Android Arcade-Style Racing Game “CarsTime” With Antigravitation Theme

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Abstract. CarsTime is an arcade-style racing game with antigravitation theme. This game is made using Unity3D game engine with C# programming language. This game is an Android game. In this game, player will race against bots on track that is not bound by gravity so each car can move even on upside down track. There are three cars that can be used by players, namely C.car, Sonic and Magnum. There are three stages that player can choose to play, namely Map Aspal which doesn’t have any additional difficulties, Map Pasir which makes player’s car move slower and Map Salju which makes player’s car slippery. There are three items that player can collect or interact while racing, namely coin which player can collect for buying car, boost can which player can collect to fill boost meter which can be used when full to increase player’s speed for a certain time, and boost pad which will increase player’s and bots speed for certain time when touched. This game is tested by using three methods which are blackbox testing, alpha testing and beta testing. Based on the testing result, it can be concluded that “CarsTime” has an interesting racing gameplay with hard difficulty on Map Salju and easy difficulty on Map Aspal and Map Pasir.

1. Introduction
Games are entertainment media that can be played by anyone. Games are divided into two types, namely online games and offline games. Offline game means games that can be used on a computer or smartphone without having to be connected to the internet. This is possible to do because all game commands and data are already installed on the computer.[1] The meaning of game itself is an activity or contest physically or mentally that has a rule and carried out by people for their pleasure.[2] While the meaning of racing game itself is a type of game that allows players to race, or drive a vehicle in a relaxed manner that is racing can be done with vehicles, mounts, legs or graphics that are entirely abstract.[3] Racing games are suitable for anyone, including children, because racing games require players to make quick decisions, determine the best path and actions to take, and learn to avoid obstacles that can develop children's minds to be flexible.[4]
The game that was created has the title "CarsTime". This title implies that the player will play as a racer racing against bots to finish the race faster than opponent. The game was created using unity game engine with C# programming language. "CarsTime" is an arcade-style racing game where players play using the car they select. The car moves like an arcade car. Players will be given several stages to choose, each of which has additional difficulty that can provide a different and challenging playing experience.
Example of game that have been previously designed with the same genre is DEATH CAR. DEATH CAR is a game designed by Yosep from Computer Science Department Faculty of Information Technology Tarumanagara University. DEATH CAR is a racing game that was designed using flash programs and two-dimensional graphics. In this game, player is given the freedom to move left, and right and each level has a target point (money) and a level of enemies difficulty that increases each level.[5]

2. Basic Theory
Basic Theory is required as a foundation in designing a game. Basic theory that needs to be explained is design method, game genre, environment, making process and several other things related to the design of this game.

2.1. Design Method
Design method is needed before a game is made as a goal in the process of making a game and also determine the scope of the game you want to make. There are several things that must be considered which are high concept, game genre, and gameplay.[6]

2.1.1. High Concept.
High concept in CarsTime is an arcade-style racing genre game with an antigravity theme. This game is designed with a 3-dimensional appearance. This game is a single-player game. This game is made with the Unity game engine and using C# programming language. This game can run only on smartphones that use the Android operating system. This game is an arcade-style racing genre so it will have the main element of racing that is racing against enemy bots to finish the race as the fastest. There are three cars that can be used by players, namely C.car, Sonic and Magnum. Players can play on three different stages that can be selected namely Map Aspal, Map Pasir and Map Salju.

2.1.2. Game genre.
There are many ways to categorize a game. One of them is game genre. Game genre categorizes a game based on game interactions.[7] CarsTime’s genre is Arcade-style racing game which is a branch of racing genre which has a meaning that player will compete against enemy to finish the race first. In arcade-style racing, the vehicle that player use is not being bound by a real car physics so that the player can control car more freely.

2.1.3. Gameplay.
Gameplay explains what needs to be done in the game and how to do it. There are several things that are also an important part of gameplay which are control design, character design, object design, level design, sound design and score design. CarsTime’s gameplay design can be seen below.
1). Control design : Virtual Joystick.
2). Character design : Three playable cars namely C.car, Sonic and Magnum.
3). Object design : Interactable object namely boost pad and collectible items namely coin and boost can.
4). Level design : Three stages namely Map Aspal, Map Pasir and Map Salju.
5). Sound design : BGM and sound effects
6). Score design : Best times on each stages.

2.1.4. Virtual Joystick.
Joystick is a tool to help players control characters in games. Virtual joystick is a joystick that is used on mobile phone that doesn’t have button and can only be controlled via touch screen. CarsTime is using virtual joystick as its game’s main control. The virtual joystick in this game is in the form of gas pedal to increase car speed, brake pedal to decrease car speed and can be used to move backward. Arrow left and right to control car’s direction. Boost button to activate boost and pause button to pause the game. There are many other virtual buttons in this game that is used to maneuver game scene.
3. Game Production

3.1. Characters
There are three playable cars in this game namely C.car, Sonic and Magnum. C.car is player’s starting car. It has a balanced statistic between speed and handling. Sonic is an unlockable car which need 50 coins to unlock. It is the best handling car available and faster than C.car. Magnum is an unlockable car too which need 100 coins to unlock. It is the fastest car available but it has lower handling than C.car. Each car model can be seen on Figure 1 to Figure 3.

3.2. Object items
There are two types of object item in this game which is interactable item and collectible item. Interactable item in this game is boost pad. Player and bot can interact with it to increase their speed for a certain time. There are two collectible item in this game, namely coin and boost can. Coin can be collected to be used as a game currency to buy a new car. Boost can can be collected to fill boost meter. If boost meter is full, player can use boost to increase their max speed for 3.5 seconds. Object items model can be seen on Figure 4 to Figure 6.

3.3. Stages
There are three stages in this game, namely Map Aspal, Map pasir dan Map Salju. Each map has their own characteristics. Map Aspal is a map with a city road theme. It has normal characteristic. Map Pasir is a map with a sand road theme. It makes player's car run slower. The last map is Map Salju which is a map with a snow road theme, it is a slippery road so the player’s car will slip easily. Map’s environment can be seen on Figure 7 to 9.

4. Testing Result

4.1. Blackbox Testing
This method is used to check whether the game in the game "CarsTime" is running properly or not, blackbox testing is done by running every module. Blackbox testing results for game “CarsTime” can be seen as follow :
1). Main menu module.
   In this module there are four buttons that can be pressed namely the game start button to proceed to the car selection module, game instruction button to proceed to the game instruction module, the about game button to proceed to the about game module and the exit button to exit the game. There
is also a BGM and sound effect checkbox to determine whether the BGM and the sound effect are playing or not. The main menu module display can be seen in Figure 10.

2). About Game module.
In this module, there is text about persons who is involved in making the game. In addition, there is a back button to continue to the main menu module. About game module display can be seen on Figure 11.

3). Game Instructions Module.
In this module, there is a text about the function of each button that functions in the game. In addition, there is a back button to continue to the main menu module. Game Instructions module display can be seen in Figure 12.

4). Car Selection Module.
In this module, there is a information about number of coins that player has collected on game, three car buttons to select which player can choose one of them to use, five speed boxes and five car handling boxes that can change color according to the status of the selected vehicle, the main menu button to point to the module main menu, the stage selection button to point to the stage selection module If the selected car is locked and has not been purchased, the stage selection button will disappear and message that that car is not owned will appear, buy button to buy the selected car and the number of coins needed to buy the car. If the player presses the buy button and the coins that are owned are insufficient, a message about not enough coin and an ok button will appear which when pressed will remove the message and return to the time the player has not pressed the buy button. When a player buys a car, message about the car is not owned, the number of coins needed to buy and the buy button will disappear. Then the stage selection button will appear. Car selection module display can be seen on Figure 13.

5). Stage Selection Module.
In this module, there are three stages names and images that players can choose to play. Each stages has the best time the player has ever achieved on that stage. When the stage image is pressed, a white image will appear indicating the stage is selected. There is a select car button to return to the car selection module and a start button that points to the gameplay module. Car Selection module display can be seen on Figure 14.

6). Gameplay Module.
In this module, on the right side there is a gas button to increase the speed of vehicle, a brake button to reduce the speed and move backward, a boost button to activate the boost on the vehicle, timer to indicate the time that has passed, and number of lap. At the top center, there is number of
player's position in the race. On the left there are left and right arrows to change the direction of the vehicle and the pause button to pause the game and number of coin collected. The game module display can be seen in Figure 15.

The conclusion of this blackbox testing is that every module has been working properly, each button pressed continues to the module that has been determined and each text has been placed properly.

4.2. Alpha Testing

Alpha testing on the game "CarsTime" was carried out by instructors as a party who understands the concepts and objectives of making this game. By doing alpha testing, it can be seen that there are still shortcomings that must be corrected and added to the game "CarsTime". Based on the alpha testing done, there are some small changes to the gameplay in the game such as adding a dust trails effect on Map Pasir, enlarging menu’s button and adding a new image and information about items in game instruction module. The flaws found during alpha testing have been corrected according to the tester's instructions.

4.3. Beta Testing

Beta testing was done online using Google Form which contains a questionnaire and a link to download the game. Beta testing is conducted on 12 June to 15 June 2020. There are 30 respondents that participate in beta testing. The questionnaire contained 14 questions consisting of 4 questions about respondents’ information and 10 questions about game’s gameplay.

4.4. Testing Result

The test results from 30 respondents showed that 63.3% of respondents consider “CarsTime” has an interesting gameplay. The test results also show that 60% of respondents agreed that Map Aspal is the easiest stage out of three and 26.7% of respondents agreed that Map Salju is the hardest stage. In addition, the test results also show that 30% of respondents Magnum is the most difficult vehicle to control compared to the other two vehicles. According to respondents, the gameplay of "CarsTime" is interesting and this game does not cause all respondents to have an intent to illegal racing in real life after playing this game because the vehicles in this game are considered not fast enough to cause wild racing intentions. Many suggestions and comments from respondents are received. Suggestions received from respondents are adding additional vehicles that can be used by players, implementing special moves on each player's vehicle and adding features to increase the difficulty level of enemy bots. Testing result’s diagram can be seen on Figure 16 to 19.
5. Conclusion
The results of testing can be concluded as follows:
1). Gameplay concept of “CarsTime” is considered interesting that makes player want to play this game again.
2). Map Aspal is the easiest stage to play out of three available stages which makes this stage suitable for beginners.
3). Map Salju is the hardest stage to play which makes this stage suitable for those who are looking for a challenge.
4). Magnum is the hardest car to control out of three car which makes this car is not suitable for beginner to use.
5). This game does not give its player the curiosity to try illegal racing in the real world because the speed of the vehicle in the game is considered not fast enough so it does not make its player curious to try driving with a high speed in the real world.

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