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Android arcade game "City Protector" with Touch Gesture Recognizer

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Android arcade game "City Protector" with Touch Gesture Recognizer

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Abstract.   City Protector is an Arcade Tower Defense Game with endless element. This game implements touch gesture recognizer feature. This game is developed with Unity game engine and playable in Android-based smartphone. To kill zombies, players must draw the symbols contained in the explosives that brought by zombies. Testing is done by blackbox testing, alpha testing, and beta testing through a survey of 32 respondents. The results indicate that City Protector has interesting features and gameplay concepts. It is provides new experiences because the Touch Gesture Recognizer feature is rarely found in general.

1. Introduction

Games can be easily run on a computer or smartphone.[1] Definition of game is an activity or physical or mental contest that has a rule and is carried out by people for their pleasure.[2] Meanwhile the definition of an arcade game is a game that doesn't focus on the story, it's only played for fun as a free time or just to find the highest score.[3]

Arcade games are very suitable to be used as a means to practice body coordination skills. Not only useful for children, arcade games useful for adults as well as the elderly too. The interaction between the eyes, brain and hands can increase balance of the coordination between the body part. Of course this can increase the speed of thinking, seeing, and moving and directed.[4] The focus of arcade game is the user reflexes at the push a buttons and don't contain too many puzzles or strategies.[5]

The game "City Protector" is a game with Arcade Tower Defense genre and endless element that players can draw a gestures on the Android screen to protect the city from the onslaught of zombie hordes that come to destroy the city by carrying explosives. The use of touch gestures for arcade games is intended to make the game more interesting and unique from the other arcade games. The game was created using Unity and played on the Android platform.

A similar game that was previously made is Summoner's Quest designed by Bill Kevin, student from Computer Science Department, Faculty of Information Techonology Tarumanagara University. Example of Summoner's Quest game interface can be seen in **Figure 1.**[6]

Figure 1 Summoner's Quest

2. Method and materials
2.1. Game Design
Before making a game, A design method is needed as a benchmark in the process of making a game and also determines the scope of the game. There are several things that must be considered, as follows: [7]

1. High Concept
    High Concept is a short description of the City Protector game. City Protector is an Android game with Arcade Tower Defense genre and endless element.
2. Gameplay
    Gameplay describe what the player can do inside the game. In this game the player must protect the city from zombies that carry explosives. Players use gestures to draw symbols similar to explosives that carried by zombies. Zombies will die if the symbol drawn match with the symbol on explosives that carried by the zombies.
3. Audience
    Audience contains the target City Protector game. City Protector is intended for players with a minimum 10 years old or at least understand the use of gestures function because, gesture is the main element in this game.
4. Hardware
    The hardware specifications used to developing are prosessor Intel® Core™ i3-3217U, Ram4GB, dan NVIDIA GeForce 720M
5. Game Develop
    The software used for developing is Unity Game Engine and C# programming language. To create graphic components in the game, Adobe Photoshop and Aseprite software are used.
6. Testing
    After the game is finished, there needs to be a testing phase to make sure the game is running properly. City Protector game testing is done using the Blackbox Testing, Alpha Testing, and Beta Testing methods.

2.2. Game Genre
The genre that City Protector used is arcade tower defense with endless element. Arcade games are a type of game that relies more on player reflexes in control and requires a bit of complex thinking. Arcade games have short game time, uncomplicated controls, and increasing levels of difficulty.[8]

Strategy games genre generally focus on the player's ability to think in making the right strategy or tactic to win the game. Tower Defense is part of a real-time strategy game genre. Players must protect the player's base or base from enemies who come through a predetermined path. [9]

2.3. Touch Screen Gesture
Gestures are divided into Touch Mechanics and Touch Activities. Touch mechanics has several results depending on the context. Touch activity can be reached through several touch mechanics.[10] Game City Protector uses Touch, Drag, Swipe, and Fling as touch mechanics.

2.4. Touch Screen Recognizer
Gesture Recognition is a technique for identifying special stroke not as handwriting input, but as an indicator of a specific order.[11] Gesture recognition method that will be used is pointcloud recognizer. This point-cloud recognizer will change the stroke of gesture input into a collection of points. This point-cloud recognizer will only accept input from the first finger touching the screen. When the player touches a finger on the screen, this point-cloud recognizer will read the player's input each frame until the player stops touching the screen. This input will be read as points with X and Y coordinates. These coordinate points will be compared with the coordinates of the points contained in files that have been previously stored. If the player input image is different in size from the image contained in the files, the image size will be resized by the normalization process. Input points and points contained in files will run into a resampling process until the number of input points equal with points contained inside the file. This gesture recognition will be used to draw certain symbols on the screen as input to defeat the enemy.

3.   Testing and discussion
The testing of "City Protector" has been done using 3 testing methods. The methods are blackbox testing, alpha testing, and beta testing.

3.1. Blackbox Testing
Blackbox testing is done by running every features in the game on several devices to check whether the game has running properly or there are errors in the game. Home, Credit, Tutorial, In-Game,Pause, and Result interface can be seen in **Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7**.
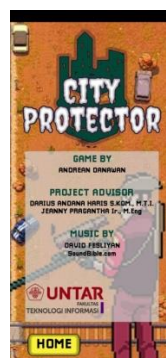

Figure 2 Home Interface   **Figure 3** Credit Interface   **Figure 4** Tutorial Interface

Figure 5 In-Game Interface

Figure 6 Pause Interface

Figure 7 Result Interface

Based on the test results, all modules have been running properly. No errors were found on button and information displayed.

3.2. Alpha Testing
Alpha testing is realized by those who expert in programming. Alpha testing on City Protector game has been done by project advisor, as people that have understood the concept of this game. The advisor give advice to change the text and buttons to pixel style, comments about the "W" symbol sometimes cannot be recognized, and there is no game icon image yet. Questions, comments, and advice that were found during alpha testing have been corrected according to instructions from project advisor.

3.3. Beta Testing
Beta testing was done by distributing survey via Google Form. Respondents who played "City Protector" from 7 Juni 2020 until 13 Juni 2020 were asked to fill out a survey. There were 32 respondents who joined the survey. Some of the beta testing result can be seen in **Figure 8** and **Figure 9.**
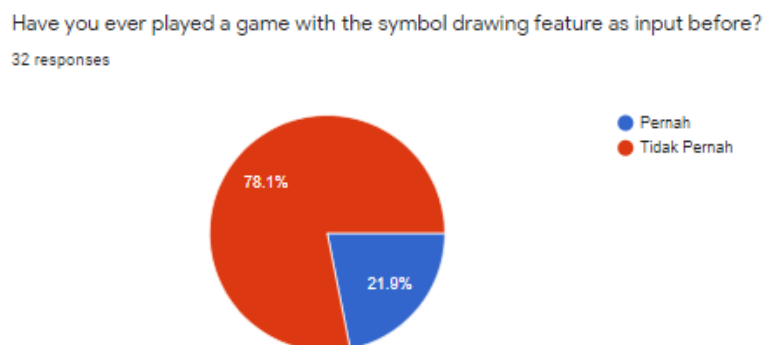

Figure 8 Game With The Symbol Drawing Feature

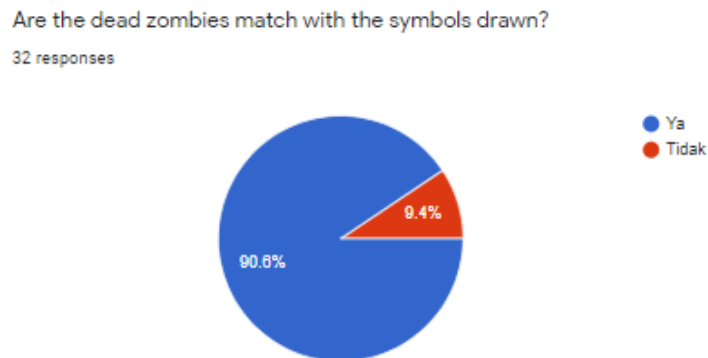Are the dead zombies match with the symbols drawn?

32 responses

Figure 9 Accuracy Of The Symbol Drawn With The Dead Zombies

Based on the respondent's answers, the following results were collected:

1. As many as 78.10% of respondents said they had never played a game with the symbol drawing feature as input before and as many as 87.50% of respondents stated the concept of drawing symbols to defeat the enemy gave a new experience, so it can be concluded that the symbol drawing feature in the City Protector game is still rarely found in general thus providing a new experience.
2. All of respondents stated that the symbols on the explosives carried by zombies were clear enough to be drawn
3. 90.6% of respondents stated that dead zombies match with the symbols drawn. This is because respondents cannot drawn properly. For example the "N" symbol is drawn similar to the "W" symbol so the touch gesture recognizer recognize the incorrect symbol.
4. Of the 8 types of symbols, as many as 46.90% of respondents said the "Next" symbol was the most easily to draw.
5. Of the 8 types of symbols, as many as 65.60% of respondents said the "Infinite" symbol was the most difficult to draw.
6. As many as 84.40% of respondents stated the concept of drawing symbols as interesting gameplay and 88.89% of the respondents were interested to play the City Protector game again, so it can be concluded that the City Protector game is an interesting game so that players are interested to play again.

4. Conclusion

After all of the testing have been completed, the conclusions that can be drawn from the test results are as follows:

1. The feature of drawing symbols using Touch Gesture Recognizer in the City Protector game is still rarely found in general so that provides a new experience for players.
2. The gameplay concept of City Protector is considered interesting so that players are interested to play the game again
3. The symbol display on the explosives in are clear enough for players to draw.
4. The rezognizer touch gesture training was considered sufficient and work properly because the dead zombie match with the symbol drawn by the player.
5. Touch Gesture Recognizer only accepts input from the first finger that touches the screen, so it is impossible to draw 2 symbols simultaneously.

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