VIRTUAL RECREATION PARK (BUKIT JALIL)

MALYIA AFZAN BINTI ABD AZIZ

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Nama Penyelia

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I hereby declare that this project report entitled

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STUDENT   :_____ Date: 22/11/06
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SUPERVISOR:_____ Date: 22/11/06
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ABSTRACT

This virtual walkthrough project was developed to promote a recreational park to the public and allow user to experience an acrhitectural model by simulating a walk through a model. Getting the idea to create the design of the park from Taman Bukit Jalil which is located at Bukit Jalil. User can explore every angle of the virtual world and can feel like visiting the real place by using keyboard and mouse to interact with the world.

The important part in this project is a model of 3D recreational park and it's name is Virtual Recreational Park. This park include the 3D models of tree, houses, lake, cars and bridge.

It was developed by using a programming languages of OpenGL. This OpenGL programming can be use by virtual reality developer in all operating system platform because OpenGL is an application programming interface (API) that exposes hardware features needed to create computer graphics. For 3D modelling, it was developed by using 3D Studio Max.

ABSTRAK

Projek ini merupakan satu penjelajahan maya (virtual walkthrough) yang dibangunkan untuk memperkenalkan sebuah taman rekreasi kepada orang ramai dan memberi peluang kepada mereka untuk menjelajah taman tersebut secara maya. Taman maya ini telah diilhamkan daripada Taman Bukit Jalil yang terletak di Bukit Jalil. Pengguna yang memasuki dunia maya ini akan dapat melawati setiap sudut alam tersebut seperti membuat lawatan di dunia sebenar dengan menggunakan papan kekunci dan tetikus untuk berinteraksi.

Perkara yang lebih ditekankan di sini ialah model sebuah taman rekreasi yang diberi nama Taman Rekreasi Maya. Ia merangkumi objek-objek 3 dimensi seperti pokok, rumah, tasik, kereta dan jambatan.

Taman maya ini dihasilkan menggunakan pengaturcaraan OpenGL yang dapat aplikasikan oleh pengguna dalam apa jua pelantaran sistem operasi kerana OpenGL merupakan satu antaramuka aturcara aplikasi (API) yang memberikan kelebihan kepada perkakasan komputer dalam membangunkan grafik komputer. Bagi 3D modellingnya, ia dibangunkan menggunakan 3d Studio Max.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

.

CHAPTER 1

INTRODUCTION

1.1 Project Background

In Malaysia, Computer Technology expending quickly even though many kinds of feasible venture by government increase the citizen knowledge for the IT. The computer application give more profit and benefit to people in a multimedia in particular. Mostly in private companies and government, multimedia application give a lot of benefit and advantages by web development and designing, education package, E-Commerce, animation and simulation conception. One of the most popular field in multimedia application is virtual reality(VR). One of the most important component in virtual reality application environment is to make audiences believe that they really in the virtual environment. Several factors that included in this environment there is "immersion" which is interact with real time and all the graphics dimension.

In this project , would develop one of the virtual reality world using effective simulation software. With this, user know how to learn and interact with basic of virtual reality development and produce all the human being. Virtual reality is new technology that bring the audience into an illusion for 3D graphics models and animation technique. The objective in virtual reality is for audience to know that all environment are truly real and have some experience. In the future equivalent with technology development, the commercial application will increase. In medical field, it can be used to train specialist

to commit surgery with ultra sound imaging that can be used produce real-time images of tissue and the blood motion and also can commit surgery directly with visual cue for the organ location.

For this project, will design a virtual recreation park. Nevertheless, it doesn't include for all the Bukit Jalil's courtyard that because the area landscape elements are too large and very huge, this application development is one of the virtual exploration(virtual walkthrough) that bring the people into the global of 3 dimension environment where user can be able to explore this virtual park. The consumers can explore the garden that include such as building, tree, board, lake and other thing. To explore the park, user just have to uses mouse and keyboard to walkthrough. Illusion explore more to expose the technique in 3D such as collision detection, texture mapping and lighting.

1.2   Problem Statement

In Malaysia, our government built a lot of recreational park and resort.
The recreation park where the facilities that the people can release their pressure after comfortable daily working. The recreation park at Bukit Jalil Park prepare a lot of good facility to visitor such as toilet, playground for kids, rest hut. The design of this park count of visitor who comes. This is because the visitors prefer the strategically park, clean and interesting park that they visit. The visitors who visit the park including of all kinds of groups, age, nation and sex. Many kinds of procedure to introduce this recreation park for example a sign board, a television advertising and magazine. It is one more mode to introduce this recreation park to the user that is virtual exploration. Through virtual exploration, 3D model will be built same as the real object and interactive function will be provided so that user are able to explore the virtual recreation park. Since technology virtual reality is still in Malaysia, many society is still expose with this technology. It is difficult to research the illusion explore. Thus, through the illusion park, the public especially students can improve their knowledge about creating illusion explore.

1.3   Objective

The objective of this project are as follows :

- To be as a guideline to whom do not have an opportunity to visit the recreation park of Bukit Jalil before.

- To visualize the environment of recreation park using the OpenGL for programming, terrain technique just for modeled. Research on landscapes structure for example the landform that horizontal and the lake with puddle.

- CD-based walkthrough application. After all of implementation process has been done, this project will be delivering on CDs. This is because it easy to bring at anyplace, anytime and anywhere.

1.4   Scopes

The main focus in this project are construction structure recreation park in 3 form dimension. It contains element in landscape such as tree, stool, stones, light, pond and building. User can explore virtual park easily just only control the camera movement with keyboard and move forward and backward.

This application will provide in a very user friendly and just basic knowledge to handle. User just do a simple mouse action such as move forward and backward. The interfaces would be very simple but interesting which are suitable for target user.

1.5   Project significance

There are a lot of benefits existed when this project completely finish. As a mention before, the main objectives of this project is to be as a guideline to who do not have an opportunity to visit the recreation park of Bukit Jalil before. So when this application exists, it certainly can provide a lot of benefits. Now we are use using this powerful technique explore the virtual recreation park of Bukit Jalil's. This fact stands alone independent as a strong reason to the significance of developing this project.

1.6   Conclusion

As a whole, this project would offer a lot of benefits especially for users. This chapter is about the introduction on how VR could be used to visualized the recreation park the objective of this project and scope with who is the target user for this recreation park. In other words, this project will achieve what of the objectives. The next phase is about literature review and project methodology about this project.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1   Introduction

This chapter is one of the most important chapters for any projects that will develop. The main sections for this chapter are fact and finding as well as project methodology that should be used during development process of any project. Researching by these thing including analyze related data through reference such as book or internet. All the types of the project such as virtual reality, walkthrough also must be mention properly instead of having good information of the project.

Virtual reality is a combination of computer and interface device which present the illusion in the 3D perspective by computer. Certain systems in this virtual reality using a hardware as head-mounted display for tracing user's *head-mountain display* movement and make a level images to headset in a real world. User would focus the eyes contain to screen and also some VR system entail usage a data sleeve for enable the user to integrate with the virtual object.

VR is a technology revolution that bring along into world that produce with computer as room, city, solar system and human anatomy. Virtual reality also expending and can produce simulation for train a pilot and design the house, system of multimedia in the future.

According to the user interaction methods, VR can be divided into 3 types such as non-immersive, semi-immersive and immersive. The immerse system needed immersive display hardware in 3D. Non-immersive also called desktop VR, which includes mouse-controlled navigation through a three-dimensional environment on a graphics monitor, stereo projection system and others. Semi-immersive is used to describe projection-based VR system. Fully-immersive system is what most people think a VR system should look like and user has to employ a head-coupled display which is either head mounted or arranged to move with the head.

The virtual reality application that will produced is a non-immersive that use computer desktop to render the images. It allows user walking through in recreation park. The purpose of this project is to produce computer graphic application which allowed viewers to experienced the exploration only by 3D model.

2.2   Fact and Finding

This is the most important topic in this thesis. Research had been done through several resources and there are some topics that developer think it much related to the project develop. Nowadays there are many attractive simulation system for user to explore a virtual reality through different ways.

2.2.1 GardenReich

New media in Institute of Frankfurt already produced one virtual model for a park that is *Garden Reich in Woerlitz (1996)*. This system yield with computer Silicon Graphics Inc (SGI) for combination of 3D model like building, lake, bridge and also landscape including tree and vegetation. The combination of the models are using the '*Texture Mapping*'. This model construct with detailed especially the exploration simulation.

2.2.2 Architectural Walkthrough Layout

Sandia National Laboratories have developed an architectural walkthrough application. This application allows users to load in large scale, detailed architectural models and to explore the design using e-Touch technology. Virtual Modeling Language (VRML) technology is used in user interfaces for this application which allow user to feel the digital models. In addition, various touch-enabled programs can be launched as the user navigates in the digital realm. For example, if the user enters a "medical building" in the simulation, a medical visualization program can be instantiated.
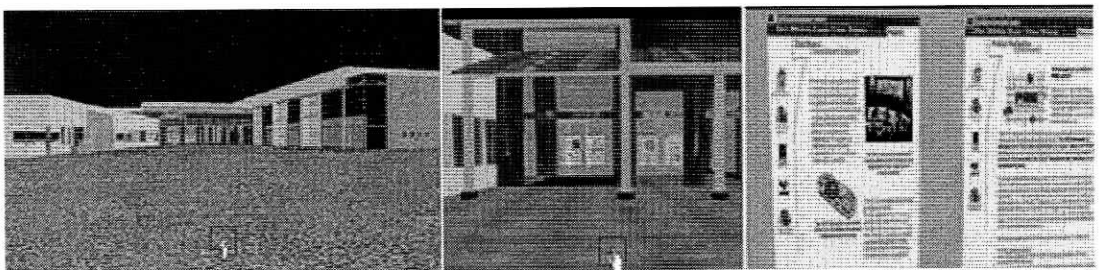

Figure 2.1 : Application Architectural Walkthrough

2.2.3 History of Virtual Reality

VR has started since 1968 by *Ivan Sutherland*. The first real stereographer was *Sir Charles Wheatstone*, who made geometric 3-D drawings and a device to view a reflecting mirror stereoscope in 1838.

Since twelve years later, *Sir David Brewster* a Scottish scientist invented the first practical device called the lenticular stereoscrope.

When the stereoscope began to decline in the late 1930's, another application for 3-D was invented by *William Gruber* a German-born tinkerer. Kodak had introduced flexible 35mm film and Gruber invented a method for taking and showing 3-D views with this new film.

The first three-dimensional anaglyphic created by *William Friese* with motion pictures in 1889. The first anaglyphic films were designated as "plasticons" and "plastigrams". Only used one strip of film with emulsion on both sides. The Red image was applied to the front and the green image just in back.

2.2.4 Introduction to Virtual Reality

Virtual reality can make the artificial as realistic, and even more realistic, than real. For example, a flight simulation which is most sophisticated and longest standing application of VR than flying a real plane. Besides that, only pilots can take the controls of a completely loaded passenger plane for their first flight. This is because they have learned more simulator and also have learned the actual plane. In the simulator, a pilot can be subjected to all sorts of rare situations that, in the real world and should be impossible because they would require more than a near miss or could rip apart an actual plane.

Another socially responsible application of VR would be to require its use in driving schools. On a slippery, wet road, if a child darts out from between two cars, none of us knows how we might react. VR allows one to experience a situation with one's own body.

2.2.5 Virtual Reality Application

There are a number of applications for virtual reality that are currently being used and numerous others that are being explored. Virtual reality is being used not only for games and entertainment purposes, but for training and educational uses as well.

One of the advantages of virtual reality, it can give users the opportunity to experience things that may not be possible in real life. For example, one of the benefits of flight simulators can give pilots the opportunity a experience to trying control a crashing plane.

2.2.6 Research on programming technique in OpenGL

i.   Using OpenGL

The OpenGL® API (Application Programming Interface) began as an initiative by SGI to create a single, vendor-independent API for the development of 2D and 3D graphics applications. Prior to the introduction of OpenGL, many hardware vendors had different graphics libraries.
This situation made it expensive for software developers to support versions of their applications on multiple hardware platforms, and it made porting of applications from one hardware platform to another very time-consuming and difficult. SGI saw the lack of a standard graphics API as an inhibitor to the growth of the 3D marketplace and decided to lead an industry group in creating such a standard.

ii.   QuickTime VR

QuickTime VR is an immersive imaging technology that places the viewer in the center of a 360 degree virtual environment called a panorama. The view is created with actual photographs, not computer generated images so that it same as real. The viewer has complete control over the view. They can look up, down, left, right, zoom in or out, they have control of where and what they want to see.

iii.   VRML

VRML (Virtual Reality Modeling Language, usually pronounced vermal) is a standard file format for representing 3-dimensional (3D) such as interactive vector graphics, designed particularly with the World Wide Web.

VRML files are commonly called worlds and have the .wrl extension (for example island.wrl). Although VRML worlds use a text format they may often be compressed using zip so that will be transfer over the internet quickly. Most 3D modeling programs can save objects and scenes in VRML format.

2.3 Virtual Reality Input Devices – Sensors

    i.   Instrumented Gloves

Another major category of VR input devices is that of instrumented gloves. Using optical, magnetic, or mechanical measurement instruments located on fifteen to twenty-five finger joints a glove can read numerical values for all joint flex angles at up to 60 times per second. One vendor manufactures an alternative hand device that is a high precision mechanical exo-skeleton. Such devices can be used in a VR simulation to control joint bending of a virtual hand that represents the human participant's hand. Thus, the participant's real hand can control his or her virtual hand to point at, touch, or grab virtual world objects as well as to make gestures for communication and control. Usually a 6 DOF sensor is placed on the user's wrist or back of the hand for tracking the hand position and orientation. Most vendors sell the 6 DOF sensor packaged with the glove. Both right and left handed gloves are manufactured though very few actual VR applications implemented to date use two gloves.

    ii.   Multi DOF Sensors

The input devices that can be used with existing commercial VR software include 6 DOF position sensors or trackers. Commonly sold sensors use either magnetic, acoustic (ultrasound), optical, or mechanical measurement methods, the most popular being magnetic and acoustic. A 6 DOF sensor can measure and supply to a VR simulation computer 6 floating point values at rates up to 60 times or more per second. Such an input device can be used by physically attaching it in the real world to a user's head, hand, or other body part. Multiple sensors can be attached simultaneously to track more than one of the above. Some vendors combine push buttons on the same device as the tracker. Others have merged a

standard mouse with a 6 DOF sensor. A number of variations on these devices exist in many different shapes with 2 to 6 degrees of freedom and a variety of buttons.

2.4 Virtual Reality Output Devices – Displays and Effectors

i.   Head-Mounted Displays

The most prominent piece of peripheral output hardware that most people associate with Virtual Reality is a special purpose video output display. There are three categories of commonly used displays: a head-mounted display, a boom-mounted display, and special workstation monitors equipped for viewing stereo images while wearing LCD shuttered eye-glasses. Each of these types of displays are usually sold with a built-in 6 DOF tracking sensor. These displays are also the most essential devices for creating a sense of full immersion in a virtual world.

A HMD is the most common of the three types of displays. HMD's currently on the market use either two liquid crystal displays (LCD's), one placed directly in front of each eye, or two CRT's positioned along each side of the head with mirrors to redirect their images to the eyes.

ii.   Boom-Mounted Displays

A second type of video display is one that suspends two miniature CRT or LCD displays on a counter-balanced boom mechanism. The displays are housed in a box that has optics positioned for direct stereo eye viewing. Typically boom-mounted displays sit on a desktop or on a floor mount with wheels. The boom arm has six or seven 1 or 2 DOF joints and permit full 6 DOF