

## VIRTUAL REALITY TELECONFERENCING



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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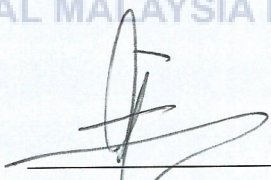
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# VIRTUAL REALITY TELECONFERENCING

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This report is submitted in partial fulfillment of the requirements for the

Bachelor of Computer Science (Interactive Media)  
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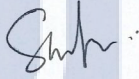
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## DECLARATION

I hereby declare that this project report entitled  
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Is written by me and is my own effort and that no part has been plagiarized  
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## DEDICATION

To my beloved parents,  
for your support and love.



To my supervisor,  
for always encourage and help me to complete this project.

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I would like to express my gratitude to those who provided me the possibility to complete this project. A special thanks to my supervisor, Mrs. Nazreen bin Abdullasim for giving me suggestions and encouragement throughout my project. I would also like to thank Universiti Teknikal Malaysia Melaka and Faculty of Information and Communication Technology for giving me the opportunity to do this project. Furthermore, I would like to express my deepest appreciation to my family and friends who always support and motivate me. Thank you.



## ABSTRACT

Virtual Reality (VR) is an attempt to immerse the user in a virtual environment, and this technology is becoming more advanced nowadays. Although it has been applied in a variety of areas, the cost of implementation is getting higher and higher which is not affordable for the small sectors. The purpose of this project is to study about virtual reality, and to develop and test the usability and user experience of teleconferencing in a VR application. The methodology of doing this project is Software Development Life Cycle (SDLC). The application is developed in four months by using Unreal Engine. A dedicated server is built to allow multiple users can access the application simultaneously through a local area network. The application is tested by randomly selected 10 testers. From the results of testing, the application gives the feeling of immersion to the users and it can be used for teleconferencing. This project indicates that teleconferencing can be conducted in VR. Further improvements can be done to expand the usefulness of the application and make it becomes a marketable product.

## ABSTRAK

Realiti maya (VR) merupakan satu percubaan untuk membenamkan pengguna dalam persekitaran maya, dan teknologi ini menjadi semakin maju pada masa kini. Walaupun ia telah digunakan di pelbagai bidang, kos pelaksanaan semakin tinggi dan banyak sektor tidak mampu melaksanakan teknologi ini. Tujuan projek ini adalah untuk mengkaji tentang realiti maya, dan membangun serta menguji kebolegunaan dan pengalaman pengguna telekonferensi dalam aplikasi VR. Metodologi untuk menjalankan projek ini ialah Kitaran Pembangunan Perisian (SDLC). Aplikasi ini dibangunkan dalam tempoh empat bulan dengan menggunakan Unreal Engine. Satu pelayan yang berdedikasi dibina untuk membolehkan beberapa pengguna boleh mengakses aplikasi secara serentak melalui rangkaian kawasan setempat. Aplikasi ini telah diuji oleh 10 penguji secara rawak. Dari hasil ujian, aplikasi ini memberikan perasaan rendaman kepada pengguna dan boleh digunakan untuk telekonferensi. Projek ini menunjukkan bahawa telekonferensi dapat dijalankan dalam aplikasi VR. Penambahbaikan yang lebih lanjut boleh dilakukan untuk mengembangkan kegunaan aplikasi ini dan menjadinya produk yang boleh dipasarkan.



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## LIST OF ABBREVIATIONS

AR	-	Augmented Reality
CAVE	-	Cave Automatic Virtual Environment
HMD	-	Head-mounted Displays
LAN	-	Local Area Network
MR	-	Mixed Reality
MSN	-	Microsoft Network
RC	-	Release Candidate
SDLC	-	Software Development Life Cycle
SL	-	Second Life
UTeM	-	Universiti Teknikal Malaysia Melaka
VR	-	Virtual Reality

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## CHAPTER I

### INTRODUCTION

#### 1.1 Introduction



This chapter gives the idea of conducting this project. The project background, problem statement and objectives will be stated in this chapter. The project significance is discussed in this chapter as well.

#### 1.2 Problem Background

Virtual reality (VR) was started in 1956 and has drawn so much attention in these few years. Extensive media coverage causes this technology to grow rapidly. VR is being applied in all areas of human endeavor. Many VR applications have been developed for manufacturing, training in a variety of areas (military, medical, equipment operation, etc.), education, simulation, design evaluation (virtual prototyping), architectural walk-through, ergonomic studies, simulation of assembly sequences and maintenance tasks, assistance

for the handicapped, study and treatment of phobias (e.g., fear of height), entertainment, rapid prototyping and much more.

### 1.3 Problem Statement

Video conferencing in VR has been developed in the western countries as one of the communication tool. It provides face-to-face meeting between two parties by eliminating wasted time with travel, transportation, and money of travel. However, this kind of telecommunication tool is costly and it is not affordable for the small sectors to deploy it. An idea of developing VR teleconferencing application by using the game engine available in the market has come out. It aims to provide a cheaper way to implement teleconferencing in VR.

### 1.4 Objective

This project is based on the following objectives:

- To study about VR and teleconferencing.

This project is studied deeper about VR and teleconferencing.

- To develop a VR application using Unreal Engine.

A VR mobile application is developed. The application can be viewed through the screen of mobile phone. The mobile phone will be placed in a VR goggles to give the feeling of immersion.

- To test the usability and user experience of teleconferencing in VR.

The VR application is built with a dedicated server. Two users can access the application at the same time through Internet connection. The possibility of teleconferencing in VR will be tested out and identified.

## 1.5 Scope

The scopes of this project are:

- Maximum two users can access the application at the same time.

The users will be connected through a dedicated server. The users will be able to see and interact with each other in the VR application.

- The application is only available for the mobile phone with Android platform (Lollipop version, API level 21 or above).

The mobile phone must have higher performance to install the application. Since the virtual objects and environment are in three-dimensional (3D), the mobile phone also must have a better display for better visual experience.

- Teleconferencing can be conducted within a local area network (LAN).

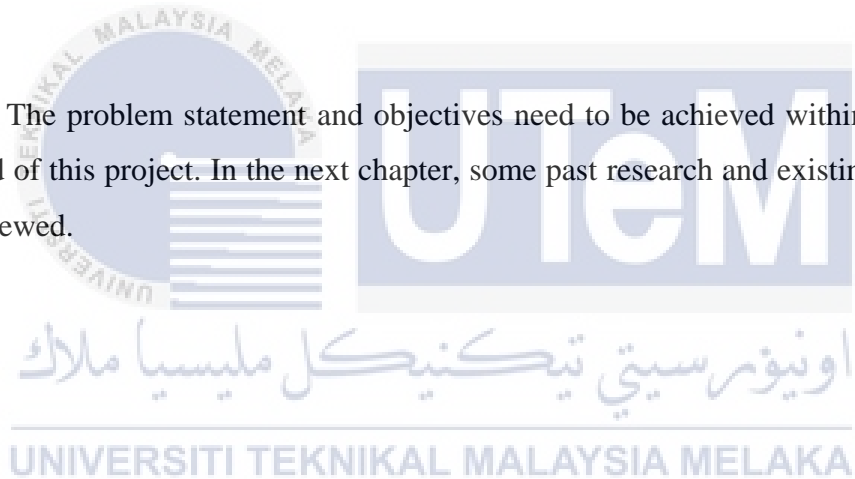
The application can be accessed by two users within the range of 100 meters. Teleconferencing can only be conducted by connecting to the same wireless LAN.

## 1.6 Project Significance

The VR teleconferencing application is developed to provide an affordable and advanced telecommunication tool. By using the game engine that free for student developer, the cost of development and implementation is reduced. This project aims to allow wider range of users from different fields to access and deploy the advanced technology in their daily life.

## 1.7 Conclusion

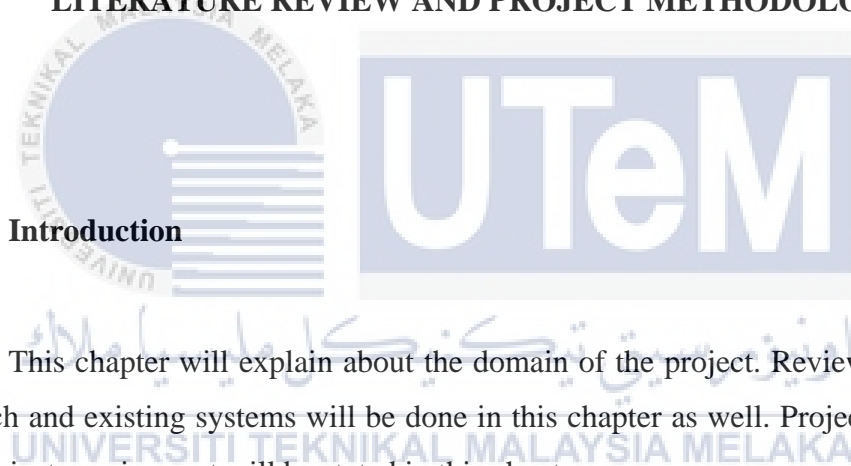
The problem statement and objectives need to be achieved within the scopes in the end of this project. In the next chapter, some past research and existing systems will be reviewed.



## CHAPTER II

### LITERATURE REVIEW AND PROJECT METHODOLOGY

#### 2.1 Introduction



This chapter will explain about the domain of the project. Review on some past research and existing systems will be done in this chapter as well. Project methodology and project requirement will be stated in this chapter.

#### 2.2 Domain

The domain of this project is VR and teleconferencing as this project has the intention to test the feasibility of teleconferencing in VR. The history, goals and application of VR will be highlighted in the review. Besides, the definition, advantages and disadvantages will be highlighted too.

### 2.2.1 Virtual Reality

What is VR? According to Oxford Dictionary, the meaning of ‘virtual’ is something that not physically existing, it could be a simulation of something real illusion. While ‘reality’ is defined as the state of something that exists independently of ideas concerning it. VR is a technology that gives an illusion of immersion in the virtual environment with supplemented objects by computer-generated sensory input such as sound, video, or graphics. There are many different definitions for VR, but they are essentially equivalent. Besides, there are two variables to define VR: vividness and interactivity. Vividness defines the richness of an environments representation, interactivity extends to which a user can modify form and content of a mediated environment.

The concept of VR was started in 1956, where a multi-sensory simulator created by Morton Heilig. This was the first approach of VR system. The simulator had all the features of such an environment, but it was not interactive. The very first idea of VR was presented by Ivan Sutherland in 1965. He proposed the Ultimate Display which is an artificial world construction concept that look real, sound real, feel real, and interactive to the user. In 1968, Ivan Sutherland constructed head-mounted display (HMD). It was the first VR system realized in hardware. The HMD was built with head tracking which the view in HMD can be updated according to the user’s head position and orientation. Table 2.1 shows the brief of the research has been done in the past decades.

**Table 2.1: The brief of the research about VR.**

Year	Past Research	Description of Research
1971	GROPE	The first prototype of a force-feedback system created by Fred Brooks.
1975	VIDEOSPACE	Artificial Reality created by Myron Krueger where the cameras place the users into a

		projected screen, the image processing technique used to track the users in the 2D space.
1982	VCASS	Visual Coupled Airborne Systems Simulator is an advanced flight simulator created by Thomas Furness.
1984	VIVED	Virtual Visual Environment Display constructed by NASA with off-the-shelf technology in a stereoscopic HMD.
1985	VPL	The first company that manufactures VR products such as DataGlove.
1989	BOOM	A box containing two CRT monitors that can be viewed through the eye holes by Fake Space Labs. User can move through the virtual world as a mechanical arm measures the position and orientation of the box.
1992	CAVE	Cave Automatic Virtual Environment is a VR scientific visualization system. It consists of at least four CRT projectors to place on the surrounding and reflect the image off mirrors for providing a wider field of view compared to HMD.

VR has a goal to convince a user that he is somewhere else, this technology attempts to immerse the user in a virtual world. There are three 'I' in VR, which are Immersion, Interaction and Imagination. The three 'I' gives the sense of being presence in a virtual environment through different format of displays. The various format of displays to experience VR that are head-mounted displays (HMD), Cave Automatic Virtual Environment (CAVE) surround projectors, panoramic projectors, workbench projectors and desktop displays. The degrees of immersion in VR have been defined as fully-immersive, semi-immersive and non-immersive. HDM and CAVE are fully

immersive VR system. They have the ability to block out the contradictory sensory impressions from the real world, they provide a better visual experience of VR. Panoramic projectors and workbench projectors are semi-immersive VR system. While desktop displays are non-immersive VR system as they hardly block out the real world, hence they do not create the illusion of immersion in the virtual environment.

The invention of VR has benefited the community in a variety of areas. VR assures the quality of presentation, easiness of interaction and correctness of behavior in industrial application. In vehicle training simulator, VR system allows better understanding and provides the mean for intuitive operation and control. The visual and auditory displays give a realistic training experience to the user. Besides, VR system in simulator can enhance the ability of user to deal with complex situations as the virtual incidents can be constructed. The strengths and opportunities of VR are immersive storytelling, shopping and product demos, able to stir emotions and the content production that enables the user thinking outside of the frame.

*“Virtual reality is a new communication platform. You can share unbounded spaces and experiences with the people in your life. Imagine sharing not just moments with your friends online, but entire experiences and adventures.”*

*– Mark Zuckerberg*

### **2.2.2 Teleconferencing**

The term of ‘teleconferencing’ comes from the words ‘tele’ and ‘conference’. The word ‘tele’ means distance, while ‘conference’ means meeting. Teleconferencing allows people in different locations to come together without travelling. They can communicate and interact with each other through phone, fax, and e-mail in real time. Teleconferencing is essentially a means for communication and training. It can be used for information