UNIVERSITI PENDIDIKAN SULTAN IDRIS

H&A REALITY : THE DEVELOPMENT OF AR-BASED INTERACTIVE MOBILE APPS FOR FORM 4 BIOLOGY STUDENTS TOWARDS SELF-PACED LEARNING

NUR ANISA SYAHIDA BINTI NOROLASIKIN

2022

LAPORAN PROJEK TAHUN AKHIR DIKEMUKAKAN BAGI MEMENUHI SYARAT UNTUK MEMPEROLEH IJAZAH SARJANA MUDA KEJURUTERAAN PERISIAN (PERISIAN PENDIDIKAN) DENGAN KEPUJIAN

FAKULTI SENI, KOMPUTERAN DAN INDUSTRI KREATIF
UNIVERSITI PENDIDIKAN SULTAN IDRIS

2022

PERAKUAN KEASLIAN PENULISAN

Nama Pelajar:	Nur Anisa Syahida binti Norolasikin
No. Pendaftaran:	D20191087046
Nama Ijazah:	Ijazah Sarjana Muda Kejuruteraan Perisian (Perisian Pendidikan) dengan Kepujian
Bidang Pengkhususan:	Augmented Reality (AR)
Tajuk Projek:	H&A Reality : The Development of AR-based interactive Mobile Apps for Form 4 Biology Students Towards Self-Paced Learning

Saya sahkan bahawa segala bahan yang terkandung dalam laporan projek tahun akhir ini adalah hasil usaha saya sendiri. Sekiranya terdapat hasil kerja orang lain atau pihak lain sama ada diterbitkan atau tidak (seperti buku, artikel, kertas kerja, atau bahan dalam bentuk yang lain seperti rakaman audio dan video, penerbitan elektronik atau Internet) yang telah digunakan, saya telah pun merakamkan pengiktirafan terhadap sumbangan mereka melalui konvensyen akademik yang bersesuaian. Saya juga mengakui bahawa bahan yang terkandung dalam laporan projek tahun akhir ini belum lagi diterbitkan atau diserahkan untuk program atau diploma/ijazah lain di mana-mana universiti.

Tarikh		Tandatangan Pelajar (Nur Anisa Syahida binti Norolasikin)	

Perakuan Penyelia:

Saya akui bahawa saya telah membaca karya ini dan pada pandangan saya karya ini adalah memadai dari segi skop dan kualiti untuk tujuan penganugerahan Ijazah Sarjana Muda Kejuruteraan Perisian (Perisian Pendidikan) dengan Kepujian.

Tarikh		Tandatangan Penyelia (Dr Roznim Binti Mohd Rasli)	

ACKNOWLEDGEMENT

I'd like to express my gratitude to my supervisor, Dr. Roznim binti Mohamad Raslli, for her helpful advice, insightful comments, and significant encouragement for me to complete this thesis.

I wish to express my heartfelt gratitude to all of my lecturers at Universiti Pendidikan Sultan Idris for their invaluable assistance, scholarly knowledge, and enthusiasm.

Much gratitude is extended to all of my friends for their assistance in both data collection and my academic journey.

I'd also like to express my sincere thanks to my family for their unending support and encouragement in helping me complete this thesis.

Last but not least, I wanna thank me. I wanna thank me for believing in me. I wanna thank me for doing all this hard work. I wanna thank me for having no days off. I wanna thank me for, for never quitting.

ABSTRACT

Augmented reality allows for the real-time superimposition of computer-generated images over real-world scenes. This paper describes a project in which an interactive mobile app was created to assist Form 4 high school students in Biology specifically in the topic Transport in Human and Animal in understanding spatial concepts through the use of augmented reality. The marker-based augmented reality application works by reading a marker with a camera, then calculating and superimposing the camera position in 3D space. Augmented reality application development is simple with a camera and a laptop.

ABSTRAK

Augmented Reality (AR) membenarkan tindanan masa nyata imej yang dijana komputer ke atas pemandangan dunia sebenar. Kertas kerja ini menerangkan projek di mana aplikasi mudah alih interaktif dicipta untuk membantu pelajar sekolah menengah Tingkatan 4 dalam Biologi khususnya dalam topik Pengangkutan dalam Manusia dan Haiwan dalam memahami konsep spatial melalui penggunaan *Augmented Reality (AR)*. Aplikasi *Augmented Reality (AR)* berasaskan penanda berfungsi dengan membaca penanda dengan kamera, kemudian mengira dan menindih kedudukan kamera dalam ruang 3D. Pembangunan aplikasi *Augmented Reality (AR)* adalah mudah dengan kamera dan komputer riba.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 Introduction

Augmented reality is appearing in a variety of settings, including marketing, entertainment,

sightseeing, industry, fashion, medicine, and education. Because of the proliferation of

smartphones with location-based services, augmented reality is becoming more appealing as

a mainstream technology. Over the next few years, augmented reality is expected to become

a bigger part of our lives. In the last decade, augmented reality (AR) has become a popular

topic in educational research (Akçayr & Akçayr, 2017; Bacca, Baldiris, Fabregat, & Graf,

2014). The availability of low-cost handheld devices with innovative features that allow the

deployment of AR-based applications, as well as the recognition of AR, are the primary

determinants of AR acceptance in the educational arena.

In this paper, we will look at how H&A Reality can help make learning more effective.

H&A Reality is an interactive mobile app based on augmented reality (AR) that is designed

specifically for Form 4 Biology students. Because the system focuses on the sub-topic

"Transport in Human and Animal in Biology," H&A refers to human and animal as the main

subject. The primary goal is to create an interactive AR that can be used as a learning tool in

secondary school biology, including Form 4, in order to help students better understand

spatial concepts and make learning more effective and interactive when compared to

traditional methods.

1.2 Research Background

Biology education, which is an inseparable discipline of medical and veterinary education, places a high value on allowing students to practice in real-world settings and gain knowledge and skills related to their professional fields throughout their education. It is critical to quickly adapt new technologies to education rather than using cadavers or laboratory animals, particularly when making practice directly related to human and animal anatomy. For this purpose, virtual and augmented reality applications, which have rapidly evolved in recent years, have emerged as a highly effective technique that allows the user to interact visually with the objects they provide.

The use of augmented reality applications in surgical interventions on humans or animals as both educational and supportive technology is becoming more common. Various AR technologies are mentioned in many studies as being used in medical and veterinary education, particularly in the practise of surgical operations, in addition to their use in medical and biology education (Nakamoto et al., 2008; Moro et al, 2017; Küçük et al, 2016; Ferrer et al, 2015).

Saidin et al. (2015) investigated studies on the use of augmented reality in education. According to the investigation, AR applications have demonstrated a high potential for making the learning process more active, effective, and meaningful since their introduction. This is because advanced technology allows users to interact with virtual and real-time applications, providing them with natural experiences. Furthermore, the incorporation of AR into education has piqued the interest of researchers because it allows students to interact

with realistic experiences. In various fields such as Medicine, Chemistry, Mathematics, Physics, Geography, Biology, Astronomy and History. It was discovered that AR applications have a positive potential and advantages that can be adapted to education when compared to traditional technology (such as e-learning and educational software) and traditional teaching methods (such as speech and traditional books).

1.3 Research Problem Statements

Self-paced learning is an active learning process that focuses on the students. Since we are in the twenty-first century, students in school are encouraged to study independently and explore the topics that they have learned. Previous research has found that following students' personal learning styles and formats increased their overall achievement (Larkin-Hein & Budny, 2000). Furthermore, the problem discovered that students are unable to observe this artificial environment by using traditional methods such as using books. Aside from that, poor content analysis and delivery may have an impact on students' academic performance. Some content delivery and analysis do not adhere to the KSSM outlined by KPM.

1.4 Research Objectives

H&A Reality's primary goal is to create an interactive augmented reality that can be used as a learning tool in secondary school biology, specifically Form 4, to help students better understand spatial concepts. As a result, several objectives have been developed to address the problems that have been identified:

    1.4.1   To identify the requirements and impact of augmented reality (AR) technology on students learning outcome

1.4.2   To develop an AR-based interactive prototype using Unity-3D based on the issues discovered.

1.4.3 To evaluate the usability and functionality of the prototype using a quantitative method via a questionnaire instrument.

1.5 Research Question

As a guide to achieve the objectives of this study, some research questions presented as follows:

1.5.1   What features should be developed to solve the problem?

1.5.2   What are the best instruments to use for evaluating H&A Reality?

1.5.3   What is the best methodology for developing a Web-based management system for H&A Reality?

1.6 Research Scope

This interactive mobile app focuses on specific prototype attributes that are related to solving the problem statement. For example, this interactive mobile app allows students to scan an AR marker that generates a 3D image of human and animal transportation to help them learn the topic on their own. Aside from that, it focuses on Form 4 Biology Students who are studying the topic "Transport in Human and Animal." This interactive mobile app is also appropriate for use in any Malaysian secondary school classroom.