The 3-dimensional arcade game application of Khalid ibn al-Walid

K Fathoni[*]**, H A T Nurhadi, R Y Hakkun and R Asmara**

Politeknik Elektronika Negeri Surabaya (PENS), Surabaya, Indonesia

*kholid@pens.ac.id

Abstract. Khalid ibn al-Walid was a hero of Islam who was very meritorious and inherited many exemplary values, namely sincerity, struggle and intelligence. But many people don't know this hero. This is due to the widely available media introduction of Khalid ibn al-Walid figures such as history books and comic books that are less interesting. This can be overcome by developing an interactive historical game Khalid ibn al-Walid. This game is built with 3D characters using the arcade genre and the First Person Shooter viewpoint. There are 4 parts in this game namely Prologue, Phase Before Islam, Islamic Phase, Epilogue. The test results show that all game features can work properly. Then the game was tested on 10 users and they stated that they had received adequate information about Khalid ibn al-Walid from this game.

1. Introduction

Learning the character and example of Muslims cannot be separated from the character of the Prophet's friend, Khalid ibn al-Walid. He is an inspiring legendary Islamic figure and has a heroic spirit and is a good example. The intelligence, courage, sincerity, humility of Khalid ibn al-Walid in the history of his struggle should be studied and emulated for a Muslim. Khalid ibn al-Walid was a great and formidable Muslim warrior [1]. His greatness in strategy and tactics has been widely studied in various schools throughout the world until now [2]. Muslims are one of the biggest residents in the world and they should spread the positive values exemplified by Khalid ibn al-Walid. Muslim children and adolescents must continue their enthusiasm for learning to improve their character and adults and parents can become better people by learning to understand history and emulate the character of Khalid ibn alWalid. Exemplary learning from the character of Khalid ibn al-Walid will be more effective and interesting when using interactive or interaction-based methods. Creativity in managing the learning process is needed in order to be able to present enjoyable learning [3].

In learning strategies, when teachers teach students may not necessarily learn; when students do a lot of activities, that's actually when students learn [4]. One learning method that uses interaction is to use games. Games can be used as a reliable learning method. The use of games in learning has a tremendous impact on enlightenment efforts for teaching assignments [5]. In the game environment, players will interact with several other characters in the game including Non-Playable Character. With this interaction, the player learns the history and example of Khalid ibn al-Walid. Therefore, in this study, the authors build a method of learning history and the characterization of Khalid ibn al-Walid based on interactive 3-dimensional games.

2. Related works

There are several studies related to the research development of the historical 3D arcade game application Khalid ibn al-Walid. Nyimas Ariny Sabilarrusyda developed the mobile game application history of Uthman Ibn Affan based on the monotone chain convex hull algorithm [6]. This game application uses the Android platform, has a genre of strategy and is based on 2D environment and has a story for learning the history of Utsman bin Affan's best friend. David Fahmi Abdillah developed a VR first person shooter game based on November 10, 1945 with motion controller [7]. This game application uses a desktop platform, has an arcade genre and is based on a 3D environment. This game provides learning related to the history of the 10 November 1945 war in Surabaya, Indonesia, which is celebrated every year as a hero day. Other research has also developed the Application of the K-Nearest Neighbor Algorithm for Puzzle Games of Human Body's Learning System on Virtual Mannequin [8]. This game application uses a desktop platform, has a puzzle genre and is based on a 3D environment using the K-Nearest Neighbor Algorithm method. The research developed by this author uses a desktop platform, has an arcade genre, with an interactive drama approach, is based on a 3D environment and provides learning and example from the best friend Khalid ibn al-Walid.

3. System design

The design of this game interaction includes: player, game story, gameplay, virtual reality hardware and motion controller and sensors. The player will give an input to motion controllers and sensors. After that, motion controllers and sensors will send the input data to the Virtual Reality hardware. At the same time, the Virtual Reality Hardware will simulate and visualize the output of the game. The Virtual Reality Hardware process and translate the input data into the data that can be processed by the game software and implement it to the gameplay of the game. The gameplay will be playing the story that happens on the game. And the whole thing will be visualized and seen by the player. On the development of the game, there are several mechanics function that implemented to the game. This mechanics will form a complete version of the game that will be tested. A clearer diagram is shown in the following figure.
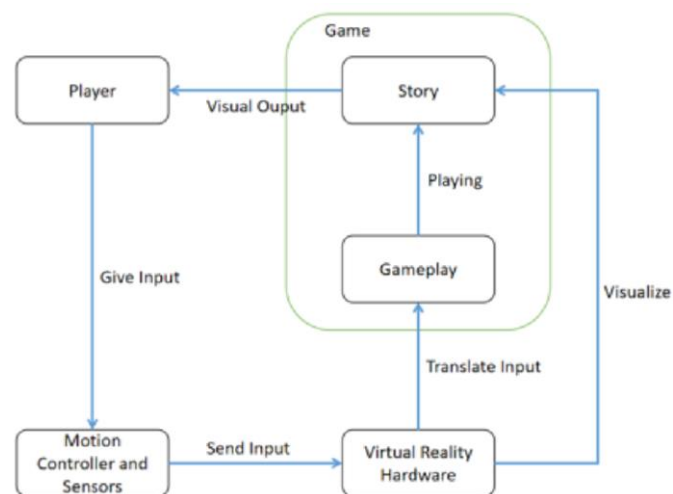

Figure 1. Game interaction flow.

3.1. Game menu

This game has several menus, namely main menu, continue story, option and exit. The Main Menu is the first state that is run shortly after the game is initialized. In the Main Menu, the user has the freedom to choose several options from the main menu namely Story Mode, Continue Story Mode, Options, Exit. Story Mode is a mode that starts the game based on the story from the earliest and runs according to the story that has been prepared. The story in the game is implemented in Scenes, where from the whole

story it is divided into 5 Scenes. Continue Story is another mode that is similar to Story Mode, but this mode does not start from the beginning of the story. This mode starts from the most recent checkpoint obtained by the player. The options contain settings that affect the game in the game, such as sound settings, images, and others. Menu flow can be seen in the following picture.
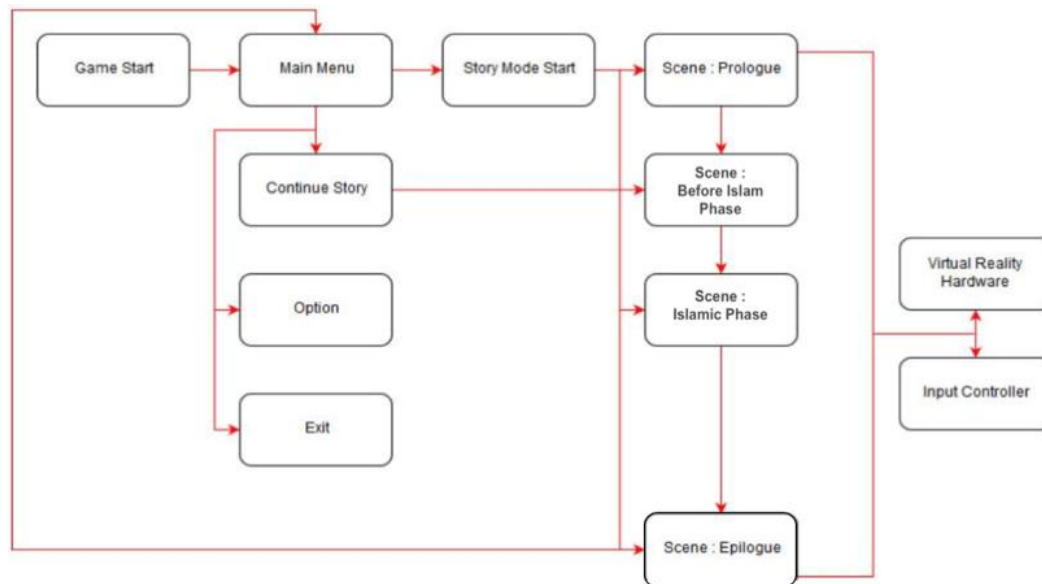

Figure 2. Game menu flow.

3.2. Quest system

Quest System is a system that has been implemented in the game to regulate and control the course of Quest or in-game missions that play an important role in bringing the storyline of the game. In one Quest, there are several missions recognized by the system because each mission has its own ID. Each mission, has its own parameters that indicate the mission has been completed. At the beginning of the Quest System running, the Quest System will automatically execute the first Quest and will always check the Goal Parameters for each frame. If the Goal Parameters have been met, the next mission will be executed, until the Nth mission.
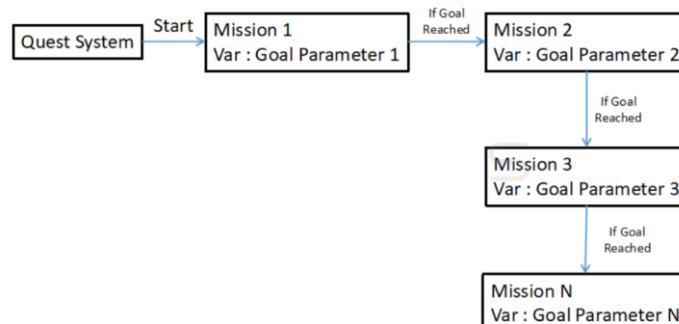

Figure 3. Quest system process flow.

3.3. Story flow

The storyline in this game consists of 6 chapters, each chapter has its own topic and story. There are 6 topics involved, namely: prologue, the caravan, the war of the mountain uhud, the ditch war, deep inside his mind, a new journey. In detail, the story in this game is explained in the following table.

Table 1. Story.

Chapter	Title	Story
Chapter I	Prologue	Opening of the story of Khalid ibn al-Walid. Tells from the birth of Khalid ibn al-Walid and Fast Forward from the outline of the events in the whole story.
Chapter II	The Caravan	Tells about the cause of the uhud war that is the anger of the Quraysh who want to take revenge against the believers for defeating the Quraysh army in the Badr war. And also the attack of the believers in the trade caravans of the Quraysh in order to take back the rights of the believers who have been deprived by the Quraysh
Chapter III	War of The Mountain (Uhud War)	After the conflict and the anger of the Quraysh that surged. Begin the decision to declare war on the faithful again. This is where the most famous war in Islamic history, the Battle of Uhud. Where in this battle of Uhud Khalid ibn al-Walid as the leader of the Quraysh army, he succeeded in seeing a gap in the army of the believers and carried out the right strategy so that the believers would lose to the Quraysh.
Chapter IV	The Ditch War	After the Uhud war, there was also a war known as the trench warfare. In this war, the faithful are in very unfavorable conditions to carry out the war. But the strategy carried out by the Prophet Muhammad on the advice of one of his friends to make a ditch so as to create regional conditions that make the faithful can do a good defense strategy.
Chapter V	Deep Inside His Mind	This is where Khalid ibn al-Walid believed that Allah always helps the faithful, even though it is impossible for the believers to win, but the believers can always get out of the problem. With that also Khalid ibn al-Walid also came and joined the faithful.
Chapter VI	A New Journey	First steps, new stories, and the journey of new life of Khalid ibn al-Walid after moving to become a believer Khalid ibn al-Walid prepared to go to Medina to meet the Prophet Muhammad. In the evening, Khalid packed his armor and brought his horse to Medina to meet with the Prophet Muhammad.

3.4. Level design
This Khalid ibn al-Walid game has 4 parts in its story: Prologue, Pre-Islamic Phase, Islamic Phase, Epilogue. Level Design describes the atmosphere of settlements in the middle of the desert with the feel of the Middle East and Uhud Mount.

Figure 4. Level design of quraisy village and Uhud mount.

Some of the characters involved in this game are Abdul and Villager. Abdul is an NPC who acts as the narrator in this game. At the level of this prologue, players will meet with Abdul and Abdul will then tell of major events that occurred during the life and journey of Khalid ibn al-Walid. Villager is a sweetener NPC that can support the living conditions of the environment or the level that has been built. This villager cannot be directly interacted by the player, but this villager has a behavior "Environment

Interact with Player", so interactions that occur such as Random Event Dialogue will be run based on the presence of players in that environment.
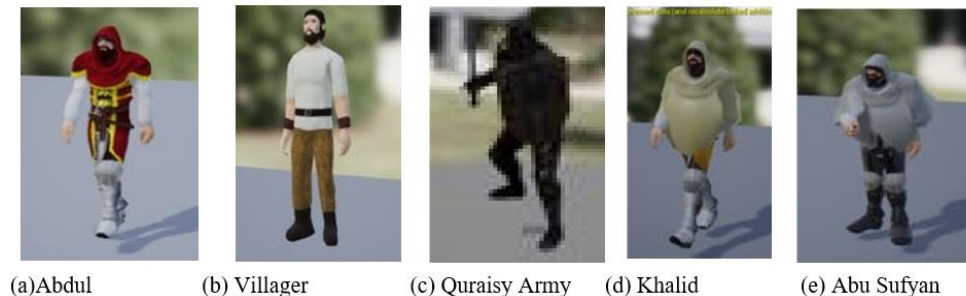

(a)Abdul   (b) Villager   (c) Quraisy Army   (d) Khalid   (e) Abu Sufyan

Figure 5. 3D characters.

4. Testing and results

The test is run using the Black Box Testing method as shown in the following table.

Table 2. Black box testing result.

No	Test Case	Condition	Result
1	Menu Choosing	Users can select and run all menus	Valid
2	3D Non Playable Character	All 3D NPC characters can be run on the game	Valid
3	3D Environment Game	Players can use the 3D game environment according to the scenario	Valid
4	Quest System	User can finish one mission and proceed to the next mission	Valid
5	Chapter Flow	All chapters can be run on games from chapter I to chapter VI	Valid
6	First Person Shooter Perspective	Players can run the perspective of a first person shooter	Valid

The second test is Story Test. The scenario of this is, we preparing the user as a sample with below criteria: ever played a game, ever used VR, not in pregnant, not suffer from vertigo, never played this game and on a productive aged (15-64 years old). After the sample is gathered, we let them to play the game with Virtual Reality device until the game is finished without any help or instructions for external side. The next scenario, after the sample finished playing the game, they will be given a form. In that form, there are already been 37 statements, this statements are the points of the game story. The sample must validate which points that they get from playing the game. The sample doesn't know that they will be given this form later. The result are given on the Table 3 below.

Table 3. Story test result.

No	Number of chosen story points	Achievement Percentage
1	12	32%
2	28	75%
3	20	54%
4	30	81%
5	35	94%
6	29	78%
7	21	56%
8	25	67%
9	27	72%
10	37	100%

From the   table   3   we can conclude that the average of the achievement percentage is 71% with maximum result is 100% and minimum result is 32%.

Next, we proceed to the last test, the Gameplay Test. We got the parameter data of the duration of playing is 15 minutes and 15 seconds. After the samples are gathered, we proceed to the testing step. The test results are given on the Table 3 below.

Table 4. Gameplay test result.

Sample No.	Playing duration (mm:ss)	In seconds
1	13:58	838
2	15:34	934
3	14:46	886
4	17:22	1042
5	14:15	855
6	14:37	877
7	15:15	915
8	15:00	900
9	14:00	840
10	14:10	850

On the table above, we can conclude that the average of the playing duration is 894 seconds (14 minutes and 54 seconds). We got a result of 80% of the player can play the better with the longest duration is 17 minutes and 22 seconds and the fastest duration is 13 minutes and 58 seconds, and the average of the playing duration is 15 minutes and 05 seconds where the parameter data or minimum playing duration is 15 minutes and 15 seconds.

5. Conclusion
The game as a Figure Introduction Media of Khalid Ibn Waleed is able to give the understanding about introduction of Khalid Ibn Waleed to the people who play the game. It can be seen from the test result of the game that the achievement percentage of this game on delivering the story of Khalid Ibn Waleed is 71%, where the highest result is 100% and the lowest one is 32%. After that, this game is playable and understandable by the people who never had experienced on Virtual Reality. So, with these results, tell us that this game can done its role and purpose as an introduction media of Khalid Ibn Waleed that enjoyable for the player.

References
[1]   Jatmiko 2016 *The role of Khalid ibn al-Walid in spreading Islam in the Arabian Peninsula* (Universitas Negeri Medan: Undergraduate thesis)
[2]   Hakim, Manshur A 2014 *Khalid bin Al-Walid Commander of the Invincible* (Jakarta: Al-Kautsar)
[3]   Narwati S 2011 *Creative Learning: Tips for Becoming a Creative and Favorite Teacher* (Yogyakarta: Familia)
[4]   Chatib M 2012 *Human School* (Bandung: Kaifa Learning)
[5]   Susanto E 2012 *60 Games for Teaching Class Openers* (Yogyakarta: Lukita)
[6]   Nyimas A S, Achmad B and Kholid F 2017 Game Mobile Application History of Uthman Ibn Affan Based on Monotone Chain Convex Hull Algorithm *IEEE International Electronics Symposium (IES)*

[7] David F A, Kholid F and Fahim N C B 2018 First Person Shooter VR based Game On 10 November 1945 With Motion Controller *IEEE International Electronics Symposium (IES)*

[8] Kholid F, Moh. Zikky and Anita S N 2018 Application of K-Nearest Neighbor Algorithm For Puzzle Game of Human Body's System Learning on Virtual Mannequin *IEEE International Conference on Applied Science and Technology (iCAST)*