GAME-BASED SIGN LANGUAGE EDUTAINMENT SYSTEM FOR DEAF AND HEARING CHILDREN

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BORANG PENGESAHAN STATUS TESIS*

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GAME-BASED SIGN LANGUAGE EDUTAINMENT SYSTEM FOR DEAF AND HEARING CHILDREN

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

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2016

DECLARATION

I hereby declare that this project report entitled

GAME-BASED SIGN LANGUAGE EDUTAINMENT SYSTEM

FOR DEAF AND HEARING CHILDREN

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

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I hereby declare that I have read this project report and found this project report is sufficient in term of the scope and quality for the award of Bachelor of Computer Science (Software Development) With Honours.

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DEDICATION

I would like to dedicate this project to both my parents for their support. Although they are not by my side most of the time, but I am clearly know that they are supporting me silently at my back all the time. Thanks to their effort all along the time, I am able to freely pursue my dream in the university.

Besides, I would also want to thanks my fellow course mates, seniors and friends. They are giving me help all along the journey in all different form. Be it words of courage, a helping hand, a safe ride, a meal or even a friendly smile. Even for a thousand words, it is not enough to convey my gratefulness to all of them.

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ABSTRACT

Game-based Sign Language Edutainment System For Deaf and Hearing Children is a game developed for exposing sign language to the deaf children in the early stage of formal learning in their life, which is around 4 to 6 years old, and also the hearing parents who lack of source to get to know sign language. This game is developed to interact with the player using only Kinect motion sensor, it capture the player's body movement as input to interact with the game. This can solve the equipment maintenance problem faced by other similar products. Because the children can learn better by involving their body movement in the learning process, this also can boost the learning experience for the player. The sign language content in this game focuses on basic numbers and shapes. Due to time constraint, this game contains of two modules which are numbers and shapes. Each module has tutorial stages and game stages. The player can learn the sign language in the tutorial stages and try to play the game stages to get more familiar with the sign language. The game is developed by using Spiral Model, a software development methodology that can easily adapt to changes in requirements along the development process. At the end of the project, the developer hopes that it will bring great impacts on the education field, because such an edutainment product can prove that learning can be fun and engaging.

ABSTRAK

Sistem permainan bahasa isyarat untuk kanak-kanak yang mempunyai masalah pendengaran dan kanak-kanak yang boleh dengar merupakan satu permainan yang dibangunkan untuk memperkenalkan bahasa isyarat kepada kanak-kanak di tahap awal pembelajaran formal kehidupan mereka, iaitu sekitar umur 4 hingga 6, dan juga ibubapa yang tiada asas mengenali bahasa isyarat. Permainan ini dibangunkan untuk permain berinteraksi menggunakan sensor gerakan Kinect sahaja, dengan cara Kinect akan mengambil gerakan badan pemain sebagai input untuk berinteraksi dengan permainan tersebut. Ini boleh menyelesaikan masalah kerosakan peralatan yang ditemui dalam produk-produk dalam kategori yang sama. Memandangkan kanak-kanak boleh belajar dengan lebih baik apabila menglibatkan gerakan badan dalam proses pembelajaran, ini juga boleh meningkatkan pengalaman pembelajaran untuk mereka. Kandungan bahasa isyarat dalam permainan ini fokus kepada nombor dan bentuk yang mudah. Memandangkan ruang masa yang terhad, permainan ini mempunyai dua modul iaitu nombor dan bentuk. Setiap modul ada mempunyai bahagian pembelajaran *tutorial* dan bahagian bermain. Pemain boleh belajar bahasa isyarat dalam bahagian pembelajaran *tutorial* , seterusnya menguji diri dalam bahagian bermain bagi memastikan bahasa isyarat yang telah diajar menjadi lebih baik. Permainan ini dibangunkan menggunakan *Spiral Modal*, sejenis metodologi pembangunan perisian yang mudah disesuaikan kepada sebarang perubahan sepanjang proses pembangunan. Akhir kata, pembangun berharap permainan ini mampu memberi impak yang baik kepada sektor pendidikan, kerana produk seperti ini dapat mewujudkan pembelajaran yang menyeronokkan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ABBREVIATIONS	FULL NAME	PAGE
SMILE	Science and Math in an Immersive Learning Environment	1
VLE	Virtual Learning Environment	2
ASL	American Sign Langugage	11
AASD	Atlanta Area School for the Deaf	11
VR	Virtual Reality	13
BIM	Bahasa Isyarat Malaysia	31

CHAPTER I

INTRODUCTION

1.1 Introduction

Arcording to Zafrulla et al. (2010), hearing parents might give birth to deaf children, and surprisingly, ninety percent of the deaf children are born in this situation. Normally, children will start to play with combination of words at the age of twenty-four month and deaf chilren will communicate with deaf parents using combined sign to form sentence around eighteen month. Unfortunately, this third group children with their hearing parents, they start to learn language skill at very late stage due to they have less or no exposure and environment to learn sign language (Lee et al. 2005).

Brashear et al. (2006) stated that children need to obtain enough if not excessive information on language during the stage of a "critical period" around the age of four to six years old. If not, it will results in difficulties for their language skill development for the whole life. However, they might able to start learning sign language from school if they are lucky enough, or else, they will have no chance to learn it at all and miss the "critical period" as stated above and forced to go through the hardship in language skill developement.

Henderson et al. (2005) mentioned a study in 1999 estimated that there are a total of 54% of children with ages ranging from 2-13 play computer games on any day. This shows that game is very close to children's life nowadays. Therefore, a game that teaches sign language suitable to children can be helpful to those children by providing them extra source to learn sign language, which will be the product of this project.

The developer has done some research on the topic, some articles show that there exists similar product which interact with the player using data gloves, motion tracking system with single or multiple camera and motion capture systems to handcrafted sensors networks (Brashear et al. 2006). One of the similar product, SMILE (Science and Mant in an Immersive Learning Environment), used 6-dof(degree of freedom) wand, 3D shutter glasses and a pair of gloves to interact with the children. This game focus on teaching the children basic science and maths concept through completing tasks inside the game (Adamo-villani & Wright 2007).

Fortunately, with rapid evolution in the camera technology, the 3D depth camera has finally comes to the stage. It can get the depth data of the players and the environment just using only one camera (Zhang 2012). This new emerging technology can be apply in many uses and edutainment game is one of them. The 3D depth camera from Microsoft, Kinect, will be used in this project as the input device to track the body movement of the player. This will make the game for fun and engaging because the player only need to move their body to control the game without equipping any other tracking equipment on their body.

1.2 Problem Statement

According to Zafrulla et al. (2010), 90% of deaf children are having hearing parents with little or no knowledge on sign language. This will leads to low ineffective communication between them. Furthermore, the parents will have hard time when they

want to educate the child because they cannot get the child's attention just by calling their name like others do. They will need to move themselves into the sight of the child and this can be difficult because the child's sight would not stay long at a place as they are busy with exploring the world to fulfil their curiosity to the world. It can be worse when the children has learn to walk or run and it's almost an impossible mission to have the child's attention for a long period.

Fortunately, there were games developed to ease the process of getting the children' attention and also to teach them sign language or other knowledge. However, most of them used tools like gloves with accelerometers (Brashear et al. 2006), or controller to interact with the player (Adamo-villani & Wright 2007). Although these devices were able to interact greatly with the child, they still have weaknesses when implemented.

In this project, the main target players for the game would be deaf children that are within the age range of 4 to 10 years old. The problem arise because the children at this age lack of the ability to take care of these essential equipments for the game such as the computer, console, or any electrical devices. They might used the equipment with rough manner when they get frustrated playing the game or think that it is just playfulness. Although they are not damaging the equipment intentionally, but the damaged equipments that are not working will make the game cannot function and reducing the lifespan of the game.

Finally, the developed product in this field is less fun and engaging to the deaf children. Adamo-villani & Wright (2007) stated that most of the developed VLE (Virtual Learning Environment) for children have tried to include game design elements into the products but still cannot achieve good result as an edutainment product. It is because the games are not appealing and exciting enough for the children compare to the games and apps nowadays.

1.3 Objective

- To create a game-based system that promotes learning of sign language suitable for deaf children with hearing parents.
- To create a game-based system that is easy to use with the help of motion tracking device, Kinect.

1.4 Project Scope

- Deaf children and hearing parents
  The main users for this product are hearing parents with their deaf children, with the reason to help them by exposing them the basic of sign language.

- Hearing children
  The product can be used by hearing children or teacher to introduce the basic sign language to them as additional information.

1.5 Project Significance

This project will develop a game that provides chance for deaf children with hearing parents to expose to sign language at an earlier stage of life in a fun and engaging way different from the traditional way of learning sign language with books and teachers. Besides, any other people who is interested in learning sign language also can start to do so with this product.

Other than that, there is also data and statistic provide in the project regarding the implementation of Kinect on edutainment product. The researchers and developers interested in the same topic might used the data to compare with other latest technology for future project.

Finally, the product of the project, can be one of the pioneer in combining depth camera with game to create an edutainment project to expose the sign language for the deaf and hearing children. The effect of such combination might bring positive impact on the education field, especially in the sign language skill development for deaf children.

1.6 Expected Output

The game will gather input from the player with Kinect, the motion capture device, to make the game more fun, engaging and also easy to control, especially for the deaf children. The children can stand in front of the camera and start to interact with the game using body movement and gestures without wearing any other equipment to track their movement. The project final report will be publish as a reference for other developers or researchers.

The game will contains stages with different difficulties level to ease the learning process for the player. The player can learn the sign language in the tutorial stage and try to challenge themselves in the game stage. This can make sure the player would not find it hard to start playing the game. The content of the game will focus on teaching basic shapes and numbers.

The product will overcome the equipment maintenance problem faced by similar product by avoid using any wearable equipment for children. This can ensure the prouct will have longer lifespan to serve it’s purpose.

1.7 Conclusion

In conclusion, the game-based sign language edutainment system will provide an effective way for both deaf children and hearing parents to get familiar with the sign language. The children can get to expose to sign language in the early life stage to help them to perform well in their language skill development stage. The environment of learning for these children should be non-stress, fun and exciting which helps them to keep the curiosity in learning and exploring knowledge in their life rather than to make them afraid of learning because of test and punishment.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

In the previous chapter, an overall explanation on the problem statements and objectives of the project has been given. The project will develop a game that act as an alternative ways of exposing to sign language for deaf and hearing children or any other people who interested in knowing sign language. The game will use no wearable equipment to overcome the equipment maintenance problem and will only interact with the player using Kinect, the motion capture device.

Moreover, in this chapter, the definition of the chosen domain – edutainment, the reason of choosing Kinect as the input device will be discuss. Analysis on existing system from the perspective of strength and weakness will be done. Finally, the reason of choosing the compatible software and methodology will be stated.

2.2 Facts and Findings

For the project, many decisions have been made in choosing different kind of software and hardware, in such that these selections were chosen based on certain research that has been done. In addition, this section is divided into Domain as shown in section 2.2.1, section 2.2.2 describes some examples of existing systems and section 2.2.3 describes on several techniques being used in this study.

2.2.1 Domain

In this subsection, some findings with regard to the relationship of involvement level and the effectiveness of learning were written.

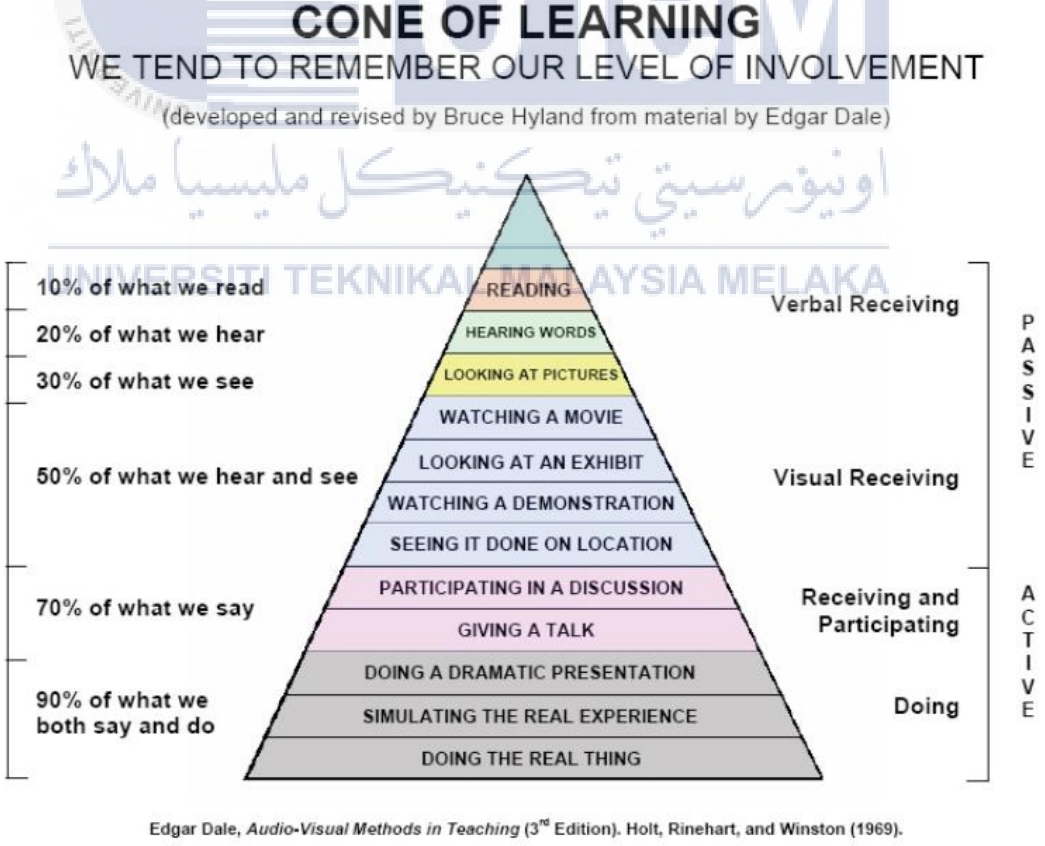

Figure 2.1 : Cone of learning by Edgar (1969)

The researcher named Edgar (1969) had suggested the cone of learning as shown in Figure 2.1, and stated that the level of involvement in an activity can affects the memory of the people on that activity. He compares the passive way of involvement such as reading and listening with the active way of involvement, such as thinking and discussing. The cone of learning shows that people tend to remember better on the activities which they involve with active way of involvement.

From the theory suggested by Edgar, it also can be applied in the field of education. It shows that by involving active way of involvement in the learning and teaching process, the results can be better. This directs the project to the path of edutainment.

According to the online Oxford dictionary (Edutainment, n.d.) :

'Edutainment - Computer games, television programmes, or other material, intended to be both educational and enjoyable.'

Based on the definition above, edutainment product can be any materials that are intended to teach some knowledge or skill to the user while it must be enjoyable to use. Nowadays, edutainment products can be easily found around us, such as toys for teaching kids at elementary school, tutorial videos played to the student when they are boring in the class, radio and television programmes that are teaching specific knowledge, video games with content on certain field of knowledge, zoos and also botanical gardens. Among all these tools, games were the best to achieve high engaging level due to its elements like progressive and achievement rewards.

Therefore, the product of the project has been set to develop a game that use active way of involvement with the purpose of teaching some basic sign language to the target users. Before start with development, the game need to have an input device to get the input from the player. The developer has been searching for the input device which can support the best in active way of involvement.