DEVELOPMENT OF E-LEARNING GAME USING VR TO PROMOTE STEM EDUCATION

NUR HANIS IZZATI BINTI MOHD HANAPI
B071710066

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
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DEVELOPMENT OF E-LEARNING GAME USING VR TO PROMOTE STEM EDUCATION

This report is submitted in accordance with the requirements of Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer System) with Honours

by

NUR HANIS IZZATI BINTI MOHD HANAPI

B071710066

940704125208

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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☒ TIDAK TERHAD

Yang benar,

.....

NUR HANIS IZZATI BINTI MOHD HANAPI

Alamat Tetap:

1335,

Jalan Semarak 35,

Taman Panchor Jaya Fasa 6,

70400, Seremban

Negeri Sembilan.

Tarikh: 12 February 2021

Disahkan oleh penyelia:

.....

TS SHAMSUL FAKHAR BIN ABD GANI

Cop Rasmi Penyelia

SHAMSUL FAKHAR BIN ABD GANI
Penyelaras Program BEEC / Pensyarah
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 12/2/2021

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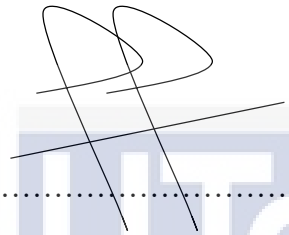
I declare that this project entitled DEVELOPMENT OF E-LEARNING GAME USING VR TO PROMOTE STEM EDUCATION is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature: 

……

Author : NUR HANIS IZZATI BINTI MOHD HANAPI

Date: 12 February 2021

APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours. The supervisory members are as follows:

SHAMSUL FAKHAR BIN ABD GANI
Penyelaras Program BEEC / Pensyarah
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

Signature: .....

Supervisor: EN SHAMSUL FAKHAR BIN ABD GANI

Signature: .....

Co-Supervisor: EN NADZRIE BIN MOHAMOOD

Ts. NADZRIE BIN MOHAMOOD
Jurutera Pengajar Kanan
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

ABSTRAK

Projek ini bertujuan untuk menarik minat pelajar pada masa kini untuk bermain permainan video sambil belajar, ia juga akan membantu pelajar meneroka teknologi baru dimana ianya dapat membantu pelajar dari tahun satu hingga tahun tiga sekolah rendah untuk mempelajari bidang kejuruteraan. Selepas membuat kajian terhadap pelajar sekolah rendah, didapati bahawa pelajar lebih tertarik untuk bermain sambil belajar. Alat yang canggih dan telefon pintar adalah alat teknologi yang digemari oleh orang ramai dari pelbagai generasi, lebih-lebih lagi generasi kini iaitu pelajar sekolah. Projek ini juga turut mempromosikan pendidikan STEM dengan menggunakan teknologi terbaru iaitu VR. Tujuan utama projek ini adalah untuk mencipta permainan 'E-Learning' dengan menggunakan VR untuk mempromosikan pendidikan STEM. Sistem ini harus menemui beberapa kondisi, dimana pelajar mempelajari setiap aspek dalam subjek sains, teknologi, kejuruteraan dan matematik. VRBox digunakan untuk menguji permainan video ini. Di akhir projek ini, pelajar diharapkan dapat memahami tentang asas komponen elektrik iaitu pengetahuan tentang asas eletrik seperti perintang, wayar dan papan litar elektronik. Selain daripada itu, pelajar juga turut dapat mempelajari pengetahuan asas tentang sains dan matematik. Dalam sains terdapat dua fakta iaitu teknologi (robot) dan elektrik. Manakala, dalam matematik, turut terdapat dua fakta iaitu Untuk sains dan matematik, ada 2 informasi sains seperti fakta teknologi iaitu polihedron berbentuk 3D dan fakta nombor yang menarik. Kemudian, pelajar akan diminta unruk menjawab kuiz di dalam bahagian kuiz. Kuiz tersebut mempunyai enam soalan dan dalam 100 saat, pelajar harus menjawab kesemua soalan

yang diberikan. Setelah pelajar selesai menjawab semua soalan, keputusan kuiz akan dikeluarkan.

ABSTRACT

This project was developed to attract primary school students nowadays to play more video games through learning, with a way to explore new technology that can helps students from year one to year three primary school to learn Engineering. After observed primary school students, they prefer something that can attract them to play while learning. Gadget and smartphone are the most things likely being used by peoples of the new generation which is to be expected the students in primary school. This project was also promoting STEM education by using new technology which is Virtual Reality (VR). The main aims of this project are to develop E-Learning game using VR to promote STEM education. The system must meet certain condition, where students learn each aspect of the subjects in Science, Technology, Engineering, and Mathematics. VRBox are the tools that will be used to test this project. At the end of this project, students would understand the basic electrical components which is electrical basic knowledge, resistor, jumper and breadboard. Furthermore, beside that the students will also learn about the basic knowledge of science and mathematics. In science, it has two facts which is technology (Robot) and electricity. Meanwhile, in Mathematics, it also has two facts which is 3D Polyhedron Shapes and Interesting Number Facts. After that, students need to answer a quiz in the quiz section. The quiz has six questions and in 100 seconds, students need to answer all the questions given. After students answered all the questions, the results of the quiz will be given.

DEDICATION

This project is dedicated to both my parents, Mohd Hanapi Bin Mohd Sani and Fauziah Binti Ujang who never stop believing in me, motivate me and taught me that even the largest task can be accomplished if it is done one step at a time. I also dedicate my project to my supervisor Ts. Shamsul Fakhar Bin Abd Gani and Ts. Nadzrie Bin Mohamood, who never stop guiding me until the completion of this project and who always provide me with the knowledge and new things in technology. And also to my nephew Adam Zahry Bin Asfairul and Aliff Zareef Bin Asfairul, the reason why I do this project, to help and to give them the opportunity to explore new technology and also to help them learn the new style of learning.

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LIST OF ABBREVIATION

VR	Virtual Reality
C#	C sharp

CHAPTER 1

INTRODUCTION

1.1 Research Background

For the current generation, a smartphone is the most common gadgets people have and it is the most used gadgets every day. With the new technology era, it is not just to improve the basic used messaging and calls. Lots of things can be done anytime and anywhere by using only smartphone, which it plays a big role in our life. Therefore, it can be used for study and other activity for students in primary school. This e-Learning VR games will help to attract student to learn in interactive way. This project is meant to attract student from playing games to learning and also to attract students in knowing basic electrical knowledge which is basic circuit and basic component. It also to help student to love learning. (Nichols, 2003)

1.2 Problem Statement

Nowadays, Virtual Reality games is only for gaming purpose, generation more attract to playing games, rather than learning. In this case, this project come out after observing primary school students that prefer something to attract them to play and learn. As we know with now situation where gadget and smartphone are most likely being use by people in new generation, even in school. Student rather spent times hours in playing games rather than sitting in front of a desk and learning. Student are most likely attracted by the new gadget and technology than learning in school. (Hussin, Jaafar and Downe, 2011)

1.3 Objectives

The main aim of this project is to propose a systematic and effective methodology to estimate development of E-Learning game using VR to promote STEM education. Specifically, the objectives are as follows:

1. To develop an interactive game for e-Learning by using Virtual Reality.
2. To analyse the performance of the developed e-Learning game.

1.4 Scope Research

The scope of this research are this project mainly for primary school students. Fully controlled using VR Box, it limited to the development of games in Android-based applications that are widely used by Android users. And it also has basic knowledge of electrical, electronic and STEM education that suitable for standard one (1) until standard three (3) students.

1.5 Thesis Organisation

This project research will consist of five chapters which are introduction, literature review, the third one is methodology, followed by result discussion and last chapter is conclusion and recommendation.

Chapter 1: Introduction

Chapter 1 mainly providing the introduction of the project through this thesis. The ingredients for this chapter are research background, problem statements, objectives, and research's scope.

Chapter 2: Literature Review

Chapter 2 focuses on previous works and theory of components that relates with the project. The theories related such as Virtual Reality helps in industrial life, education, healthcare and automotive

Chapter 3: Methodology

Chapter 3 basically explain the strategies and methods used in order to fulfil project's objectives. The development process of VR E-learning Games will be covered, and every step of process and flowchart will be included.

Chapter 4: Result and Discussion

In chapter 4, it consists the results of the projects where it will be presented in figures and explanation of every part in this games.

Chapter 5: Conclusion and Recommendation

The last chapter is responsible to summarise the results from the project and the project's objectives that need to be achieved. This chapter also will recommend any further improvement that can be made in order to achieve optimum system.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will explain the overview of Virtual Reality and e-Learning in the world and a different type learning in Malaysia. Previous research of Virtual Reality also stated. Further research and discussion will be carried out in this chapter on the elements taken into the purpose and use of the Virtual Reality (Lee, Wong and Fung, 2010)

2.2 E-Learning Overview

E-Learning is the new concept that been use to state a form of e-learning that can be performed via online learning by students. With the appearance of this new technology, e-learning has developed in the term that refer to online classes and activity. This e-Learning are one of the new method or system that accessible for students to manage and to deliver the learning content. This is one of the most popular single-user learning environments which provide the best way of interaction and stimulation for the students. This researcher is to explore the innovative techniques that can motivate and encourage students to start explore this online learning and enhance newest way e-learning experience.

E-learning are the new method for students in primary school in Malaysia. Almost all public and private universities used e-learning platform as their method.

	TRADITIONAL CLASSROOM LEARNING	E-LEARNING
ADVANTAGES	• Immediate feedback by students • Familiar to both educator and students • Motivates students	• Learner-centered and self-placed • Time and location are flexibility • Cost-effective for students • Potentially available to all audience • Unlimited access to knowledge • Archival capability for knowledge to reuse and sharing
DISADVANTAGES	• Educator-centered • Time and location are constraints • Expensive to deliver	• Lack of immediate feedback in asynchronous e-learning • Increased the preparation time for the educator • Not a comfortable way to some people

Table 2.1: Advantage & disadvantage of e-Learning and Traditional Classroom Learning

In the past few years, e-Learning has become one of platform that emerged as a promising solution to lifelong learning. This e-Learning also can be state as a technology-based learning which learning materials are delivered by using interactive way or online based. This is one of the most effective and efficient training methods are crucial to education industry. Some opinion that e-Learning systems can be frustrated and confusion, also reduced learner interest because of some

e-learning system only present text-based learning materials, which actually may lead to bored and disengagement in students and prevent them from understanding the topic. However, some of the multimedia-based systems suffer from insufficient learner-content interactivity and flexibility because of the way it been presented and given instruction content are not attractive. (Zhang et al., 2004)

The latest technology has presented the newest trend to breakthrough both technological and theoretical in e-learning to become more advances.

2.3 Overview of Virtual Reality

	VIRTUAL REALITY	AUGMENTED REALITY
ENVIRONMENT	Digitally-simulated environments	Real-world environment enhanced with information
SENSORY EXPERIENCE	Completely immersive and interactive	Limited field of view
DEVICES	• Head-mounted displays • Controller • Cameras	• Smartphones • Glasses • Tablets • PCs

Table 2.2: Virtual and Augmented Reality Overview