objects in the game, both the function of the object and other things. The design of the objects used in this game are as follows:

1) Key

As the name implies, this object is yellow. The key is the objective of this game. With the key, players can proceed to the next level.

2) Box Push

The Box Push is an object that takes the form of a box that can be pushed by players. This box has its own weight to be able to be pushed. The weight is determined by the number of players in one level. This box also displays the weight in numbers.

3) Door

As its name implies, this object can later be entered by players to change levels after the players have found the key.

4) Push Platform

Like the box push, the push platform has its own weight to be pushed. The weight is determined by the number of players on one level. The push platform also displays the weight in numbers. The push platform comes in two forms: vertical and horizontal.

5) Moving Platform

The moving platform object is a platform-shaped object. This object can move left, right, up, and down.

6) Coin

The player must collect coins that appear in the Time theme to get a key.

7) Jump Pad

Jump pad is an object that helps players jump and move objects to a higher place.

8) Button

The button is an object that can be pressed by players to perform an activity such as wanting to open a wall or it can be a trap for players.

9) Moving Wall

This object is a wall that can be opened and closed using a button object. This wall will later hinder players in completing the game's objective. The Moving Wall comes in two forms: vertical and horizontal.

10) Platform

This object is just a platform that does not move. It serves as a footing for players to move to a higher place. The platform only has one form: vertical.

11) Cannon

This object can fire a bullet that can eliminate players. The speed of the bullet increases from slow to fast.

12) Board

This object is used to help players get through the water.

13) Active Box

This object is a box that will break and cause the player to fall down if the box is stepped on by the player.

d. Level Design

Level design explains the design of the levels that the player must complete in the game. In the “Cho Cho Cat” game, there are five themes and in each theme, there are two levels that have different levels of difficulty. Since this game is an online multiplayer game, the objects in the level will change according to the number of players. Here is a brief description of each theme:

1) Introduction

In this theme, players will push a box more and jump from one platform to another platform to find the objective of the "Cho Cho Cat" game.

2) Time

In this theme, players will collect coins found in each level. If the coins in the level have run out, the key will appear. But to reach the key there is a time limit, that is when the player is collecting coins there is a time given if the time runs out then the player will repeat the level. The time given to players varies with each level.

3) Swim Cat

In this theme, players will ride a ship. The ship will take the player past the key and help the player to the door. If the player touches the water, the player will be eliminated.

4) Ghost

In this theme, players will meet an NPC named White Ghost who can eliminate players if one of the players does not look in the direction of the NPC.

5) Cannon shoot

In this theme, players will jump over a bullet fired by a cannon object. If the bullet hits the player, the player will be eliminated.

e. Score Design

Score design includes calculations from several aspects in the game to calculate the results obtained. Such as the number of steps, use of items, and completion time. The score design in the "Cho Cho Cat" game uses the time the player takes to complete a level. The time will then be converted into stars. Because each level in the theme has different mechanisms, the score for each theme and level also differs. The design of the time to star conversion table can be seen in Table 2 to Table 7.

Table 2. Score Design for Introduction Theme




<i>Theme Introduction</i>	
Time	Star
< 1 Minutes	
< 2 Minutes	
> 2 Minutes	

Table 3. Score Design for Time Theme Level 1

Theme Time Level 1	
Time	Star
> 25 seconds	★ ★ ★
> 12 seconds	★ ★
< 12 Seconds	★

Table 4. Score Design for Time Theme Level 2

Theme Time Level 2	
Time	Star
> 18 seconds	★ ★ ★
> 8 seconds	★ ★
< 8 seconds	★

Table 5. Score Design for Swim Cat Theme

Theme Swim Cat	
Time	Star
< 1 Minutes	★ ★ ★
< 2 Minutes	★ ★
> 2 Minutes	★

Table 6. Score Design for Ghost Theme

<i>Theme Ghost</i>	
Time	Star
< 3 Minutes	★ ★ ★
< 4 Minutes 30 Seconds	★ ★
> 4 Minutes 30 Seconds	★

Table 7. Score Design for Cannon Shoot Theme

<i>Theme Cannon Shoot</i>	
Waktu	Bintang
< 1 Minutes 30 Seconds	★ ★ ★
< 2 Minutes	★ ★
> 2 Minutes	★

f. Sound Design

Sound design explains the sounds that fill the game, whether it's background sound or sound effects. The sound components used in the "Cho Cho Cat" game are divided into two: Background Music and Sound Effects. Background Music will accompany the player from entering the game to level selection. As for Sound Effects, they accompany the player when interacting or performing activities like jumping.

Story

The story is a summary of the game's storyline. The "Cho Cho Cat" game has a short story about the daily life of cute and adorable cats. The cats will go through several obstacles and carry out activities that are generally done by cats, such as pushing and jumping.

Audience

The audience is the target for whom the game is made, which is determined through the content of the game and becomes a limitation. The target audience of this game is everyone over eight years old or at least those who can read. This is to ensure the game is easier to play. The game is designed to entertain, hence it is suitable for all audiences.

Hardware Platform

The Hardware Platform explains the minimum specifications of the hardware and also the software needed to play the designed game.

Here are the computer hardware specifications used in creating the game:

- 1) Processor : AMD Ryzen 5 3600 6-Core Processor (12 CPUs), 3.6Ghz

- 2) RAM : 16 GB
- 3) VGA : Nvidia RTX 3060 12GB
- 4) HDD : 500 GB
- 5) SSD : 250 GB
- 6) Other Devices : Keyboard and Mouse

Puzzle Platformer

Puzzle Platformer genre is a combination of the puzzle genre with the platformer genre, where the character moves sideways followed by the movement of the background and camera in the vertical area, and jumps from one platform to another at different heights. An example of a game that has a Puzzle Platformer genre is Pico Park. The Pico Park game display can be seen in Figure 3. [6]

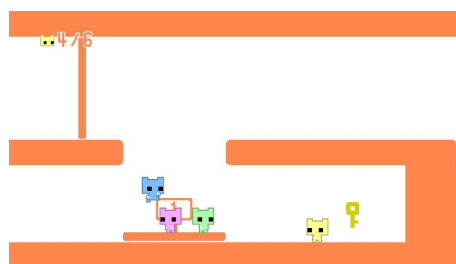


Figure 3 Pico Park

Source : [7]

Multiplayer

Multiplayer is a feature where the number of players is more than one. Multiplayer games are often played via the internet, but can also use a local area network (LAN) or dial-up connection. Most multiplayer games connect players together through multiplayer servers, which display all available online games and allow players to connect to a game or create a new game so other players can join. Although the main game server is controlled by the developer, many games allow users to create and control private servers. [8]

Photon Pun Engine

Photon Unity Networking (PUN) is a Unity package for multiplayer games. PUN is available in two versions, free and paid. Both versions can be seen from the number of players that can be accommodated, for the free version it can only accommodate 20 players. While the paid version can accommodate up to 50,000 players, depending on the price package taken. There are two main concepts in PUN, namely the lobby and room. The lobby is a place where players can see the available rooms and join them. Each room must be connected to a lobby so players can find and join it. The room is a place where players join and play together. Essentially, the room and lobby system in Photon works by players creating or joining a room through the lobby.[9]

Software Utilized for Development

In the process of creating a game, there are various software used for various purposes, such as game design, scripting, and user interface creation. The software includes:

- a. Unity
Unity is a game engine and integrated development environment (IDE) for creating interactive media, usually video games. [10]
- b. Visual Studio Code
Visual Studio Code is a code editor software that can be run on MacOS, Linux, and Windows operating systems. [11]
- c. Adobe Illustrator
Adobe Illustrator is a vector-based graphic software, developed and marketed by Adobe Systems. [12]

3. RESULTS AND DISCUSSIONS

The game titled "Cho Cho Cat" is created in the puzzle platformer genre and designed in two dimensions. This game can only be played on a PC with a minimum operating system of Windows 10. This game is only available in online multiplayer or available for more than one player only. In this game, players will choose one of five themes and within it, there are 2 level options. Players will move the character in the form of a cat, then cooperate to complete the level and get a key. The key will later be used to go to the next level.

MODULE DESIGN

The design specification of the display in the "Cho Cho Cat" game is as follows :

- 1) Loading Module
The first display that players see when opening the "Cho Cho Cat" game. This module is where the game will connect to the server. Once successfully connected, the player will move on to the next module.
- 2) Title Module
This module is where the player is already connected to the server. In this module, there is a title display of the "Cho Cho Cat" game and a button to move to the next module.
- 3) Main Menu Module
This is the main module in the "Cho Cho Cat" game. This module contains 4 options, namely the Find Room module, Create Room module, Settings module, About module, and Exit Game module.
- 4) Find Room Module
This module contains a list of rooms created by players, so other players can join the same room. Besides the list of rooms, there is also information about the number of players, player limit in one room, and room name. The Find Room module display can be seen in Figure 4.

Room Name	1/4
Room Name	1/4
Room Name	1/4
Room Name	1/4
Room Name	1/4

Back

Figure 4 Find Room Module Display

5) Create Room Module

The Create Room Module is where players can create a room to play together. In this module, players will enter the room name and the number of players who will play. The Create Room module display can be seen in Figure 5.

Create Room

Room Name
Input Name.....

Number of players
2 Player 3 Player 4 Player

Back Create

Figure 5 Create Room Module Display

6) About Module

In this module, players can see information about the developer and supervising lecturer. There is also the Tarumanagara University logo and Game Development logo.

7) Settings Module

In this module, players can adjust the display of the "Cho Cho Cat" game, such as resolution, full screen, and volume.

8) Exit Game Module

This module will display a pop up containing "Are you sure you want to quit?". If the player presses the "Yes" button, the player will exit the game. Then if the player presses the "No" button, the player will return to the Main Menu module.

9) Name and Character Selection Module

This module appears when the player has created or chosen a room. In this module, players will enter names and select colors for each character. Name and Character Selection Module display can be seen in Figure 6.

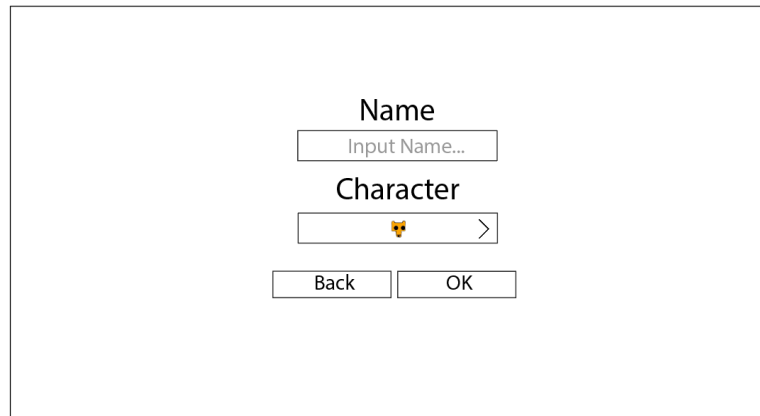


Figure 6 Name and Character Selection Module Display

10) Room Module

After players enter names and select colors for characters, they will move to the Room Module, which contains a list of players who have entered the room. There is also information like the chosen character, names of each player, the number of players who have entered, and the room name. The Room module display can be seen in Figure 7.



Figure 7 Room Module Display

11) Theme Selection Module

After players gather in one room and the room master presses the start button, players will move to the Theme Selection Module, where the room master will select the Theme.

12) Level Selection Module

After choosing Theme Selection, the room master will select Level Selection. In the "Cho Cho Cat" game, there are two levels with different levels of difficulty.

13) Gameplay Display

This display will appear when players have chosen a level. In the Gameplay display, there is a list of buttons at the top left. Then at the top left, there is a timer to count the duration of the game. The gameplay display can be seen in Figure 8.

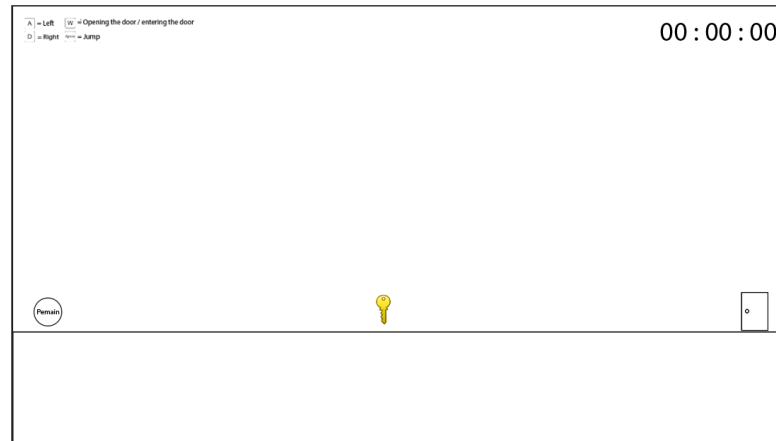


Figure 8 Gameplay Display Module

14) Pause Module

This module appears when a player presses "ESC" on the keyboard. This module will pause the game. The game will resume when the player presses the continue button in the Pause Module.

15) Level Finish Module

This module appears when a player has completed a level. This module contains scores using a time-based scoring system.

4. CONCLUSIONS AND SUGGESTIONS

The game "Cho Cho Cat" is still in development, designed to be an online multiplayer with a 2D appearance. Cho Cho Cat features five themes, each with different mechanisms and two levels. The game combines two genres, platformer and puzzle. The objective of this game is to collect a key to unlock the door and progress to the next level.

REFERENCES

- [1] Agustina, R., & Chandra, A. (2017). Analisis Implementasi Game Edukasi “The Hero Diponegoro” Guna Meningkatkan Hasil Belajar Siswa Di MTS. Attaroqie Malang. Jurnal Teknologi Informasi, 8(1).
- [2] Sunarjo, J., Pragantha, J., & Haris, D. A. (2021). Pembuatan Game 2D Online Cross-Play Multiplayer Co-op Platformer “Shape Survivor”. Jurnal Ilmu Komputer dan Sistem Informasi, 9(1), 4.
- [3] Schell, J. (2020). The art of game design: A book of lenses (3rd ed.). CRC Press.
- [4] Assetstoreunity. (2022). Cho Cho Cat Character. Retrieved March 08, 2023, from <https://assetstore.unity.com/packages/templates/packs/tico-park-complete-game-213683>
- [5] Bates, B. (2004). Game design (2nd ed.). Thomson Course Technology.
- [6] Steam. (2021). Pico Park. Retrieved February 15, 2023, from https://store.steampowered.com/app/1509960/PICO_PARK/
- [7] Ordinarygaming. (2021). Pico Park. Retrieved February 23, 2023, from <https://www.ordinarygaming.com/pico-park-level-1-guide/>
- [8] Computer Hope. (2017). What is Multiplayer? Retrieved February 23, 2023, from <https://www.computerhope.com/jargon/m/multiplay.htm>
- [9] Photon Engine. (n.d.). What is a Photon? Retrieved February 26, 2023, from <https://doc.photonengine.com/pun/current/getting-started/pun-intro>
- [10] Haas, J. K. (2014). What is Unity? Retrieved February 26, 2023, from <https://core.ac.uk/download/pdf/212986458.pdf>
- [11] Id Cloud Host. (2022). Apa itu Visual Studio Code? Retrieved March 8, 2023, from <https://idcloudhost.com/panduan/visual-code-studio-adalah/>
- [12] Setyaningsih, Y. (2023). Apa itu Adobe Illustrator? Retrieved March 9, 2023, from <https://dianisa.com/pengertian-adobe-illustrator/>

---This Page is left blank---