

**BORANG PENGESAHAN STATUS TESIS\***

JUDUL: NAVIGATING UTEM IN VIRTUAL ENVIRONMENT

SESI PENGAJIAN: 2009/2010

Saya CHOO WAI SUN

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/ \_\_\_\_\_ TIDAK TERHAD

Choo  
\_\_\_\_\_  
(TANDATANGAN PENULIS)  
Alamat tetap: 143, Kampung Nalla  
31750 Tronoh, Perak.

[Signature]  
\_\_\_\_\_  
(TANDATANGAN PENYELIA)  
Dr. Syariffanor binti Hisham

Tarikh: 25/6/2010

Tarikh: 25/6/2010

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NAVIGATING UTeM IN VIRTUAL ENVIRONMENT

CHOO WAI SUN

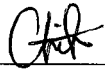
This report is submitted in partial fulfillment of the requirement for the  
Bachelor of Computer Science (Multimedia Interactive)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY  
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DECLARATION**

I hereby declare that this project report entitled  
**NAVIGATING UTeM IN VIRTUAL ENVIRONMENT**

is written by me and is my own effort and that no part has been plagiarized  
without citations.

STUDENT :  Date: 25/6/2010  
(CHOO WAI SUN)

SUPERVISOR :  Date: 25/6/2010  
(DR. SYARIFFANOR BT HISHAM)

## **DEDICATION**

I dedicated this project to my parents. This work would not have been possible if do not have their patients, understanding, support and their love.

## ACKNOWLEDGEMENT

I would like to thank Dr. Syarifanor bt Hisham for her direction, assistance, and guidance. In particular, the recommendations and suggestions from Dr. Syarifanor were invaluable for the project.

I also wish to thank En. Ibrahim bin Ahmad who taught me the subject of virtual reality technology. From this subject, I learnt about virtual reality and EON Studio software to develop my final year project. I have to apply the 3D virtual environment based with virtual reality technology.

Special thanks for my parents and friends. They are giving me support and motivation throughout my final year project. Besides, my friends also give their suggestions and opinions for me to complete this project successfully.

## ABSTRACT

The purpose of this project is to study the application of virtual reality technology. Virtual reality application of architecture walkthrough will provide natural control interface by clicking the mouse or using keyboard's shortcut key function. The functionality of this project is to provide information about UTeM's building such as Faculty of Information and Communication Technology, Hall, Mosque, Chancellery, and Library. This application will also guide the students or staffs go to these locations by clicking the buttons on the screen. UTeM campus will be introduced in form of 3D models. Software Autodesk Maya 2009 is used to modeling the five UTeM's building and EON Studio is used to apply virtual UTeM environment with five building based on virtual reality technology. This project is defined as non-immersive which will display the 3D virtual environment on a computer.

## ABSTRAK

Projek ini bertujuan untuk mempelajari aplikasi dalam realiti maya teknologi. Aplikasi realiti maya dalam arsitektur mudah untuk kontrol dengan butang tetikus dan pad kekunci. Projek ini berfungsi untuk memberikan informasi mengenai bangunan UTeM seperti fakulti teknologi maklumat dan komunikasi, dewan besar, canselor, masjid dan perpustakaan. Aplikasi ini juga memberi panduan atau petunjuk jalan kepada pelajar atau staf sampai ke bangunan tersebut dengan klik butang tetikus. Kampus UTeM akan diperkenalkan dalam bentuk model 3D. Autodesk Maya 2009 adalah perisian yang digunakan untuk mereka lima bangunan di UTeM dan EON Studio adalah perisian yang digunakan untuk membangunkan sekitaran UTeM dengan realiti maya teknologi. Projek ini dikategorikan sebagai *non-immersive* yang memaparkan persekitaran UTeM dalam bentuk 3D.

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## LIST OF ABBREVIATIONS

2D	-	Two Dimensional
3D	-	Three Dimensional
UTeM	-	Universiti Teknikal Malaysia Melaka
VR	-	Virtual Reality
HMD	-	Head Mounted (Coupled) Display
FTMK	-	Fakluti Teknologi Maklumat dan Komunikasi
BRTS	-	Bus Rapid Transit System
USM	-	University of Southern Mississippi
KSRTC	-	Karnataka State Road Transport Corporation
CAVE	-	Cave Automatic Virtual Environment
AVS	-	Advanced Visual System
TV	-	Television
API	-	Application Program Interface
SDLC	-	System Development Life Cycle

## **CHAPTER I**

### **INTRODUCTION**

#### **1.1 Project Background**

The domain of this project is virtual reality application for architectural walk through. Virtual reality is simulated a real environment by computer that can experience visually in the three dimensions. The virtual reality system of this project is defined as non-immersive which will display the 3D virtual environment on a computer monitor.

Nowadays, the technology of interaction interface between human and computer become more powerful. This “Navigating UTeM in virtual environment” project will develop a real world environment about Universiti Teknikal Malaysia Melaka (UTeM) main campus located in Durian Tunggal. The technology of virtual reality is used to display a real environment of UTeM which is modeling in 3D object. The students can view through their university’s environment and get information about each building.

3D computer graphic is the graphic that use a three-dimensional to represent of geometric data that stored in the computer to perform calculation and render 2D image. Autodesk Maya 9.0 will be used for modeling the main campus area of Universiti Teknikal Malaysia Melaka. The software such as EON Studio will be used to interact the UTeM’s building to display the output with non-immersive.



## 1.2 Problem Statement

There are many applications can reused to search for any location that you want to go such as google map and tourism website which display the location's information in the form of two dimensional. The google map only provide top view 2D image. Nevertheless, some of the users want to know the real appear of the environment for easily to find the location. Hence, the image in two dimensional is not achieved high level of efficiency if compared to three dimensional which apply with virtual reality technology.

## 1.3 Objective

The objectives of this project are described briefly as following:

- To understand the virtual reality application technology.  
Eon Studio 5.0 is using to interact virtually with 3D models based on virtual reality technology. The virtual reality application of architecture walkthrough will provide the natural control interface by clicking the keyboard or mouse.
- To explore the technique in modeling a virtual reality environment.  
There are some techniques and software can be used to develop a reality environment such as use AutoDesk Maya 2009 to develop 3D environment, Flash to develop 2D environment, OpenGL to develop 3D environment, and so on. For this project, the Autodesk Maya software is used to model a reality environment.
- To develop a virtual reality application in which provides information about UTeM main campus areas.  
The UTeM's student and staff will benefit from the project with the provided information by clicking on the area that follows their interest.

## **1.4 Scope**

This project will help to introduce UTeM main campus areas in a form of 3D models and apply in virtual reality technology. The basic phases such as 3D modeling and 3D texturing will be used to create 3D computer graphic. The target users of the project are the students and staff especially the new student of Universiti Teknikal Malaysia Melaka (UTeM). Users can use the mouse or shortcut key of keyboard to view the UTeM main area which they want to know the location of their destination. When the UTeM building display on computer, user will take part with non-immersive to walk through the virtual UTeM main campus.

## **1.5 Project Significance**

The UTeM student and staff especially the new student will gain benefit from the project. Student can easily to figure out their location that they want to go and avoid lost feeling in the UTeM campus. Besides, I also can gain benefit and explore the skill or technique in modeling and develop a reality environment, and study the application of the virtual reality technology by using EON Studio.

## **1.6 Conclusion**

This project consists of a virtual UTeM which located in Durian Tunggal. This will combined by a virtual reality technology. Users can use the mouse or shortcut key of keyboard to view the UTeM main campus which they want to know more information. When display the UTeM building, the user can take part with non-immersive to walk through the virtual UTeM main campus. This project is very useful and benefits for the students so they can view the campus on their computer. In the next chapter is related with literature review and project methodology.

## CHAPTER II

### LITERATURE REVIEW AND PROJECT METHODOLOGY

#### 2.1 Introduction

Whyte, J. (2003) reported her research about construction field in virtual reality of industrial application in the USA and the UK. Some case study approach used to explore strategies and business drivers for identifying the pattern of use in virtual reality. The driver business for the use of virtual reality included demonstrating technical competence, design review, simulating dynamic operation, co-coordinating detail design, scheduling construction and marketing. The reused design for extend and project size may affect the strategy of implementing and using of virtual reality. For the research result, virtual reality is a universal interface to all construction applications.

There is an empirical study of the use of virtual reality applications in architecture and construction. According to her research, construction often perceived as a backward industry and mentions that some improvement is necessary for government reports. Whyte, J. (2003) indicated that “The ‘pioneers’ of virtual reality expected architecture to be a major application: walkthrough systems were developed (Brooks, 1986); Autodesk collaborated with the VR hardware company VPL (Hayward, 1993) and the trade press described potential applications (e.g. Evans, 1992). However, virtual reality is an emergent and unstable technology, which lacks a dominant design (Swann and Watts, 2002), and has had initially very slow diffusion into the sector (Bouchlaghem, *et al.* 1996).” (Whyte, J. 2003)

## 2.2 Domain

Virtual reality can be in term as a simulation that the computer creates a virtual world. The objects of virtual world are life like because it is essentially three dimensional. The users can explore and give power to interact as well as manipulate in the virtual reality world. Computer scientists and visual experts have devised a lot of technical application and devices such as Head Mounted (Coupled) Display (HMD) to develop the effect in people. The application tools used must track user activity such as movements, eyes, neck movement efficiently. The final outcome of tracking those movement must match the with user action inside virtual world.

There has been little empirical study and focus on the narrative aspects of the walkthrough in virtual reality. Architecture walkthrough is a universal application of virtual reality. It helps to visualize my project, construction and space of proposed buildings. Virtual reality walkthrough is an environment accessible through computer that allows user to walk through the UTeM campus. User can walk through the virtual reality environment and walk into different areas such as the Chancellery, Library, Mosque, FTMK, and Hall. The virtual reality walkthrough provides an opportunity to learn more about the layout of the UTeM. It is expected that this type of virtual reality walkthrough will allow user to have a more enjoyable experience while learning about the structural layout of UTeM campus.

## 2.3 Existing System

Based on a work conducted by a group of researcher in Delft University of Technology, geometrical precision and experiential quality is the main technical criteria to develop an architecture walkthrough. In the paper, they present a human-centered analysis and propose design solution and focused on walkthrough narrative aspect. Besides, architectural walkthrough became a common feature in partly presentation of large architectural design projects.

There are several types of existing application in virtual architecture walkthrough such as virtual reality walkthrough of the University of Southern Mississippi (USM) Stadium which produced by Nosser, J. (Aug 05 - Dec 06) from University of Southern Mississippi, virtual reality animation of Bus Rapid Transit System (BRTS) in Mysore City which produced by Sutech Solution Company (2001), and animated walkthrough showing the entrance of Presidency Grand a premier township coming up at Vizag which also produced by Sutech Solution Company (2001).

For the Nosser's project, he developed an interactive environment and accessible through the internet that allows users to walk through the USM stadium. User can walk through the virtual environment include concession areas, restrooms, ticket office area, athletic building area, and the seating areas. In his project, he had to provide a learning opportunity about the structural layout of the USM stadium.

For the project which produced by Sutech Solution Company, it developed the virtual environment in 3D with rotation and navigation features. The project about Bus Rapid Transit System (BRTS) in Mysore City for Karnataka State Road Transport Corporation (KSRTC) in which the proposed 17Km BRTS corridor has been modeled in detail mixing virtual reality by integrating the actual site to proposed BRTS Corridor.

The project about walkthrough to display the entrance of Presidency Grand is stated the art housing colony at Vizag. This virtual environment built on 50 acres with over 175 independent villas, club house with swimming pool, gym, spa, sauna, mini theatre and a huge park. This project is creating a walkthrough of the entire structural layout to show all the exteriors, interiors, club house and the entire park with all elevation.

### **2.3.1 Hardware used in Existing System**

There are a lot of hardware is used by exiting system such as Cave Automatic Virtual Environment (CAVE), Google, Head Mounted (Coupled) Display (HMD), and so on. The powerful hardware is used to observe the output of the application.

CAVE is projector-based display, multi person virtual environment and high resolution color images. The characteristics of CAVE are inside-out surround 3D video presentation, head and hand-tracked user interaction, and off axis stereo projection. From the report of Stappers, the participants in a CAVE presentation wear stereo goggles to see stereo images on four wall display. In a general architectural walkthrough, an architect will guide people representing through parts of the proposed building. The CAVE supports communication between users and user is the controller of the physical movement when they are inside the CAVE.

HMD gives a view of the world coupled with sound from earphones attached to the device. Each eye has a separate display. HMD can be divided in two principle group, there are opaque and see-through. Opaque HMDs is totally replacing the user's view with image of the virtual world and can be used in application that creates their own world like architectural walkthrough and scientific visualization. However, see-through HMDs is superimpose computer generated image on real objects, augmenting the real world with additional information. The optics allow user to focus at some depth and not focus on the surface of the display screen.

### **2.3.2 Software used in Existing System**

There are a lot software is used by exiting system such as AVS/Express, Autodesk 3DStudio MAX, EON Studio. The useful software is used to develop some powerful applications and system.

AVS/Express is a product of Advanced Visual System. It is a useful program to create scientific and technical visualization application. It provides many application components for visualizing, analyzing, manipulating, and interacting with

data. It is a simple visual method in which just drag and drop different modules to the application and then modify the parameters within the modules. However, AVS/Express has some limitation on type of geometry files.

Autodesk 3D Studio Max is used for modeling, animation, and rendering which developed by Autodesk Media and Entertainment. It is a tool to create 3D models and animation to produce a virtual environment and apply it based on virtual reality technology. 3D Studio Max can be used for video game developer, TV commercial studio, and architectural visualization studio. Furthermore, 3D Studio Max is a new graphite modeling and texturing system introduces at least 100 additional creative tools.

EON Studio is a powerful authoring tool used to develop an interactive 3D application. Studio is the first tool to interact the technology gap for the integration of 3D digital assets from multiple sources that allow the developer to create simulation. The EON Studio users able to develop or build complete an interactive product because it is not require any programming experience. According to Scholtes, P., he said that the developer able to decrease production time spent developing configurations with complex interactivity and functionality by using EON Studio.

### **2.3.3 Comparison of Existing System**

The element of functionality is using to compare between the existing system and application that applied based on virtual reality technology.

**Table 2.1: Comparison of Existing System.**

Functionality	Project Name		
	USM Stadium	BRTS in Mysore City	Presidency Grand
Immersive	Fully immersive	Semi-immersive	Semi-immersive
Input device	Mouse/ Keyboard	Mouse	Mouse
Display(platform)	Computer	Computer	Computer
Animation	No	Yes	Yes
Concept	Walkthrough	Walkthrough	Walkthrough
Transform/transition	No	No	Yes
Camera Movement	Smooth	Smooth	Smooth
Zoom In	Yes	Yes	Yes
Zoom Out	Yes	Yes	Yes
Rotation	No	No	No
Background Sound	No	Yes	No

As a result from the comparison table above, it is distinct that the minor difference between the existing systems. Generally, the architecture walkthrough applications mostly playing same function in virtual reality technology. The immersive in virtual reality is important for user to immersive themselves with the application and gain more enjoyable experience while viewing the structural layout of building.

### **2.3.4 Comparison Analysis: UTeM Map versus Google Map**

UTeM map for University Teknikal Malaysia Melaka is non existing system. Functionality of UTeM Map is definitely not same with the Google Map. UTeM