

**FUNSCANNERAR: RECOGNITION OF REAL OBJECT USING MARKER-  
LESS AUGMENTED REALITY (AR)**



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

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LESS AUGMENTED REALITY (AR)**



**This report is submitted in partial fulfillment of the requirements for the  
Bachelor of Information Technology (Game Technology)**

**FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA 2017**

## DECLARATION

I hereby declare that this project report entitled

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

STUDENT: \_\_\_\_\_

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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  
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(PROD MADYA DR SAZILAH SALAM)

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## Abstract

This project aim is to study on marker-less Augmented Reality which has real object in real world as reference(real object recognition). At the same time, a casual game based on this marker-less Augmented Reality is developed for children age 9 to 12. This casual game consist of two category in the play mode.

This casual game is inspired from the application 'CamFind', 'EyeSpy' and 'Hunt w.Cam-Find the Color' which these applications are mainly to give information on the recognition of captured image. The objectives of this project are to study and develop casual marker-less AR game based on real object recognition using Unity and Vuforia. In result, this project is to test the playability of the casual marker-less AR game. The development of this project follows the Agile Methodology which has five phases planning, design, build, test and report. This project should be able to retrieve accurate data in order to supply correct information for target user.

## Abstrak

Projek ini bertujuan untuk mengkaji dengan lebih mendalam lagi konteks marker-less Augmented Reality di mana objek sebenar sebagai rujukan. Di samping itu, permainan kasual berdasarkan 'marker-less AR' juga dibangunkan untuk kanak-kanak berumur 9 hingga 12 tahun. Permainan kasual ini mempunyai dua kategori. Permainan kasual ini hasil inspirasi daripada aplikasi sedia ada iaitu 'CamFind', 'EyeSpy' dan 'Hunt w. Cam-Find the Color' dimana kesemua tiga aplikasi ini khususnya adalah untuk membekalkan informasi hasil daripada kenalpasti gambar objek yang diambil. Objektif projek ini adalah untuk mengkaji dan membangunkan permainan kasual 'marker-less AR'. Hasil daripada pembangunan permainan kasual ini untuk menguji keberkesanan permainan kasual 'marker-less AR'. Pembangunan projek ini berdasarkan 'Agile Methodology' yang mempunyai lima fasa iaitu, perancangan, reka, membangunkan, ujikaji dan laporan. Projek ini dianggarkan dapat mencari data yang tepat agar kelompok sasaran pengguna dibekalkan dengan informasi yang betul.

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## CHAPTER I

### INTRODUCTION

#### 1.1 Introduction



Augmented reality (AR) is a new technology that provides digitalized information such as image, animation, and video in real time. AR can be divided into two primary types which are marker-based and marker-less. Marker-based AR utilizes images or patterns to produce result when it scanned or sensed by a reader which is typically mobile phone camera. Basically each image or pattern that plays roles as marker is assigned by system with different information. For marker-less AR, the target itself depends on natural features of physical environment rather than has specific assigned pattern to be recognized. Marker-less AR in context of physical environment can have different references such as GPS location, real object recognition and terrain-based. As for this project, it will focus on marker-less augmented reality on real object recognition. A prototype of casual game of this marker-less augmented reality based on real object recognition will be developed specifically for aged 9 to 12 as the main focus is to introduce that the information of real object can be retrieve by just scanning the object. The project will be developed by using Unity and Vuforia plug-in.

## 1.2 Problem Statement

As augmented reality is still a new technology, there is lack of application or successful game in this technology. Therefore, this project is intended to explore and introduce a marker-less augmented reality on real object recognition as casual game specifically for children. This is because children as young as age 9 already have their own technology devices such as smartphone and tablet which they used to carry it everywhere. Besides, children nowadays are lack of knowledge in recognizing object around them. Most of them able to recognize the object shape and how the object looks but hardly to remember the object name.

## 1.3 Objective

- i. To study on real object recognition of marker-less augmented reality
- ii. To develop a casual game of marker-less augmented reality based on real object recognition
- iii. To test the effectiveness of real object recognition through the casual game

## 1.4 Scope

FunScannerAR will be developed using Unity 5 engine with Vuforia plug-in and deliverable into mobile device. This game will undergo data mining to recognize object in real world. FunScannerAR is a casual game for 9 to 12 years-old children.

### 1.5 Project Significance

FunScanner AR is developed in order to assist children to recognize object name anytime and anywhere they want. Besides, this project is also developed to study on accuracy of real time object recognition by using data mining. As this project is successfully developed, I hope the project will be able to help and to improve children memory in object recognition.

### 1.6 Conclusion

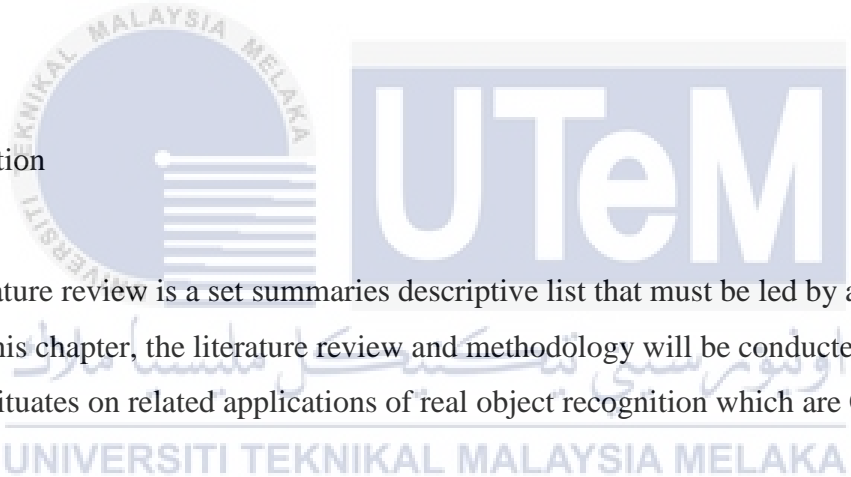
In conclusion, FunScannerAR is a casual game of real object recognition which is designed for children age 9 to 12 in order to help them recognizing real object.



## CHAPTER II

### LITERATURE REVIEW AND PROJECT METHODOLOGY

#### 2.1 Introduction



Literature review is a set summaries descriptive list that must be led by a guiding concept. In this chapter, the literature review and methodology will be conducted. Literature review will situate on related applications of real object recognition which are CamFind.

#### 2.2 Domain

FunScannerAR is a casual marker-less AR game. This game is focus on real object recognition. In general, Player will be given with an instruction to find an object which required player to find the real object in real world. After the item has been found, player has to take pictures of the item. Player has to wait for the result if the picture is correct or wrong. If the picture is right, player can go to the next mission but if the answer is wrong, player has to try again and find the correct one.

Real object recognition is found to be more attractive as people just have to point and take picture of object that they want to know. The result given is all that related to the picture taken. It requires internet connection as the data will undergo reverse search in cloud storage database.

FunScanner AR is developed by using Unity Engine and Vuforia plug-in. Vuforia is used to get a better camera view as Vuforia is a tool for augmented reality purpose. This project has to manipulate a few things in order to successfully develop and it used reverse search technique.

First, a picture taken will be uploaded to Cloudinary which is image cloud storage. Next, it will access web server (smartgreen) and get the data that will instruct the picture that has been stored in Cloudinary to be send to Google API. The picture in Cloudinary will search for the best match in Google images. These steps need internet connection to do all the searching. A strong signal of internet connection will return the result in a short time.

FunScannerAR only provide the detail on the object name. However, sometimes the result is not accurate. The accuracy of the result is hard to control since it is totally depends on the Google images.

### 2.3 Existing System

Marker-less augmented reality (AR) starts to gain attention from users since it provides with good experience in real time surrounding. As already stated, this marker-less AR project is focus on object recognition in real time. The existing applications that have the same context which is object recognition are CamFind, TapTapSee and EyeSpy. In general, these applications have the same concept in object recognition will compare picture that has been snapped against extensive image databases and return the best guess (Bill Holton, 2013).

#### a. CamFind application



Figure 2.2: CamFind

CamFind is a visual mobile search application developed by Image Searcher, Inc. in 2013. This application used image recognition technology and reverse image search to provide user with detailed information for most object based on picture taken by user (Janet Wagner, 2013).

CamFind application implements in-house API which is CloudSight. Basically when user takes a picture of object they would like to know, the HTTP request with the taken picture will be send to CloudSight in order to undergo reverse image search and return user with description of its related content. All these searching and recognition process happened behind the scene after taking picture.

The instruction is easy, user just has to point, shoot and discover. CamFind required User to point on the object, click on the camera button to take a picture and wait for the result. As the result, it will give information of related images, local results, shopping results, web results complete with voice-over information (Jordan Crone, 2013). CamFind used mobile devices as it platform. This free application can be downloaded both in AppStore for iOS and PlayStore for android.

b. Tap Tap See application



Figure 2.3: Tap Tap See



Tap Tap See is a mobile camera application which designed for blind and visually impaired users to identify objects they encounter in their daily lives (Jordan Crone, 2015). It used same technology as CamFind which is image recognition by reverse search image in database.

Tap Tap See provides user with simple interface with only two clearly labeled buttons which are “repeat” button, “about” button. In order to take a picture, user has to double tap on the screen. Tap Tap See implement voice-over for user. However, the information of the object is not displayed on the screen, but user can have the information re-voiced by pressing the “Repeat” button (Bill Holton, 2013). This application can be downloaded free in AppStore and PlayStore.



Figure 2.4: EyeSpy

EyeSpy is an object recognition application which designed to cater for blind, partially sighted and impaired user to ease their everyday lives. EyeSpy gives user answers to every visual unknown at the snap of your camera.

Once user snap the picture, the application will search for the best match and return a list of informations about the picture taken. The interface is simple which has a snap button to take a picture. EyeSpy is a free application that can be downloaded in AppStore and Playstore.

### 2.3.1 Comparison of Existing Sytem

This part includes the details of the comparison between the applications listed. There are several criteria when comparing the application which are platform, API, result of search, voice-over and internet connection.

	CamFind	TapTapSee	EyeSpy
Platform	Mobile Device	Mobile Device	Mobile Device
API	CloudSight	CloudSight	EyeSpy API
Search results (details provided)	Related image, local results, shopping results, web results	Information in voice-over only	Related Image, web results, local results
Voice-over	Yes	Yes	No
Internet Connection	Required	Required	Required

Table 2.1 Comparison of CamFind, Tap Tap See and EyeSpy

From table above, it is clear that most of the application choose mobile device as platform. CamFind and TapTapSee used the same API which is CloudSight while EyeSpy used in-house API. The search results on details provided are different for each application. For all three applications, internet connection is a must.

## 2.4 Project Methodology

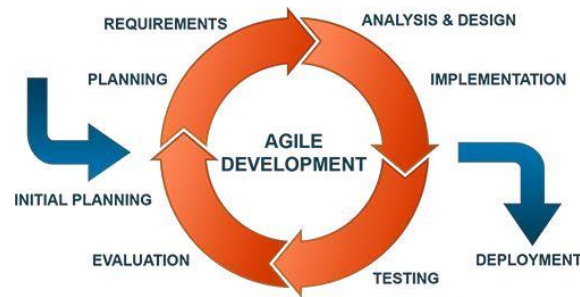


Figure 2.5: Agile Development Process (adaptation from Google)

Methodology is the methods applied to a field of study comprise the systematic and theoretical analysis. The methodology used for this project is Agile Development Process. Agile Model is defined as “iterative” and “incremental” as it focuses on the work cycles repetition. Agile Design Model consists of four phases which are planning, analysis and design, testing and evaluation. These phases will iterate until the product looks satisfied enough.

Planning phase is a phase where brainstorming of idea will take place. The problem is to be identified and followed by the latest technology. The product requirement is identified and the literature review is carried out to find advantage of our product. In addition, this phase is also the phase where the entire main concept including gameplay, genre and scope to be determined.

Next, analysis and design phase is where an outline of the game will be developed. The initial concept, game art, design, features and the GUI is decided. Analysis takes place in this phase as to find out similar product and what are the advantages and disadvantages of our product compare to others.

Testing phase is where our product will be tested out to see if the game is well functioning or not, to test the gameplay of the game, the input and output of the game and to see if there are any bugs in code.

Last but not least is the evaluation phase. All feedbacks from the testing phase will be used for refining the game.

## 2.5 Conclusion

In conclusion, literature review is a critical element to find out what are the similar products. Agile development process is applied in this project because of the flexibility.



## CHAPTER III

### ANALYSIS

#### 3.1 Requirement analysis

This section discusses in details on the requirements of the project development.



##### 3.1.1 Project Requirement

The following table compares this project with a similar existing application based on several criteria

	CamFind	Tap Tap See
<b>Type</b>	Mobile application	Mobile application
<b>Target audience</b>	General	Blind, visually impaired people
<b>API used</b>	CloudSight	CloudSight
<b>Image cloud-based</b>	CloudSight	Cloudsight
<b>Web Hostage</b>	None	None
<b>Search results (details provided)</b>	Related image, local results, shopping results, web results	Voice-over
<b>Voice-over</b>	Yes	Yes
<b>Platform</b>	Mobile device	Mobile device

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Table 3.1: Analysis of system to be developed

	EyeSpy	FunScannerAR
<b>Type</b>	Mobile application	Casual game
<b>Target audience</b>	Blind, visually impaired people	9-12 years old
<b>API</b>	EyeSpy API	Google API
<b>Image cloud-based</b>	EyeSpy	Cloudinary
<b>Web Hostage</b>	None	smartgreen
<b>Search result (details provided)</b>	Related image, local results, shopping results, web results	Name of the pictures taken
<b>Voice-over</b>	none	none
<b>Platform</b>	Mobile device	Mobile device

Table 3.2: Analysis of system to be developed(2)

### 3.1.2 Technical Requirement

This section explains on the details of the technical requirement of the project.

### 3.1.2.1 Software Requirement



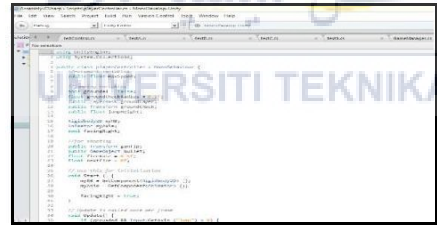
Software	Purpose
<p data-bbox="363 464 586 495"><b>Adobe Illustrator</b></p> 	<p data-bbox="883 464 1365 569">It is used to design the user interfaces including buttons, feedback images and logo in the game.</p>
<p data-bbox="363 806 513 837"><b>Unity 5.5.0</b></p> 	<p data-bbox="883 806 1365 947">Unity is a game engine that is used to develop the casual game. This is where the coding and the user interface integrated to a casual game</p>
<p data-bbox="363 1142 626 1173"><b>Monodevelop Unity</b></p> 	<p data-bbox="883 1142 1365 1325">Monodevelop is the IDE for writing codes which is already built-in in Unity game engine. Programming takes place here to combine all the codes and makes the game functional</p>

Table 3.3: Software Requirement