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JUDUL: APPLICATION OF HUMAN BLOOD CIRCULATORY SYSTEM USING VIRTUAL REALITY SEMI-IMMERSIVE

SESI PENGAJIAN: 2006/2007

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APPLICATION OF HUMAN BLOOD CIRCULATORY SYSTEM USING VIRTUAL REALITY SEMI-IMMERSIVE

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

FACULTY OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA
2006

DECLARATION

I hereby declare that this project report entitled

APPLICATION OF HUMAN BLOOD CIRCULATORY SYSTEM USING VIRTUAL REALITY SEMI-IMMERSIVE

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

STUDENT : _____ Date: 20 NOVEMBER 2006

(AHMAD ZULKHIZRIE BIN MOHAMAD ZUKI)

SUPERVISOR: _____ Date: 21/11/06

(MRS. RUSNIDA BT ROMLI)

DEDICATION

To my beloved parents, brother, sisters and friends...

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ABSTRACT

This project is proposed to develop a human blood circulatory system, a system that responsible for transporting materials throughout the entire human body, using the virtual reality application technology. By developing a human blood circulatory system using virtual reality semi-immersive, it will let the users (students) experience of perceiving and interacting through sensors and effectors with a synthetic (simulated) environment containing simulated objects as it were real. Currently, the materials that are used to illustrate the human circulatory system to the students are human models, pictures and articles and others. It is difficult for some students to understand the process because they cannot imagine the real environment of the process. The virtual reality will replace all the conventional materials with a real picture of human blood circulatory system. This will give a new interactive ways for the student in process to learn, understand and memorized them. The project methodology is based on ADDIE Instructional Design Model that consists of five stages; Analysis, Design, Development, Implementation and Evaluation. Virtual reality is suitable technology to be used in education field because it is user-friendly, easy to learn and least expensive. VR also allows the creation and visualization of representation of objects and events that have no physical in the real world or it's difficult to imagine and understand. It is hope that, by the implementation of this project, the students will get a better way to understand and memorize the subject. At the same time, it will increase the education standard in Malaysia.

***Key words**: virtual reality, semi-immersive, human blood circulatory system, biology, education.*

ABSTRAK

Projek ini adalah untuk membangunkan sistem peredaran darah manusia dengan menggunakan aplikasi technologi realiti maya. Dengan membangunkan aplikasi sistem peredaran darah manusia dengan menggunakan realiti maya "*semi-immersive*" ini, ianya akan memberi pengalaman kepada pelajar dalam suasana simulasi yang mengandungi objek seperti dalam dunia nyata. Pada masa kini, kaedah-kaedah pembelajaran yang digunakan untuk menggambarkan sistem peredaran darah manusia adalah seperti model manusia, gambarajah, artikel dan lain-lain. Bagi sesetengah pelajar, kaedah-kaedah ini adalah rumit untuk digunakan dalam meghafal kandungan dalam topik ini. Kaedah realiti maya ini dapat menggantikan kesemua kaedah-kaedah pembelajaran tersebut dengan menggambarkan suasana sebenar yang berlaku di dalam proses peredaran darah manusia dan sekaligus memperkenalkan kaedah baru dalam proses pembelajaran kepada pelajar. Bagi metadologi yang di pilih untuk membangunkan project ini pula, ianya adalah berdasarkan *ADDIE Instructional Design Model* yang mengandungi 5 fasa, iaitu *Analysis, Design, Development, Implementation* dan *Evaluation*. Realiti maya adalah teknologi yang sesuai untuk digunakan di dalam bidang pendidikan kerana aplikasi ini adalah mesra pengguna, mudah dan mudah digunakan. Realiti maya dapat juga mencipta dan mempersembahkan sesuatu objek dan kejadian yang tidak dapat di gambarkan di dalam dunia sebenar. Dengan perlaksanaan projek ini, para pelajar akan memperoleh kaedah yang lebih mudah dalam memahami dan mengingati subjek ini. Pada masa yang sama ianya akan meningkatkan lagi taraf pendidikan di Malaysia.

Kata kunci : *realiti maya, semi-imersif, sistem peredaran darah manusia, biologi, pendidikan.*

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LIST OF ABBREVIATIONS

KUTKM	Kolej Unversiti Teknikal Kebangsaan Malaysia
FTMK	Faculty Information and Communication Technology
PSM 1	Projek Sarjana Muda 1
PSM 2	Projek Sarjana Muda 2
2D	Two Dimensional
3D	Three Dimensional
KBSM	Kurrikulum Bersepadu Sekolah Menengah
VR	Virtual Reality
VE	Virtual Environment
CD	Compact Disc
ADDIE	Analysis Design Development Implementation Evaluation
IT	Information Technology
PC	Personal Computer
CD ROM	Compact Disc Read Only Memory
GUI	Graphical User Interface
CPU	Central Processing Unit
GHz	Giga Hertz
MHz	Mega Hertz
GB	Giga Byte
HCI	Human – Computer Interaction
DPI	Dots per Inch

JPEG	Joint Photographic Experts Group
BMP	Bitmap
PNG	Portable Network Graphics
MPEG	Motion Pictures Experts Group
MIDI	Musical Instrument Digital Interface
MP3	MPEG Audio Layer 3
SWF	Shock Wave Flash
VGA	Video Graphic Accelerator

CHAPTER I

INTRODUCTION

1.1 Project Background

The purpose of this research is to develop a human blood circulatory system in the virtual reality (VR) application technology. The human blood circulatory system is the system that responsible for transporting materials throughout the entire human body. As well known, this human blood circulatory system is a sub topic that contain in a Biology subject for secondary student especially for Form 5 student as they start learning this system in the Biology subject. Formally, the material that being used to describe the human circulatory system to the student are such as models, pictures and articles. It is difficult for some student to understand the process because they cannot imagine the real environment of the process. Besides that, the students and also the teachers mostly refer and study the system from the textbooks, references book, pictures and others. This project tries to present the new way of learning method for the human blood circulatory system by picturing it using the VR technology application. With this project, the user will be able to see and know what happened during the process of the human blood circulatory system. The VR technology can be a add value of the learning method as the application can explain how the process of the human blood system is running, which is difficult to be imagined. In other words, the VR is a simulation in which computer graphics is used to create a realistic-looking world.

1.2 Problem statements

Human blood circulatory system is one of the sub topics that contains in the Biology subject for the upper forms student especially Form 5. Circulatory system is a process that responsible for transporting materials throughout the entire body. It transports nutrients, water, and oxygen to the billions of body cells and carries away wastes such as carbon dioxide that body cells produce. It is an amazing highway that travels through the entire body connecting all of the body cells. Human blood circulatory system is divided into three major parts that is the heart, the blood and the vessels.

Currently, the textbooks, references book, pictures, a human model, transparency and slide presentation are some of the teaching methods that being used. All of these methods are insufficient way for the student to imagine and understand the whole circulatory process that happen in the inner side of the human body in a short time. Most of the student face the difficulty to imagine the process of the system by just reading the text and see the picture and need a long time to memorize the process. So, the solution is by educating the student using the VR technology. VR is not just a medium or high-end user interface; it also has applications that involve solutions to real problems in engineering, medicine, education, military and many more. In other words, the VR application is the clone of a physical reality.

By using this VR application, it will be easier to the student understand about the circulatory system and the application is more interesting and interactive. VR also allows better and faster understanding of even complex applications and provides means for intuitive and control. Beside that, the VR based system has the potential for a low cost compare to other hardware such as human model and transparency machine.

1.3 Objectives

The objectives of this project are:

- To provide the human blood circulatory systems using VR Semi Immersive technology application.
- To provide interactivity with the user and the system.
- To provide the system that gives the information of the blood circulatory system and its functions.
- To provide the learning environment in the interactive ways and enjoyable to learns.
- As a new learning tools that suit the need for this modern technology time.

1.4 Scopes

The scopes of the project are to develop the VR for human blood circulatory system for the upper forms students especially Form 5. The target project is in the educational field that is for Biology subject and the target user is upper forms students that take the Biology subject in the secondary school. This project will help the user to better understand about the process of the blood circulatory system that happens in the human body. For the platform of the project, this project uses the VR semi-immersive method with combination of 3D models, 2D animation and audio.

1.5 Project significance

The significance of this project is to help upper secondary students to better understand of the human blood circulatory system process in their Biology subject. This project is developing with VR technology application to experience the user for the real environment during the whole process of the blood circulation system. With that, the student is able to see and know what is happen during the whole process of the system. This project can produce more effective way to understand the process of the circulation system in the human body for the student. Besides that, this project provides the easier way of teaching and learning process in education especially for the Biology subject. With that, the VR technology application is the most suitable method to explain some complex processes or applications which is difficult to be imagine and VR also allows the creation and visualization of representations of objects and events that have no physical form in the real world.

1.6 Conclusion

As a conclusion, VR technology application can be a new adds value of learning method to explain some complex processes or applications which are difficult to be imagine. In other words, VR can be used in the education field such as Biology subject because some of the sub topics in this subject are difficult to imagine and understand. For education purposes, VR has been proposed as a technology breakthrough that holds the power to facilitate learning. This project is trying to apply VR into better understanding of human blood circulatory system among upper forms student as a new way for leaning method. Lastly, hope with development of this project, the learning environment will become more interesting and easier to understand for the students. The next phase will be discussed about the literature review and project methodology.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter is purposely to study about the VR application technology and it usage related to the requirement of this project. This chapter also will include about the definition of the human blood circulatory system, functions of the circulatory organs and how the process of the circulatory system is running in the inner of human body. Fact and finding is a way to collect such information in this project. It includes some techniques like referring to the technology environment that related to the project title and studying on the existing documentation. Besides that, this research is also about the hardware and software requirement that use to develop this project and also about the process of the circulatory system itself. This chapter also describe about the methodology uses, project schedule and milestones during the development process of this project. Project schedule is a project progress plan that shows the activities that has been plan throughout this project development. It will provide the guide to implement the progress of the project.

2.2 Fact and finding

The fact and finding information was taken from references books and articles from internet that related to this project. In this study, the research is divided into two parts. The first part is about the VR technology and the second is about the human blood circulatory system.

2.2.1 The Virtual Reality Technology

Virtual reality is the human experience of perceiving and interacting through sensors and effectors with a synthetic (simulated) environment containing simulated objects as if it were real. It is supported by advances in simulation technology that allow linking human capabilities and computational resources, sensor systems and robotic devices for real-time tasks. VR technology can be applied to many tasks that would be more difficult to do by other methods.

VR is a computer simulation of a real or imaginary system that enables a user to perform operations on the simulated system and shows the effects in real time. VR also is a high-end user-computer interface that involves real-time simulation and interactions through multiple sensorial channels. These sensorial modalities are visual, auditory, tactile, smell and taste (Burdea and Coiffet, 2003). In other words, the VR is a simulation in which computer graphics is used to create a realistic-looking world.

VR is not just a tool; it is at once technology, medium, and engine of social relations. It is not structures social relations, it is the space within which the relations occur and the tool that individuals use to enter that space. It is more than the context within which social relations occur, for it is commented on and imaginatively constructed by symbolic processes initiated and maintained by individuals and group (Mayer, 1999).