BORANG PENGESAHAN STATUS TESIS*

JUDUL : IMPLEMENTATION OF PHOTOREALISTIC AUGMENTED REAITY TECHNIQUE ON ANDROID PLATFORM IN COLOR LEARNING PROCESS FOR TODDLERS

SESI PENGAJIAN : 2012/2013

Saya SAM CHEE XIN

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IMPLEMENTATION OF PHOTOREALISTIC AUGMENTED REALITY TECHNIQUE ON ANDROID PLATFORM IN COLOR LEARNING PROCESS FOR TODDLERS

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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 COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2013

DECLARATION

I hereby declare that this project report entitled

IMPLEMENTATION OF PHOTOREALISTIC AUGMENTED REALITY TECHNIQUE ON ANDROID PLATFORM IN COLOR LEARNING PROCESS FOR TODDLERS

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

STUDENT : _____ Date: _____

(SAM CHEE XIN)

SUPERVISOR : _____ Date: _____

(SYARIFFANOR BINTI HISHAM)

DEDICATION

To my beloved parents, lecturers and friends…

ACKNOWLEDGEMENT

First and foremost, I would like to thank my supervisor, Miss Syariffanor for giving me guidance and encouragement to complete this project. Beside this, I would like to thank to the Faculty of Information and Communication Technology for giving me this chance to carry out this project. I would like to express my appreciation to the lecturers of the Faculty of Information and Communication Technology. I couldn't complete this project without the knowledge that deliver from them to me. Next, I would like to thank my friends for giving me support and help whenever I need. This project wouldn't complete without their help. Last but not least, I would like to thank my family for giving me support and motivation throughout the project.

ABSTRACT

Toddlers are the beginner for everything in their life. Color indirectly deliver all the information to us through visualization. Hence, an effective color learning tool is hope to help toddlers in learning color. Augmented reality is a technology used to integrate virtual content into real-time environment. On the other hand, the photorealistic augmented reality technique is a technology used to produce a high quality of a virtual scene that augmented into real-time environment. This project aimed to develop an interactive color learning tool which explores photorealistic augmented reality techniques for color classification on the Android platform. A few areas of study are included in this project. These areas are mobile augmented reality, markerless augmented reality, photorealistic augmented reality technique and color classification in augmented reality. A little comparison of existing product on the Android platform also been made in order to understand the requirement of an interactive color learning tool. The research methodology that used in this project is prototyping model. The intent of this method is to develop a high quality and efficient application. Hence, prototyping is the most suitable methodology. The final product is an interactive color learning tool that can potentially benefit toddlers and can also be enhanced in the future development of AR applications on the Android platform. The effectiveness of the product is determined based on the result of testing and observation. The testing process and results are included. Based on the result obtained from the testing, Finding Pixie was determined as an effective color learning tool. However, the weaknesses that discovered from testing is hoped to be improved in future. In a nutshell, this project is aimed to help toddlers in learning colors while achieving all the objectives.

ABSTRAK

Zaman kanak-kanak merupakan titik permulaan bagi hidup seseorang. Warna menyampaikan maklumat secara tidak langsung menerusi visualisasi. Oleh itu, satu alat yang berkesan diharap dapat membantu kanak-kanak dalam proses pembelajaran warna. "*Augmented reality(AR)*" merupakan satu teknologi yang mengintegrasikan kandungan maya ke dalam alam nyata manakala teknik "*photorealistic AR*" adalah satu teknologi yang menghasilkan satu skrin maya yang berkualiti tinggi dalam alam nyata. Projek ini bertujuan untuk membangunkan satu alat pembelajaran warna yang berinteraktif dan menerokai teknik "*photorealistic AR"* dalam klasifikasi warna pada platform Android. Beberapa aspek kajian telah dikaji dalam projek ini. Aspek-aspek tersebut adalah mobil AR, *"markerless AR"*, teknik *"photorealistic AR"* dan klasifikasi warna dalam AR. Perbandingan antara produk sedia ada pada platform Android telah dibuat untuk memahami keperluan alat pembelajaran warna yang berinteraktif. Metodologi kajian yang digunakan dalam projek ini adalah model prototaip kerana kaedah ini paling sesuai dalam pembangunan aplikasi yang berkuailiti tinggi dan cekap. Oleh itu, produk akhir untuk projek ini adalah satu alat pembelajaran warna yang berinteraktif yang dapat memanfaatkan kanak-kanak dan masyarakat dalam pembangunan aplikasi *AR* dan aplikasi android. Keberkesanan produk ini ditentukan berdasarkan hasil ujian dan pemerhatian. Proses dan keputusan ujian telah dimasukkan ke dalam laporan ini. Berdasarkan keputusan tersebut, *Finding Pixie* telah disahkan merupaka satu alat pembelajaran warna yang berkesan. Walaubagaimanapun, kelemahan yang ditemui dalam proses ujian diharap dapat diatasi. Secara ringkas, projek ini bertujuan untuk membantu kanak-kanak dalam pembelajaran warna sementara mencapai semua objektif.

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CHAPTER 1

INTRODUCTION

This project aims to develop an Android application to help toddlers in learning colors. This application was developed using a photorealistic augmented reality technique. Toddlers are the beginner for everything in their life. Color indirectly deliver all the information through visualization. Color is important in life and plays a big role in everything. Color has an enormous impact on the way people think and feel about almost every aspect in life. This is the reason why learning color is important for toddlers at the beginning of their exploration of the world. Hence, an effective color learning tool is important to help toddlers in learning color.

1.1 Project background

Toddlers refer to kids age 1 - 3 years old. Hence, the knowledge that gain on this stage is very important. There are many color learning tools in the market but these products still need some improvement to deliver the tutorial effectively. Hence, this project is aimed to help toddlers learn color in an efficient way by using a photorealistic augmented reality technique on the Android platform.

Colors are important in the life. Learning color is important and that is the reason for many publishers, developers, educators introduce many color learning tools to the world nowadays. However, these color learning tools come with some inefficiencies. Some of it was not an interactive learning tool, lack of tutorial and so on. All these become the factors for learning color inefficiently.

Hence, a research question was identified to carry out this research. The questions were stated as below:

- How effective is delivering a color learning tool on the Android platform?

Color is the visual perceptual property of light with different wavelength. Colors carry meaning, feeling and so on. We judge, we differentiate, we feel everything with colors. Thus, color is important in our life. Augmented reality refers to the technology that augment virtual content to the real-time environment. The virtual content can be any computer sensory input such as graphic, sound and so on. Photorealistic technique is used to render the virtual scene in a very good quality integrating different properties. In other word, photorealistic technique is to produce the image with same visual response as a scene.

1.2 Problem Statement

Colors are important in our life. It is important for toddlers to learn color at the beginning of their exploration of the world. Many publishers, developers, educators introduce many color learning tools to the world nowadays. However, these color learning tools come with some inefficiencies. Some of it was not an interactive learning tool, lack of tutorial and so on. All these become the factors for learning color inefficiently.

1.3 Objective

The objectives of this project are:

i. **To explore photorealistic augmented reality techniques for color classification**

   Several studies will be conducted for the exploration of photorealistic augmented reality technique. A few research papers were referred in order to complete the studies. Photorealistic augmented reality technique was aimed to help in color classification.

ii. **To implement a color classification application on the Android platform**

   A color learning tool will be developed to implement color classification applications on the Android platform. The color learning tool will be developed using a photorealistic augmented reality technique in order to benefit its users.

iii. **To develop a prototype mobile augmented reality application using photorealistic technique**

Mobile application can be easily found on the market. However, a photorealistic augmented reality mobile application will be rarer in the market. Hence, a prototype of photorealistic augmented reality mobile application was aimed to develop this project.

1.4 Research Questions

The research question that determined to carry out this project is stated as below.

- How effective is delivering a color learning tool on the Android platform?

Mobile based learning tool was one of the famous application as it is more convenient compare to computer based application. However, most of the learning tool for android platform still comprises with a lot of inefficiencies. Hence, a game-based color learning tool was planned to develop for Android platform. Photorealistic augmented reality technique was planned to use for this application. The efficiency of this application in delivering the learning element will be investigated.

1.5 Project Scope

This session will discuss about the area or aspect that will be covered in this project. However, this session will only explain the target audience and limitation of the project.

1.5.1 Target Audience

The target audiences for this project are toddlers which refer to the kids among 1 – 3 years old.

1.5.2 Limitation

The accuracy of the detection of RGB value was not covered in this project. Next, some of the animation might fail to play due to the limitation of the device used.

1.6 Project Framework

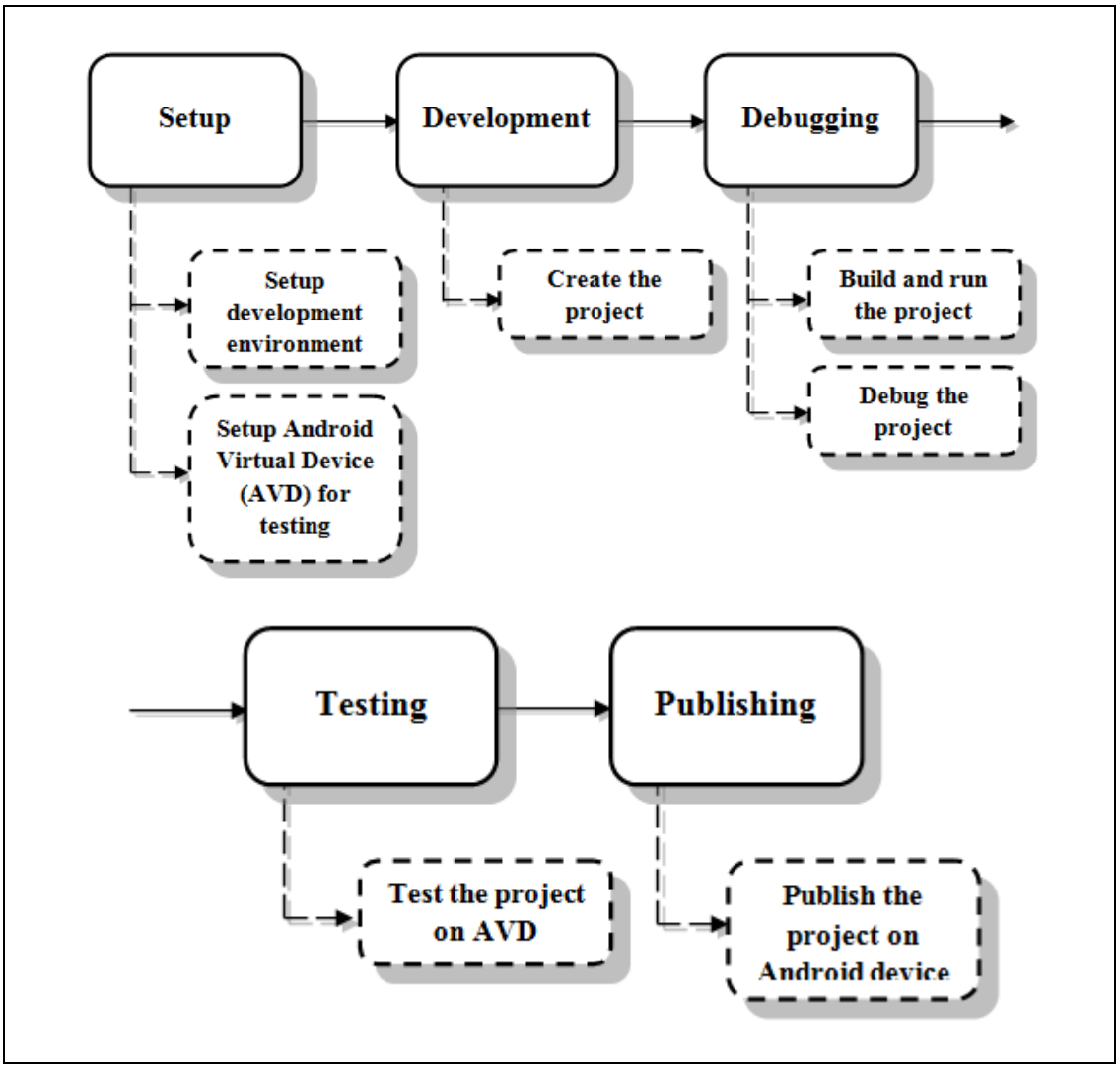

Figure 1.1 Project frameworks for this application.

Project framework was shown in figure 1.1. The stages involving in this framework include setup, development, debugging, testing and publishing. These stages discussed about the process of development of the application. The details of each stage will be further explained later.

1.7 Project Significance

The project significance of this project is to propose an effective color learning tool using a photorealistic technique on the Android platform. This project will benefit toddlers as this color learning tool is designed for them. They can learn the color of the rainbow from the provided tutorial and practice from the game developed with photorealistic augmented reality technique.

Summary

In a nutshell, an interactive color learning tool is expected to produce with photorealistic augmented reality technique in this project. Photorealistic augmented reality is aimed to help in developing this interactive color learning tool. This product is hoped to deliver the tutorial in an efficient way.

CHAPTER 2

LITERATURE REVIEW

This chapter will discuss the literature reviews in details. Resources from the journal or research paper will be used to find information for the chapter. The next part of this chapter will discuss about the existing system that available in the market.

2.1 Area of Study

To develop the interactive color learning tool using augmented reality technique, some information related to the technique needed to be investigated. Since the domain of this project focused on augmented reality, hence, a few studies regarding to augmented reality was carried out. These include mobile augmented reality, markerless augmented reality, photorealistic augmented reality technique and color classification in augmented reality. Explanation of each study provided below.

2.1.1 Mobile augmented reality

Augmented reality is an environment in which the virtual world will supplement with physical world. The integration between real and virtual world is quite an intriguing idea. Mobile AR began in 1997. Previous research of El-Zayat (2012) shows that mobile AR has been used in a wide range of field. It includes 3D mobile AR system for exploring urban environments, location based mobile AR for indoor environments, enhanced computer generated objects rendering using environment illumination. Mobile AR make the development of AR application move toward the ultimate goal which can operate in any environment. Mobility and optimization factors were significant while developing the AR platform. Figure 2.1 shows the AR mobile platform architecture designed by El-Zayat, 2012.

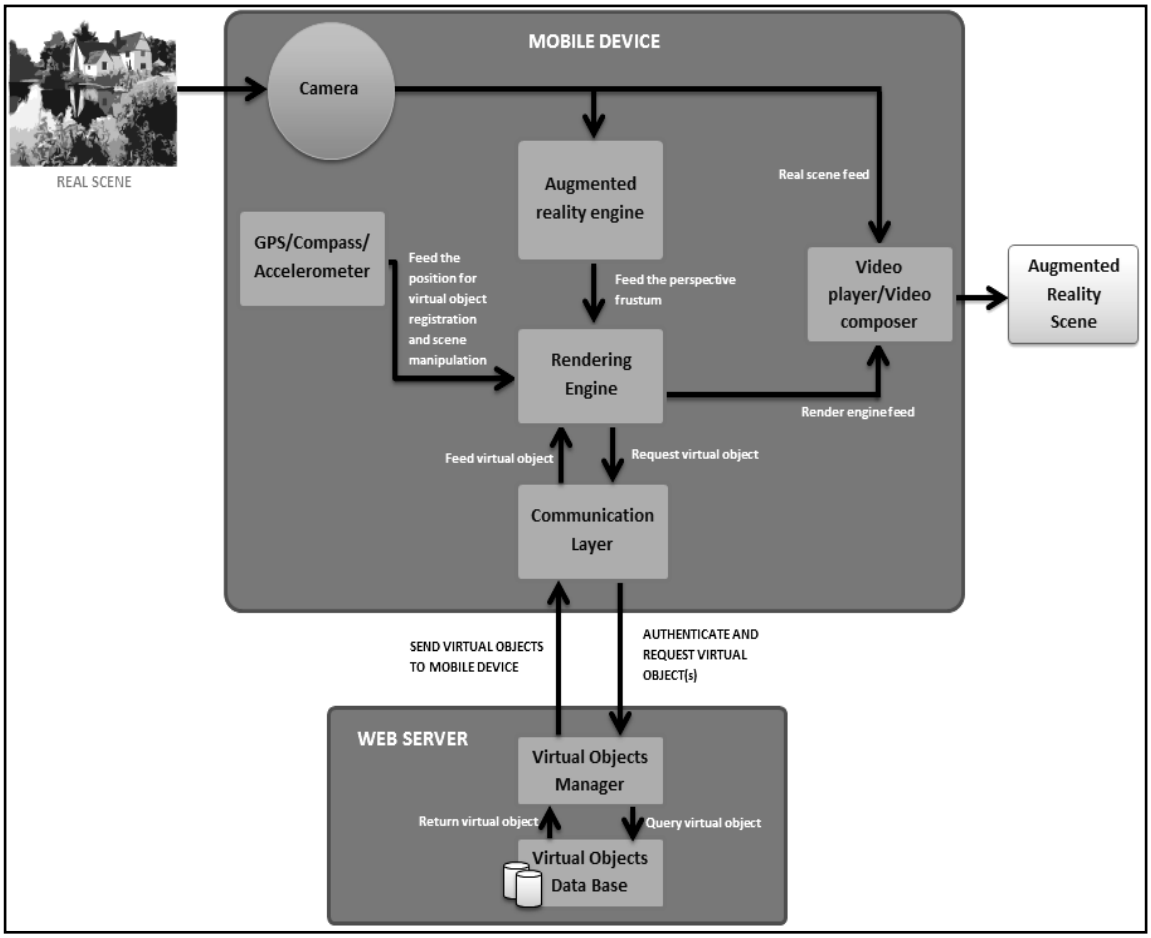

Figure 2.1: AR mobile platform architecture designed by El-Zayat, 2012

2.1.2 Markerless augmented reality

Markerless AR tracking much more complicated compared to marker AR. Marker AR used the marker to perform image tracking. The marker provides some features such as edges and texture that can be identified through image recognition. Markerless AR uses image processing technique which one of the technique of artificial intelligent. Recent years, a few markerless AR approaches have been developed. The most promising technique that currently applied in the AR application was the Model-based tracking approaches. In this technique, an object model is used to identify the features in the image (Maidi, 2011).

2.1.3 Photorealistic augmented reality technique

According to Ferwerda (2003), there are three different varieties of realism. These realisms are physical realism, photo-realism and functional realism. Physical realism means that the visual stimulation is exactly the same as the real scene. Photo-realism means that the visual response same as invoked in the scene. This is the realism that used by most of the AR application. Lastly, the functional realism means the image will provide visual information which same as the scene. On the other hand, Michael (2004) mention that most of the AR application focuses on the improvement of tracking but not rendering quality of augmented quality. AR rendered scenes can be improved by taking consideration of shading, shadows and bump mapping in the rendering stage.