Faculty of Cognitive Sciences and Human Development

BRAIN LEARNING SYSTEM IN AUGMENTED REALITY: VOICE RECOGNITION AS NAVIGATOR

Chin Sze Chien

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BRAIN LEARNING SYSTEM IN AUGMENTED REALITY: VOICE RECOGNITION AS NAVIGATOR

CHIN SZE CHIEN

This project is submitted in partial fulfilment of the requirements for a
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Statement of Originality

The work described in this Final Year Project, entitled
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is to the best of the author's knowledge that of the author except
where due reference is made.

20/5/10

(Date submitted)

(Student's signature)
Chin Sze Chien
18217

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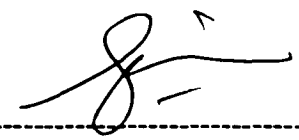

(Dr. Edmund Ng Giap Weng)

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ABSTRACT

BRAIN LEARNING SYSTEM IN AUGMENTED REALITY: VOICE RECOGNITION AS NAVIGATOR

CHIN SZE CHIEN

In the recent years, the development of technology expanded rapidly and comes to the advanced interactive techniques – Augmented Reality (AR). An Augmented Reality (AR), in a simple form, is a combination of virtual objects in real-time scene, where the virtual objects could be 2D or 3D which is generated by computer. However, the voice recognition is the recognition system that the spoken word is took and trained to a particular user which it recognizes the word based on the user's vocal sound. A variety of fields had applied in AR application. This project regards the voice recognition in AR with the content of human brain as the new learning system. It describes an AR based system for overlaying computer-generated information in the real-world where human brain is digitized and superimposed in the real-time scene. With applying speech recognition system, the voice matching will counterpart from user's voice to the prepared voice dataset to proceed to the virtual 3D brain controlling process.

ABSTRAK

SISTEM PEMBELAJARAN OTAK DALAM AUGMENTED REALITY: PENGAKUAN PERTUTURAN SEBAGAI ALAT MELAYARI

CHIN SZE CHIEN

Semenjak kebelakangan ini, perkembangan teknologi berkembang dengan pesat dan dilengkapi dengan teknik interaktif yang canggih – 'Augmented Reality' (AR). AR merupaken gabungan dari tempat virtual dalam adegan semasa ke semasa, di mana objek dalam tempat virtual boleh dihasilkan dalam bentuk 2D atau 3D oleh komputer. Namun, pengakuan pertuturan (Voice Recognition) adalah sistem pengakuan bahawa kata yang diucapkan oleh pengguna adalah diambil dan dilatih untuk mnegnali perkataan berdasarkan suara pengguna. Kini, pelbagai bidang telah diaplikasikan dengan teknologi AR. Dalam projek ini, pengakuan pertuturan diaplikasikan ke dalam teknologi AR yang berkandungan otak manusia serta berfungsi sebagai sistem pembelajaran baru. Ia menerangkan sesuatu sistem yang berdasarkan AR bagi melapisi maklumat yang dihasil oleh komputer ke dalam dunia sebenar dengan otak manusia didigitalkan serta ditempatkan ke atas lapisan dalam adegan dari semasa ke semasa. Dengan mengaplikasikan sistem pengakuan pertuturan di projek ini, suara pengguna akan dirakam dan dibanding dengan data suara yang sedia ada bagi menjalani proses kawalan otak bermaya tiga dimensi.

CHAPTER 1
INTRODUCTION

1.0 Overview

This chapter discusses the introduction of the project which consists of the background of study, problem statements, objectives, importance, scopes, value, and the significance of the research.

1.1 Background of Research

In the advanced era, the development of technology has become more potential and smarter. With the speedy development of technology, the changes of computer are more advanced and eventually the augmented reality (AR) is present. "Augmented Reality is a growing area in virtual reality research" (Vallino,

2002). AR technology helps in augmenting or expanding view of real environment by adding the virtual objects. In other word, the users are interacting with the virtual objects in the real-time where the virtual objects are superimposed in the real world (Vallino, 1998). The objective of AR is to merge the both real environment and virtual object in the real world. However, the result that the user could not even differentiate the real world and the virtual augmentation of it would be the aim of AR (Vallino, 2002). The technology of AR had created a great attention to public in this few years, as the AR has provides a lot of applications in variety of fields, such as application in medical, military, education, entertainment, and etc.

This project applies voice recognition in AR technology for education. In the 21st century, education are greatly emphasized on as white collar workforce are required to improve the quality of life and convey the knowledges to the upcoming generation. Education is an essential component to every person and it is part of learning process, which is the combination of informations and experiences that someone has obtained. Therefore, education is through learning system but the traditional method of learning is to read books.

However, the traditional learning method is rigid and static in which could cause students losing enthusiasm to read. Such is because the students may get bored or cannot have the imaginary in their mind when there is a lot of words which could make them blur (Chen, 2006). Therefore, AR is better and non-traditional learning method, which brings the visualization and interactivity to students in line of education. With this, learning will be more interesting and attractive as the interaction between the knowledge and students will help them in understanding and memorizing. According to Iddon and Williams (2003), human are all unique as human memory is storing something specific and personal. With the virtual 3D objects viewing in the real-time scene, it helps student in memorizing and better in understanding as '*a picture speak a thousand words*'.

Subsequently, by adding voice recognition on this project with the purpose of constructing an advance learning system, the voice recognition which acts as the navigator will assist student in operating the learning system. Voice recognition is the recognition system that the spoken word is took and trained to a particular user which it recognizes the word based on the user's vocal sound (Okatan, Ayanoğlu, & Senyücel, 2004). This means voice recognition is a process of recognizing the spoken words and comprehend its meaning by computer-generated speech wave. With spoken words to manipulate the AR learning system, it could help students to learn in ease. Hence, students can have more interest in studying with the AR technology applied in education by using voice recognition (Chen, 2006).

1.2 Problem Statement

In Malaysia, the human brain has become one of the sub-topic in science subject for secondary school. It is compulsory for all Malaysia's secondary school students to involve upon this topic. Also, the topic of human brain has become a fundamental part to all students as it is the important organ in human body. The complexity of the brain structures and functions may cause the students in difficulties in digesting the knowledge input. The longer time they face in reading, the understanding on the study may get distorted and ultimately, losing their interest on task at hand and causing the human brain to become a difficult topic to score.

As been mentioned in the background of study, traditional learning method by reading books is rigid and static. With the flat 2D brain image, this may bored the students and also make them having the ambiguous understanding because they failed to imagine the model of brain in 3-dimensions (3D); as result, they could not even have a simple sagittal and lateral view of the brain. However, the demonstration of

the model would increase students' understanding as a picture speaks a thousand words.

Apart from that, handicap students are being concerned more and more in education. Those handicap students may face problem in using computer as some of their limbs are amputated and hence, they are always been isolated by societies. It is a cruel reality which makes them quitting from gaining more knowledge (Werner, 2009). Thus, they may not know the existence of AR technology. Hence, AR technology has been applied in this topic in order to aid students in learning human brain with voice recognition system as navigator. As a result, students may have their own brain learning system but still, the handicap are able to operate the system by giving commands only.

On top of that, technology is a must on forward looking basic. The advancement of technology in AR should make some changes, such as the manipulation of AR system. There is always a 'click' to manipulate the AR system whereby even a joystick input also needs a 'click' to control it. Thus, new method of AR system controller should be created as the innovative step to move over the AR technology. Nevertheless, this AR technology may prove technology to the next level in which could be the easiest and user-friendly navigator to user.

1.3 Objective

The objective of the project has been divided into two parts, which are the general objective and the specific objective.

1.3.1 General Objective

The general objective of this project is to design and develop an AR voice recognition as navigator in human brain learning system. The aim of this learning system is to aid students in learning the complex structure of brain as well as the function of it. With the advance system of voice recognition on the learning system, this can help the students to do navigating at ease by the spoken words.

1.3.2 Specific Objectives

There are few specific objectives of this project, as below:

- To design and develop a voice recognition system in AR human brain learning system.
- To use voice recognition for interaction and navigation of 3D human brain in AR technology.

1.4 Importance of Research

This project develops a learning system for human brain visualization and interactivity using AR technology with voice recognition. The technology offers a great help where it provides a better visualization and interactive 3D digital model of human brain in the learning method.

The development of AR technology has spread into several fields of application. One of the applications it has spread into education field where the AR technology has the potential to aid students in leaning the anatomy of human brain. With the voice recognition function, students can utilized the technology by spoken the words to manipulate the learning system. Besides, it allows the students to

perform the cross-sectional viewing of the internal of the brain with surgical-free. Also, students able to interact with the 3D model of human brain using AR technology.

The purpose of doing this project is to assist secondary students in learning human brain's anatomy. It also serves the purpose to build up the interest of students regarding this human brain topic in order to enhance the effectiveness of learning with a good outcome.

1.5 Scope of Project

In this project, the function of voice recognition in AR brain learning system will be focused. A digitized 3D model of brain will be displayed on a marker base. Thus, this learning system will increase the interactivity and also the visualization of students, in which, may helps students understand more on human brain.

1.6 Value of the Research

The emerging technology of AR has a potential in the field of education and learning. It is the best groundwork in building a learning system which can assist students in their learning progress by solving the problem of understanding by visualizing the virtual model to it whereby the virtual object immerse to the real-time scene to create the interactive podium to students in learning. In other word, learning has indirectly demonstrated in experience which has enhanced the effectiveness of the learning system.

1.7 Significance of Research

The AR technology with the application of voice recognition is a new field of study in Malaysia. As the expanding of AR technology is rapid, the significance of the research is to reveal the AR technology with its application; hence, the development of AR in education will benefit the upcoming students in constructing more helpful methods of learning system.

1.8 Structure of Project

This section focuses on the essential outlines of each chapter in the project. The project is containing five different chapters.

Chapter 1: Introduction

This chapter discusses the introduction of the project which consists of the background of study, problem statements, objectives, importance, scopes, value, and the significance of the research.

Chapter 2: Literature Review

This chapter conducts a brief introduction of brain, voice recognition, and Augmented Reality (AR). The differences between AR and Virtual Reality (VR) will be concerned in this chapter. Besides, the application of AR in different fields will be discussed. This chapter will also concentrate on how AR works in learning system.

Chapter 3: Methodology

This chapter discusses the methodology that will be used in developing the system of this project. The system specifications will be greatly concerned, where the needs of the software and hardware equipments will list out. System requirements will also be

noticed in this chapter. Besides, the system architecture and system flow will also be discussed throughout this chapter.

Chapter 4: System Development

This chapter discusses the process in developing the system. The implemented elements in the system are being illustrated and the algorithms used in the system are explained.

Chapter 5: Discussion and Conclusion

This is the last chapter which discusses on the findings of the project. Besides, this chapter also focuses on the strengths and weaknesses of the system and also the future recommendation to the system is being viewed.

1.9 Summary

This chapter has introduced the use of AR technology in education field with the application voice recognition system and the way AR assist students in learning progress. The background of research, problem statement, objectives, importance and scopes of the project, and value and significance of the research are discussed. The following chapter will discuss on the literature review of the project.

CHAPTER 2
LITERATURE REVIEW

2.0 Overview

This chapter conducts a brief introduction of brain, voice recognition, and Augmented Reality (AR). The differences between AR and Virtual Reality (VR) will be concerned in this chapter. Besides, the application of AR in different fields will be discussed. This chapter will also concentrate on how AR works in learning system.

2.1 Introduction of Brain

The human brains are the core of the human nervous system. It is the most complex organ to human as it has a very intricate structures and functions, which helps in producing human's thought, memory, feeling, action, and experience of the