Android Rhythm VR Game "Sabeat"

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Abstract. The game is developed by Unity Game engine and Monodevelop as a script maker in C# language. The game consist of 10 Electro musics. A blue or red flashlight is used to control the game. The player use the flashlight as a saber to cut the cube. To win the game the player has to cut the cube more than 70% of cube. Testing is done by blackbox testing, alpha testing by the supervisor, and beta testing by using survey of 31 respondents. The test results show that the game "Sabeat" is an interesting game, entertaining and has unique controls for a Rhythm game, but because of these unique controls sometimes players find it difficult to get or use a controller, so more preparations such as flashlights and VR tools are needed to play the game.

1. Introduction
Game is an entertainment media because it can reduce the level of fatigue of a person from work routines every day. Games are also able to increase one’s intelligence when the game requires a level of dexterity from a player. [1]
Today, the game has developed so rapidly, the game is not only played to relieve fatigue, but also becomes one of the means of communication. With games, players can interact virtually like the real world. Nowadays has entered the era of Virtual Reality, which is a form of implementation of the evolution of digital games. [2]
Virtual Reality is a technology that allow users to interact with a 3D environment that is simulated by a computer. Virtual Reality can be implemented in the fields like Architecture, Military, and Entertainment such as games.
Rhythm game is a game that combines the beat of music with the visual rhythm and controls in the game. Games in this genre usually focus on dance or musical instrument performance simulation, and require players to press buttons in the order indicated on the screen.
“Rhythm Holic” is an example of rhythm game made by Jastin Ng, student from Computer Science Department, Faculty of Information Technology, Tarumanagara University in 2020. Screenshot Rhythm Holic game can be seen in Figure 1. [3]

Figure 1. Rhythm Holic
2. Basic Theory
In game design requires the basics of theory as a foundation for designing it. The things that
need to be explained are the design method, the developing process, the game genre and several
other things related to the design of this game.

2.1. Game Design
There’s some step in Game Developing and it’s separated into [3]:
1. High Concept
   The High Concept of this game is a VR Rhythm Game called "Sabeat" with flashlight as a
   controller. "Sabeat" is a Single Player game with English language. Game is developed by
   Unity Game Engine and C# as the programming language.
2. Gameplay
   Gameplay in this game is a general gameplay of a Rhythm game where the player combines
   the beat of the music with the visual rhythm and controls in the game. There are some
   things that are also an important part of gameplay, as follows:
   a) Control Design
      Control in this game uses a flashlight as its main controller. The type of flashlight that
      can be used in the game "Sabeat" is a flashlight that has a blue or red light.
   b) Object Design
      Objects in the game "Sabeat" are items that players can find in the game. Every object
      in the game is made by a game designer with Unity. Some objects in the game "Sabeat"
      are cubes and sabers.
   c) Score Design
      This score calculation is calculated according to the beatmap when the player cuts the
      cube. In this game there is also a combo system, where combos are players
      continuously cutting cube that appears without missing a cube.
   d) Level Design
      In "Sabeat" there are 10 levels with 10 different music. The difficulty of a level based
      on the BPM speed of a song, the higher the BPM of a music, the higher the difficulty
      the level of the song.
   e) Sound Design
      The sound used in the game "Sabeat" is Background Music (BGM) which mainly uses
      the Electro Music genre.
3. Audience
   Audience game "Sabeat" is with a minimum age of 8 years or at least can read and
   understand how to play this game.
4. Hardware and Software
   The hardware specifications for running Sabeat are Qualcomm SDM636 Snapdragon 636,
   4GB RAM, Adreno 509 with minimum operating system Android 4.4 (Kitkat).
5. Display
   Displays in this is divided into several parts, which are Main Menu module display, song
   selection module display, game module display, module options display and tutorial
   module display.
2.2. **Game Genre**

The genre of "Sabeat" is Rhythm, where players perform certain instructions to complete the game by responding to audio and visual cues. Players will use a special controller in this game, which uses a flashlight that is detected using a camera. The controller functions to move the saber in the game to be swung towards the cube in accordance with the existing rhythm.

2.3. **Unity**

The main game engine of Sabeat to developing this game is Unity. The creation of worlds and objects in Unity can be created in Unity or using assets contained in the Unity Store. The object and appearance of Sabeat in this design were made in Unity by the game developer. After the game is done, Sabeat will be built in the form of an Android Package (.apk) [5].

2.4. **Google Cardboard VR**

Google Cardboard is a virtual reality (VR) headset that was developed by Google for use on smartphone devices. Google Cardboard VR in Sabeat is used so that players can play this game in VR. Google Cardboard was chosen because it is more suitable and simpler for playing compared to other VR tools. [6]

2.5. **RevolVR**

RevolVR is a tracking technology for the Unity 3D game engine especially on Android games. Sabeat requires RevolVR as a flashlight detector with a smartphone camera so that the player can move the saber in the game. With the RevolVR Plugin, the Android Smartphone can detect the movement of a flashlight through the Smartphone's camera, so that the saber in Sabeat can move in the direction of the flashlight [7].

3. **Game Design and Developing**

The "Sabeat" game consists of 6 modules:

1. **Main Menu Module**
   
The Main Menu Module can be seen in Figure 2. The Main Menu Module can be accessed when you first open the game. The Main Menu consists of Play, Settings, and Exit Game buttons.

2. **Choose Music Module**
   
The Choose Music Module can be seen in Figure 3. The Choose Music Module can be accessed by pressing the Play button on the Main Menu. In this module the player can choose the music to be played in the game and there is a back button to return to the Main Menu.

3. **About Us Module**
   
The About Us module can be seen in Figure 4. This module contains information on the makers of the game along with the names of the mentors.

4. **How To Play Module**
   
The How to Play module can be seen in Figure 5. This module contains information about how to use VR and play in-game.

5. **Settings Module**
   
The Settings module can be seen in Figure 6. In this module the player can change the music volume in the game and the Back button to return to the Main Menu.

6. **In-Game Module**
   
The Game Module can be seen in Figure 7. The Game Module can be accessed after the player has selected the song you want to play. The Game Module consists of:
a) Pause
   Players can return to the Main Menu module by selecting the Pause button.

b) Score
   Players can see the scores and combos that players get during the game.

c) Score Window
   If the player has finished playing the game, the score window will appear showing the
   score and there is a Return button to return to the Main Menu.

d) Failed
   The Failed display will appear if the player fails to hit the cube by 70% and there is a
   Return button to return to the Main Menu.

4. Testing and Conclusion
   Game development is done by using the Unity Game Engine and C# language as the
   programming language. After completing the developing stage, the testing phase of the
   "Sabeat" game is carried out. Tests carried out to determine whether the game is made is
   appropriate and the shortcomings of the game.
4.1 Blackbox Testing
Blackbox Testing is done by testing every function of the game that has been created. Testing is done by examining each module in this game. The test results show all “Sabeat” modules already running well and works properly according to the design. The gameplay of “Sabeat” can be seen in Figure 7.

4.2 Alpha Testing
Alpha Testing in the game "Sabeat" is done by the supervisor as someone who understands the concepts and objectives of making this game. Alpha Testing is carried out by people who also have a role as representatives of potential users who will play this game. After testing, several improvements were made, the changes are:
1. Win and lose condition, which is a win condition with a minimum of 70% of cube being hit in one stage.
2. Added Miss and Perfect if the player successfully hits the cube.
3. Added a photo album to the Choose Music module.
All of these improvements have been fixed and added to the game.

4.3 Beta Testing
After Alpha Testing, Beta Testing taking place by doing a public testing. Beta Testing has been done by sharing the game with questioner to people via Google Drive on 10 June 2020, resulting 31 responders with different opinions creating a conclusion. Examples of survey results in diagram form can be seen in Figure 8 and Figure 9.

After testing Beta Testing, the results of the test will be collected and analyzed. The following are the results of the questionnaire that have been carried out:
1. Most respondents (87%) had never played a game with the Rhythm and VR genres before.
2. A total of 13 respondents (41.9%) played the game "Sabeat" for 0-3 minutes, as many as 5 respondents (16.1%) played for 4-7 minutes, as many as 3 respondents (9.7%) played for 8-10 minutes, and as many as 10 respondents (32.3%) played more than 10 minutes.
3. According to respondents, the average difficulty with a scale of 5 on Stage 1-3 is 2, Stage 4-6 is 3, and Stage 7-10 is 4.
4. Half of respondents (48.4%) experienced dizziness when playing "Sabeat". 82.3% of respondents who experienced dizziness when playing answered that they had never played a game with VR genre and 47% of respondents who were dizzy answered playing the game "Sabeat" for more than 8 minutes.
5. The precision of the movement of the Saber and flashlight is accurate based on most respondents (90.3%).
6. A total of 77.4% respondents answered that the Cube movement was accurate. Of 22.6% respondents who answered the cube movement is not accurate, 3 respondents (42.8%) answered the cube movement still too slow and 2 respondents (28.6%) answered the cube movement was too fast. All respondents who answered that the cube movement is not accurate said that they never played a game with the Rhythm VR genre.
7. According to most respondents (83.8%), the game "Sabeat" is interesting enough to be played again.

4.4 Conclusion
After the Testing, a conclusion has been made from the results of the test:
1. "Sabeat" gives the level of difficulty in the game depending on the BPM speed of the song chosen, where if the player chooses a song with a high BPM, the difficulty of the game will also increase.
2. Control in the game "Sabeat" uses a unique controller, namely a flashlight so it makes this game more interesting.
3. Although the majority of respondents have never played games with the Rhythm VR genre, respondents could understand the gameplay of "Sabeat" because they were helped by "How to Play" module.
4. Operating System used by player smartphone using a minimum operating system Android 4.4 (KitKat) to be able to play the game "Sabeat".

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