

**MOBILE APPLICATION ON LEARNING CARDIOPULMONARY
RESUSCITATION (L-CPR)**

LAI WUI CHUNG

**A thesis submitted in fulfilment of the
requirements for the award of the
Degree of Computer Science**

**Faculty of Computer Systems & Software
Engineering
University Malaysia Pahang**

JANUARY, 2016

UNIVERSITI MALAYSIA PAHANG

DECLARATION OF THESIS AND COPYRIGHT

Author's full name : Lai Wui Chung

Date of birth : 11 August 1992

Title : Mobile Application on Learning Cardiopulmonary
Resuscitation (L- CPR)

Academic Session : Semester 1 Session 2015/2016

I declare that this thesis is classified as :

☐ **CONFIDENTIAL** (Contains confidential information under the Official
Secret Act 1972)*

☐ **RESTRICTED** (Contains restricted information as specified by the
Organization where research was done)*

☐ **OPEN ACEESS** I agree that my thesis to be published as online open
access (Full Text)

I acknowledge University Malaysia Pahang reserve the right as follows :

1. The Thesis is the Property of University Malaysia Pahang
2. The Library of University Malaysia Pahang has the right to make copies for the
purpose of research only.
3. The Library has the right to make copies of the thesis for academic exchange.

Certified By:

(Student's Signature)

920811-06-5855

New IC / Passport Number

Date :

(Signature of Supervisor)

Dr. Noraziah binti Ahmad

Name of Supervisor

Date :

DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged.

8 December 2015

Lai Wui Chung
CD12037

SUPERVISOR DECLARATION

I hereby declare that I have read this thesis and in my opinion this thesis / report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Computer Science (Computer Systems & Networking).

Signature :

Supervisor : Dr. Noraziah binti Ahmad

Date :

ACKNOWLEDGEMENT

I am extremely fortunate to have Associative Professor Dr. Noraziah binti Ahmad as my supervisor. I would like to express my appreciation for her advice, guidance and support for me to complete my Final Year Project on the subject as stated. Other than that, I would like to express my gratitude to my parents who raised me and guided me with whatever means possible. Moreover, I would like to thanks University Malaysia Pahang (UMP) for giving me the opportunity to enrol as a degree student and taught me the foundation which will bring me success in my career. I deeply thank all Faculty of Computer System & Software Engineering for sharing their knowledge to me, which has provided me with fundamental knowledge in completing my Final Year Project. Last but not least, I would like to express gratitude to my fellow friends who have given my support in all kind of aspect throughout this journey.

ABSTRACT

Cardiopulmonary Resuscitation (CPR) is a procedure performed during an emergency when someone's heart stop functioning, with the goal of prolonging circulatory and lung function. It is a life lifesaving technique which can help to save a person's life. However, many people are still not aware of the important of CPR. There are still many people do not have any basic knowledge on CPR. Besides that, sometime an individual might not remember well on the correct step to perform CPR. An incorrect step in CPR might even cause the condition of the victim to become more serious. Therefore, this project, Mobile Application on Learning Cardiopulmonary Resuscitation (L-CPR) is a mobile application that teach user about the knowledge on CPR. The mobile application allow user to access and learnt CPR at anytime, just by using their smart phone. An android mobile application will be created with 4 function which are traditional notes, video tutorials, quizzes and also using Augmented Reality (AR) to illustrate the procedure in CPR.

ABSTRAK

Resusitasi Kardiopulmonari (CPR) merupakan satu prosedur yang dilakukan dalam kecemasan apabila jantung seseorang berhenti berfungsi. Ia adalah teknik yang boleh membantu untuk menyelamatkan nyawa seseorang. Walau bagaimanapun, ramai orang masih tidak kepentingan CPR. Masih ramai orang langsung tidak mempunyai pengetahuan asas mengenai CPR. Selain itu, seseorang mungkin lupa langkah yang betul untuk melakukan CPR. Satu langkah yang tidak betul dalam manjalani CPR akan menyebabkan keadaan mangsa menjadi lebih serius. Oleh itu, projek ini merupakan satu aplikasi mudah alih yang mengajar pengguna pengetahuan mengenai CPR. Aplikasi mudah alih ini membolehkan pengguna untuk mengakses dan belajar CPR pada bila-bila masa, hanya dengan menggunakan telefon pintar mereka. Aplikasi ini mengandungi 4 fungsi, iaitu nota, tutorial video, kuiz dan juga menggunakan Augmented Reality (AR) untuk mengajar prosedur dalam CPR.

TABLE OF CONTENTS

	Page
DECLARATION OF THESIS AND COPYRIGHT	ii
DECLARATION	iii
SUPERVISOR DECLARATION	iv
ACKNOWLEDGEMENT	v
ABSTRACT	vi
ABSTRAK	vii
TABLE OF CONTENT	viii
LIST OF TABLES	xii
LIST OF FIGURES	xiii

Section	Content	Page
1.	INTRODUCTION	
1.1	Background of the project	1
1.2	Problem Statement	2
1.3	Objectives	3
1.4	Scope	4
1.5	Thesis Organization	4

2.	LITERATURE REVIEW	
2.1	Introduction	5
2.2	The concept of Project	5
2.2.1	The Concept of Cardiopulmonary	5
2.2.2	The Concept of Cardiopulmonary Resuscitation	7
2.3	Existing System	8
2.3.1	First Aid - American Red Cross	9
2.3.2	Pocket First Aid & CPR	11
2.3.3	Drop First Aid	14
2.3.4	Comparison between the Existing System	17
2.4	Technology	17
2.4.1	Mobile Application	17
2.4.1.1	Native Apps	18
2.4.1.2	Mobile Web Apps	19
2.4.1.3	Hybrid Apps	19
2.4.1.4	The Comparisons between Type of Mobile Application	20
2.5	Techniques	21
2.5.1	Augmented Reality	21
2.5.2	Virtual Reality	22
2.5.3	The Comparison between Techniques	24
2.6	Methodologies	24
2.6.1	The Waterfall Model	25
2.6.2	The Spiral Model	26
2.6.3	Rapid Application Development (RAD)	27

2.6.4	Comparison between Methodologies	28
3.	METHODOLOGY	
3.1	Introduction	29
3.2	Project Methodology	29
3.3	Justification of Chosen Methodology	30
3.4	The Stages of Chosen Methodology	31
3.4.1	Requirements Planning	31
3.4.2	User Design	32
3.4.3	Construction	32
3.4.4	Cutover	34
3.5	Hardware Requirements	34
3.6	Software Requirements	35
3.7	Gantt Chart	36
4.	IMPLEMENTATION, TESTING AND RESULT SCCUSION	
4.1	Introduction	37
4.2	Implementation on Data/Model/Process/ Hardware	37
4.3	Testing Result and Discussion	50
5.	CONCLUSION	
5.1	Introduction	57
5.2	Research Constraint	57
5.3	Future Work	59

REFERENCES	59
APPENDIXES	62

LIST OF TABLES

Table	Name	Page
2.0	The Advantages and Disadvantages of the Existing Systems	17
2.1	Advantages and Disadvantages of Different Types of Mobile Application	20
2.2	Advantages and Disadvantages of Different Types of Techniques	24
2.3	Advantages and Disadvantages of Different Types of Methodologies	28
4.0	Test Case 1	51
4.1	Test Case 2	51
4.2	Test Case 3	52
4.3	Test Case 4	52
4.4	Test Case 5	53
4.5	Test Case 6	53
4.6	Test Case 7	54
4.7	Test Case 8	55
4.8	Test Case 9	55
4.9	Test Case 10	56

LIST OF FIGURES

Figure	Name	Page
2.0	The Cardiopulmonary System	6
2.1	Step by step instruction with video and link to directly call 911	10
2.2	"Tests" tab with several set of questions on different subjects	10
2.3	"Hospital" Tab with function to search for nearby hospital	11
2.4	List of Content	12
2.5	Medical Profiles page	13
2.6	Tutorial video on doing CPR	13
2.7	First page of the app	15
2.8	Chose Level of Experience	15
2.9	Step-by-step Guide	16
2.10	Augmented Reality using Marker-based method	21
2.11	Navigation using AR in London	22
2.12	A person wearing the HMD	23
2.13	Phases in Waterfall Model	25
2.14	Phases in Spiral Model	26
2.15	Phases in RUP	27
3.0	Phases in RAD	31
3.1	AR System Architecture	34
4.0	Home Page for Mobile Application on L-CPR	38

4.1	Coding for Button in Home Page	38
4.2	Confirmation Dialog Box for Exit	39
4.3	Coding for Exit Function	39
4.4	Note Menu Page	40
4.5	Code to Create Items Inside the List View	41
4.6	Coding for MyAdapter Java Class	42
4.7	Introduction Note Page	43
4.8	Coding for Loading Different Fragment	44
4.9	Video Menu Page	45
4.10	Video of Adult CPR Page	45
4.11	Quiz menu page	46
4.12	Quiz page	47
4.13	Quiz result page	57
4.14	Animation Scene Inside Maya 2015	48
4.15	Coding for Loading Wikitude SDK	49
4.16	Javascript Coding for Loading 3D animation	49
4.17	Output of Screen Scanning the Targeted Marker	50

CHAPTER 1

INTRODUCTION

In this chapter, the overview of the project will be discussed. First section of this chapter explains the project's background. The following section will explain problem statement of the project. The third section of this chapter deliberates on the objective of the project, followed by the forth section which emphasize on the project scope. Last section of this chapter will briefly explains the sequences of each chapter.

1.1 Background of the Project

Cardiopulmonary resuscitation (CPR) is one type of first aid technique. It is a lifesaving technique which is useful in many emergencies, such as heart attack ("Cardiopulmonary resuscitation (CPR): First aid", 2015). CPR is consider as one type of technique or skill which is very useful and should be learn by everyone. It can help in preserving life. For example, we can help to performing Cardiopulmonary resuscitation (CPR) to the victim, while waiting for the arrival of ambulance. This can increase the chance of the victim to survive.

In order to help people to easily remember the order of CPR's step, acronym of CAB is being used, which refer to Compressions, Airway and Breathing ("Cardiopulmonary resuscitation (CPR): First aid", 2015). The detailed process inside this step may be vary, if the victims is different, such as adult, children and infant. For example during the compression stage, the compression depth for children is smaller than that for adult (Andrew H. Travers, 2010). Just performing CPR actually is unable to restart the heart. The main purpose of CPR is to restore the partial flow of oxygenated blood to brain and heart ("CPR (cardiopulmonary resuscitation)"). Brain damage can happen if there is lack of oxygenated blood. It also will kill an individual in just eight to ten minutes. By performing CPR, it can buying time until the professional medical team arrive.

This project with title Mobile Application on Learning Cardiopulmonary Resuscitation (L-CPR) is to create a mobile application to teach the proper technique of CPR. The application can be install inside the mobile phone, where user can view the content inside the application to learn the technique of CPR. The application consists of 4 functions which are traditional notes, video tutorials, quizzes and also implemented with Augmented Reality (AR), which help user to easier understand the steps of CPR. With this application, user can easily refer to the step of CPR when an emergency occur.

1.2 Problem Statement

There might be some emergency cases suddenly happen around us in which an individual life is in danger. For example, if someone stand beside us suddenly experienced a heart attack, we might need to immediately performing CPR to the victim's while waiting for ambulance. At that moment, we don't have enough time to search online for the correct CPR technique. The life of that person might be threaten even we hesitate for a short moment.

CPR consist of many details steps. The steps may vary, depending on the actual situation and the victim's condition. If the technique is not apply correctly, it might even cause the victim's condition to become more serious. Nowadays, there are some mobile application available which teach the knowledge of CPR. However, these application

still have some flaws. Some of screen design is complex. There is too many tab inside one screen with make to layout become too complicated. Some of the application does not provide search function. This make user hard to search a specific content inside the application. Furthermore, there is also some application which need to pay and access to internet. Besides that, some of these application only use word and simple pictures to explain the CPR steps. User may not prefer to read plenty of words on the explanation of CPR steps.

CPR consist of many steps. There is also some difference in steps when performing CPR to different people such as adult, children or infant. If a person is not doing revision from time to time. They might forget some important steps in CPR. In actual emergency cases, even a small mistake in the steps may cause the victim's life in danger. There should be some quiz or simple test available for them to easily access when they are free.

1.3 Objectives

The objectives of the project are listed as below:

- i. To develop Mobile Application on L-CPR to teach the technique of CPR.
- ii. To implement Augmented Reality in Mobile Application on L-CPR to enhance the understanding of the CPR techniques.
- iii. To develop the CPR quiz, video tutorial, notes and Augmented Reality for measure the user knowledge on CPR.

1.4 Scope

The scope of this project are listed as below:

i. System Functionality

- The mobile application teaching the basic knowledge of CPR which is very helpful when emergency situation happen.

ii. System User

- The mobile application is available for user from all ages.

iii. System Platform

- The mobile application will generate the summary of user result when user doing quiz on the technique of CPR.

1.5 Thesis Organization

This thesis consists of five (5) chapters. Chapter 1 will discuss on introduction to project. Chapter 2 will emphasize on literature review. Inside this chapter, the concept of project, technology, techniques and existing system will be reviewed. The methodologies in project development will also reviewed in this chapter. Chapter 3 will further discuss on the methodology use in the project development. Chapter 4 will discuss on system process and also the user interface of the project. Besides that, this chapter will also discuss on the implementation of the system, and showing the result and discussion. Chapter 5 will discussed on the conclusion of the project.

CHAPTER 2

LITERATURE REVIEW

Literature Review for Mobile Application on Learning Cardiopulmonary Resuscitation (L-CPR) is discussed in this chapter. First part of this chapter is the introduction of the literature review. Second section will emphasize on the project's concept. In third section of this chapter, there will be a review of the existing systems. After that, techniques used within the project will also be discussed in this chapter. Last section of this chapter concerns on the methodologies used throughout the project development.

2.1 Introduction

A literature review is a critical summary of published research literature relevant to a topic under consideration for research. Literature review also act as a framework to give a clearer view for the project flow. Its objective is to create familiarity with current research on a specific topic, and may justify future research into a previously overlooked or understudied area.

2.2 The concept of the Project

There are two concepts that will be emphasize in this project. The first concept is cardiopulmonary while the second concept is cardiopulmonary resuscitation.

2.2.1 The Concept of Cardiopulmonary

Cardiopulmonary is a term that usually used in medical field. This term is always related to the heart and lung. Every human will having a cardiopulmonary system. The main purpose of cardiopulmonary system is to deliver oxygen (O_2) into human body and to remove the carbon dioxide (CO_2) and metabolites from human body. Interchange of gas between the lungs and atmosphere (external respiration), is linked to internal cellular respiration by the cardiovascular system. The air from atmosphere is brought into the lungs where O_2 moves into pulmonary capillaries. On the other hand, CO_2 will move from blood into alveoli. The CO_2 is then return to lungs for removal from the body (Claire Peel, 1996).

There is a disease called cardiopulmonary arrest (cardiac arrest) which is related to the cardiopulmonary system. Cardiac arrest is refer to a sudden loss of cardiac function, which the heart suddenly stop from beating. In United State, there is about 400,000 people experience a sudden cardiac arrest outside the hospital in a year (Robert E O'Connor, MD, MPH, 2013). When cardiac arrest occur, the individual will stop breathing and start to lose consciousness. Their pulse and blood pressure will also absent. This disease can kill a person in only a few minutes (Melissa Conrad Stöppler, MD, 2014). In order to treat for a sudden cardiac arrest, a defibrillator (AED) is needed to shock the heart to restore the normal rhythm to the heart. This action must be done within a few minute of the sudden cardiac as it effectiveness will be higher (Charles Patrick Davis, MD, PhD). If AED is not readily available, a cardiopulmonary resuscitation (CPR) can be performed while waiting for the AED (Joseph Sciammarella, MD, FACP, FACEP, 2015). Figure 2.0 show the cardiopulmonary system.

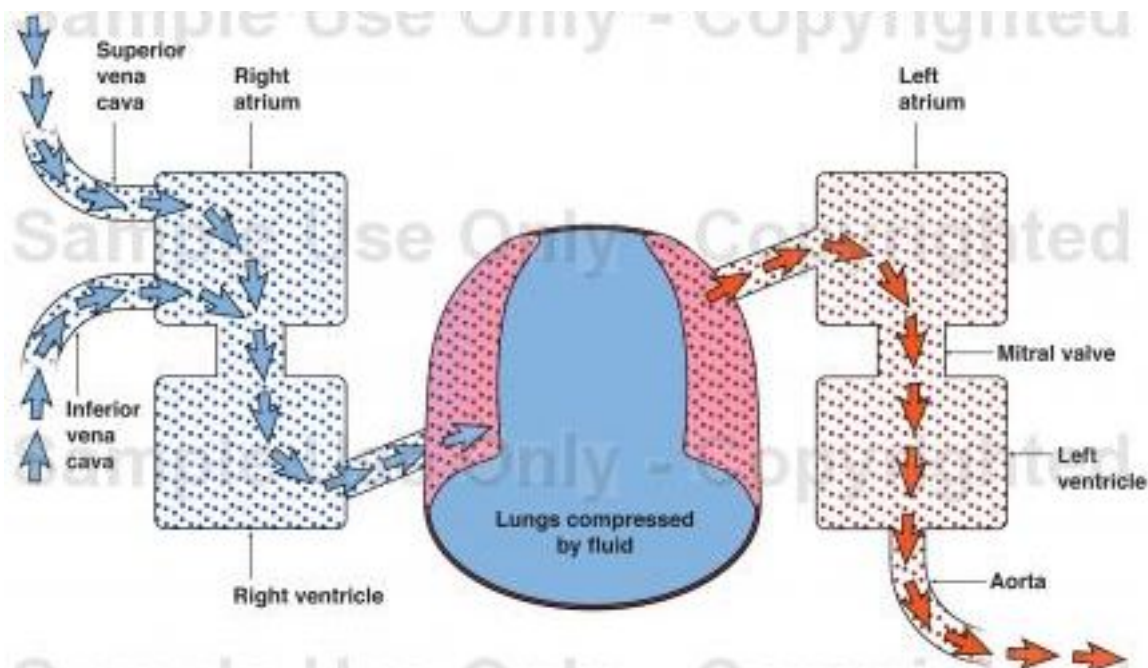


Figure 2.0 The Cardiopulmonary System.

2.2.2 The Concept of Cardiopulmonary resuscitation (CPR)

Cardiopulmonary resuscitation (CPR) is some steps that will be carry out during an emergency when someone's heart stop functioning. One of the purpose of CPR is to prolonging the human circulatory and lung function. Although the chances of surviving cardiac arrest has improved due to the advances in emergency, cardiac arrest is still one of the leading course of death in many country. The main reason an adult die from a heart attack is ventricular fibrillation. Ventricular fibrillation is actually a situation where the rhythm of the heart is being disturbed. Defibrillation can be carried out to treat it. It is done by applying electric shock to victim's chest. AED is the device need to carry out the defibrillation. If AED is not available when needed, brain will dead in not more than 10 minutes. Through CPR, we can help the affected individual to receive oxygenated blood flowing to their heart and brain (Joseph Sciammarella, MD, FACP, FACEP, 2015). The process and steps of CPR will be slightly different if we deals with adults, children or infant. For example, the compression depth for infant is smaller, compare to the adults (Andrew H. Travers, 2010).

There are few steps need to carry out before the CPR is performed. First, rescuer must first recognize that the victim is experiencing cardiac arrest. The basic symptoms are unresponsiveness and lack of normal breathing. After confirm the victim is having cardiac arrest, the rescuer should activate the emergency response system and try to get an AED. If the AED is not available, rescuer should immediately proceed to CPR. If there is AED available, rescuer should deliver shock to victim. Then, CPR process is continue (Andrew H. Travers, 2010).

In order to help people to easily remember the order of CPR's step, acronym of CAB is being used, which refer to Compressions, Airway and Breathing. For compression step, the purpose is to restore blood circulation. Firstly, the victim should be put on a firm surface. Then, rescuer will kneel beside casualty. The heel of one hand should be placed on the center of the victim's chest. The heel of the other hand should be placed on top of the first hand. The elbows are kept straight and position the shoulders directly above the hands. Leaning over the casualty, the rescuer should press straight down to 5-6 centimeters while keeping the elbows straight. The chest compression should be given in a rate of between 100-120 compressions per minute. Rescue who have not been trained in CPR can be continue the chest compression until the emergency medical personnel take over. If they have been trained in CPR, they can continue to checking the airway and rescue breathing ("Cardiopulmonary resuscitation (CPR): First aid", 2015).

Another step is airway, which the purpose is to clear the airway. Rescuer should extend the victim's neck to open the airway and begins by placing one hand on victim's forehead and lifting the jaw with the other hand (Wanda Lockwood, 2014). Next, in less between 5-10 seconds, rescuer should check if there is normal breathing on the victim. If the victim's isn't breathing normally and rescuer have been trained in CPR, they can continue perform the breathing step ("Cardiopulmonary resuscitation (CPR): First aid", 2015).

The last step is breathing which is to perform the rescue breath. Firstly, with the airway open, support the victim's chin with the fingertip of one hand. With other hand, pinch the soft part of the victim's nose. The rescuer should take a breath and place their

mouth over the victim's mouth, making a good seal. Two rescue breaths will be given to the victim. The first rescue breath will be carried out. Then the chest of the victim is observed to see whether there is a rise in their chest. If the chest does rise, second breath will be carried out. If the chest doesn't rise, second breath will be carried out after repeat the head-tilt, chin-lift maneuver. After that, chest compression is continued to carry out in order to restore circulation. An AED should be applied to the victim if the victim does not begin moving after two minutes. If an AED is not available, rescuer should continue with CPR until medical personnel arrive. ("Cardiopulmonary resuscitation (CPR): First aid", 2015).

2.3 Existing System

Since the prior days, many mobile applications were created for medical purpose. The followings are some of the common mobile applications applied in medical field.

2.3.1 First Aid - American Red Cross

First Aid - American Red Cross is a first aid application that was released officially by American Red Cross (ARC). This application allows users to access information on how to deal with the most common first aid emergencies. The mobile application is available on iOS and Android, with several features such as tutorial videos, quizzes and simple step-by-step instructions (American Red Cross, 2012).

The application consists of several tabs. The first tab, namely "Learn", which has some general information on maladies such as bleeding, head injuries, choking and more. The second tab, "Prepare", covers the topics about some preparation needed to be done for some weather events like flooding, or other issues like power outage, wildfire and more. The following tab, titled "Emergency" is a medical emergency guide. Inside this tab, users will be provided with instructions on how to help an individual who is having an asthma attack, severe bleeding, broken bone or other emergency injury or illness. Most of the categories of emergency injury or illness have provided step-by-step instructions,

accompanied by video to allow user to easily understand the steps. If an individual is experience a severe injury which will threaten their life, there is a link to dial 911 inside the app. User can directly contact 911 by click the link provided (Dan Kricke, 2012).

There is also a tab, named "Test". When a test is completed with all correct answer, user will earns a badge commemorating the achievement. User can share with their friend and off their knowledges on lifesaving skill. The test question is not only true/false or multiple choice questions. There is also some question require user to point out a specific point on an injured limb (Dan Kricke, 2012). Furthermore, there is also some tabs and functions such as "Hospital" tab which allow user to search for nearest hospital from their current location, and also donate function to give donation to American Red Cross. This mobile application is not only intended for Emergency medical technician, doctor or nurse, but also provide a great help for parents or babysitters. The contents inside the application is preloaded. This meant that user can open and having access to the content even their phone does not have internet connection (Zoe Fox, 2012).

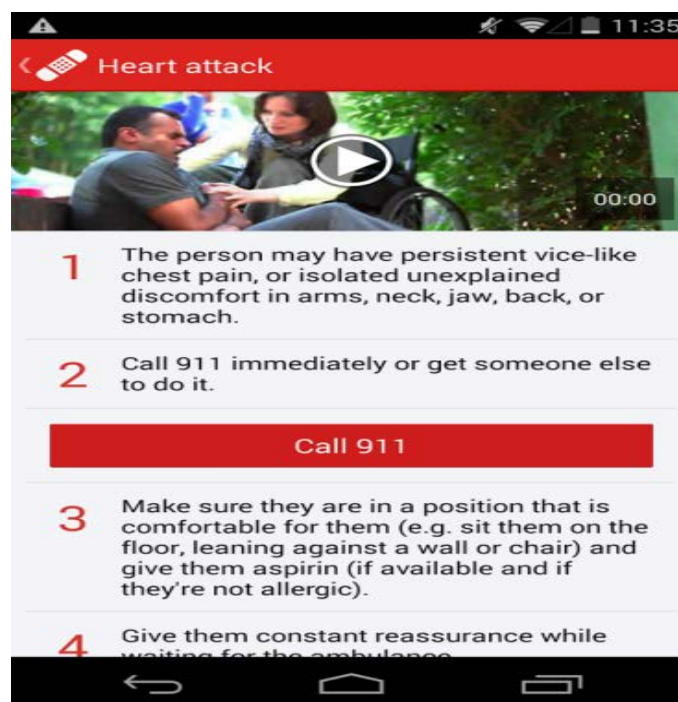


Figure 2.1 Step by step instruction with video and link to directly call 911.

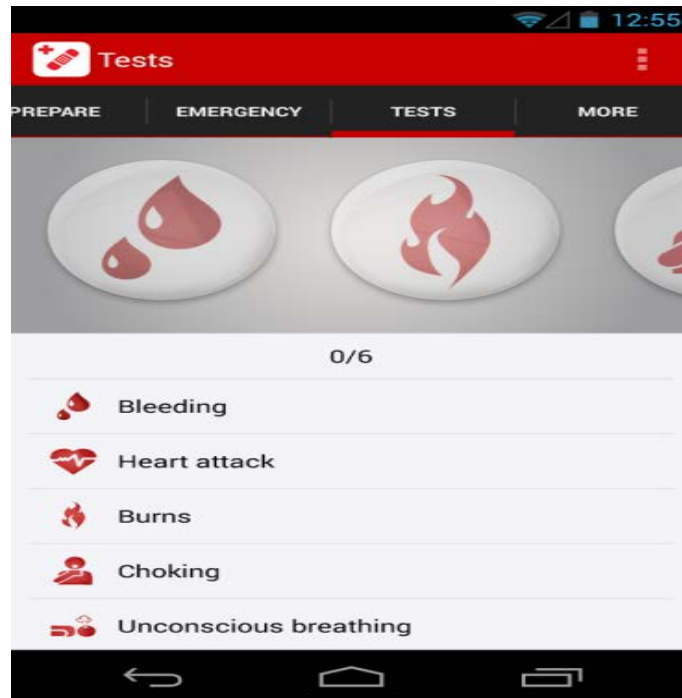


Figure 2.2 "Tests" tab with several set of questions on different subjects.

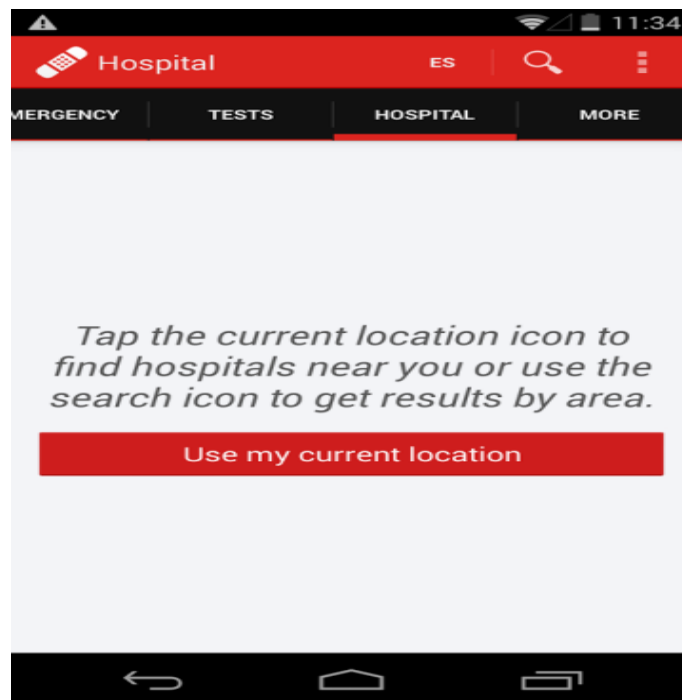


Figure 2.3 "Hospital" Tab with function to search for nearby hospital.

2.3.2 Pocket First Aid & CPR

Pocket First Aid & CPR is a mobile application created by American Heart Association (AHA). This organization had help in reduce the death caused by cardiovascular disease and stroke. This application is well known because of a man called Dan Woolley. He is a Colorado man in Haiti. He experience a serious injuries in the earthquake and manage to survive with the help of Pocket First Aid & CPR application (Iltifat Husain, MD, 2010).

The navigation of this mobile application is simple. The list of content in the application is short. The application covers the most common emergency conditions someone would encounter, such as CPR, choking, burns, and more. There is search function provided, which allow user to search for information on certain subject by just key in the keyword. For each categories such as choking, CPR or bleeding, there will have a basic information regarding the categories of injury or illness. Inside the contents, there are some hyperlink. When user click on the hyperlink, user will be navigates to page contain steps to handle different injury or illness (Iltifat Husain, MD, 2010). The application also contains collection of detailed videos that teach users how to respond to different first aid condition, whether is critical or not-so critical situation. All these contents are stored inside the mobile phones. User can directly access to the content without internet connection (ATB, 2014).

Furthermore, there is also a tab to input the user's personal medical information, such as emergency contacts, allergies & pre-existing information, blood type and so on. Once user inputted the information, they can then use the built-in search function to quickly find the information they need. This should come in handy when they need to access it when the worst happen (MarkBangs, 2014).

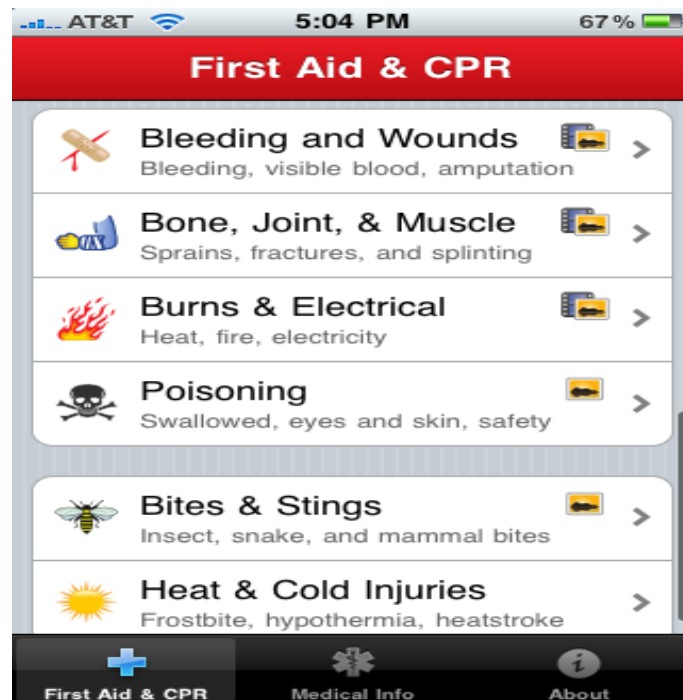


Figure 2.4 List of Content.

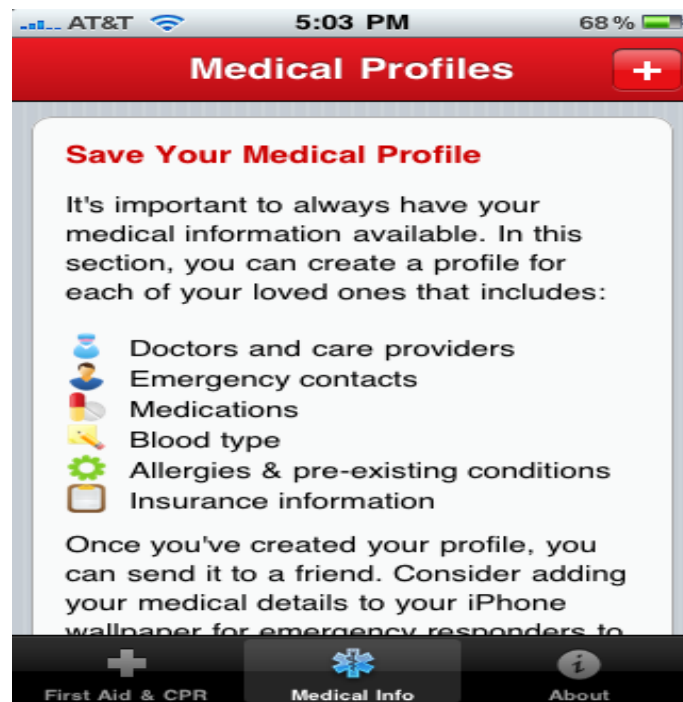


Figure 2.5 Medical Profiles page.

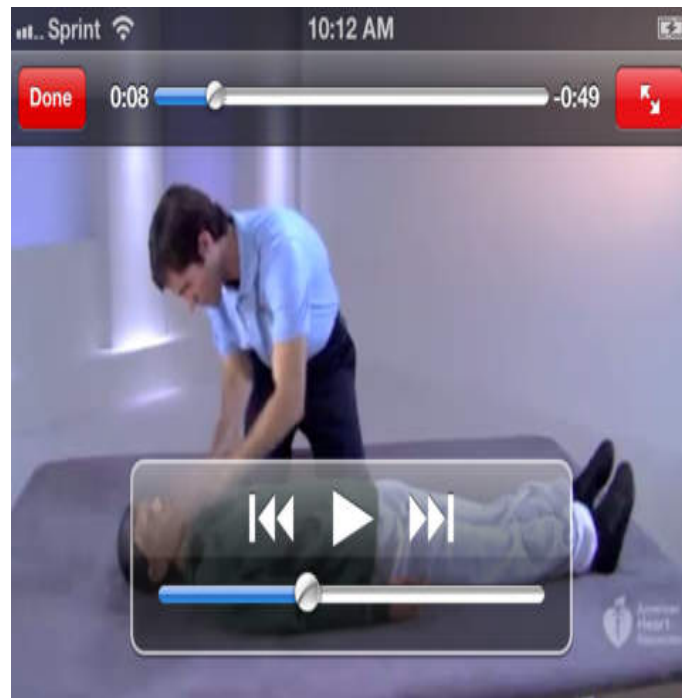


Figure 2.6 Tutorial video on doing CPR.

2.3.3 Drops First Aid

Drop First Aid is a first aid mobile application developed by Dynamisk Helse AS. The application guides and teaches user about the steps & checks that need to be undertaken in an emergency situation. Once user launched the app, there will be five scenarios to learn about, which are unconscious person, foreign object stuck in throat, stroke first person at the accident scene and internal bleeding ("Drops First Aid — A Must-Have iPhone App to Save Lives", 2013).

User need to tap on each scenario slides down the remaining cells to reveal immediate summary of steps to undertake. After user has chose one of the scenarios, there will be a page with 2 option of different level of experience. If user is just a new learner, they should choose the first level where there is a step-by-step video which will demonstrate exactly what you need to do at each stage. There is also some short written descriptions, along with the video. When the tutorial video is finish, there is some written detailed instructions and also additional photograph. If user already have basic

knowledge, they should choose another level. It will offers some additional techniques (Nick Summers, 2012).

Furthermore, this app has a progress feature. User can check the number of course they have completed. There is also a monthly reminder for each course, so that they will not forget the knowledge after a long time (Nick Summers, 2012). Besides, there is also a function which allow user to directly contact 911 inside the app (Tom, 2012).

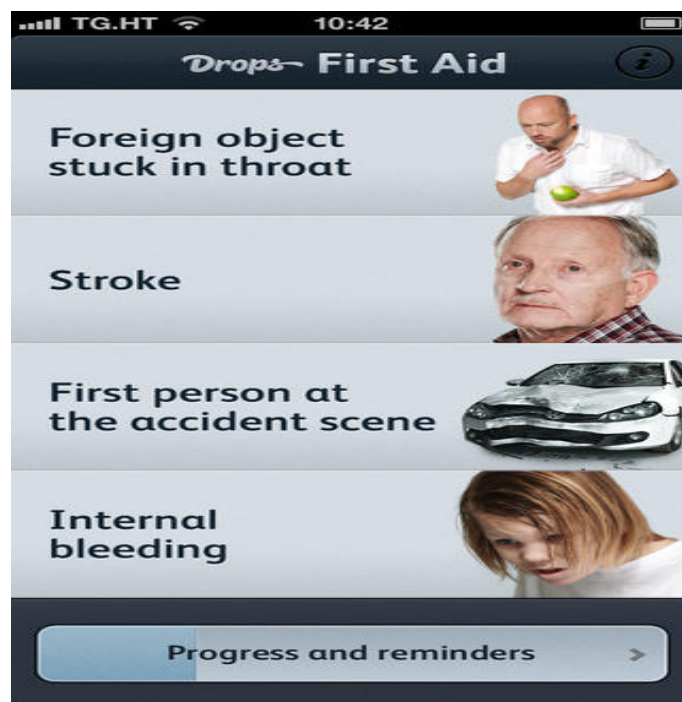


Figure 2.7 First page of the app.



Figure 2.8 Chose Level of Experience.



Figure 2.9 Step-by-step Guide.

2.3.4 Comparison between the Existing Systems

Table 2.0 shows comparison of the existing systems.

Table 2.0 The Advantages and Disadvantages of the Existing Systems.

Existing System	Features	Advantages	Disadvantages
First Aid - American Red Cross	<ul style="list-style-type: none"> • Step by step instruction with video. • Can directly call 911 inside the app. • Can search for nearby hospital. • Test with badge commemorating the achievement 	<ul style="list-style-type: none"> • Free application. • Has test function to allow user to self evaluate. 	<ul style="list-style-type: none"> • Too many tab. • Only a few video showing how to perform CPR. • No search function.
Pocket First Aid & CPR	<ul style="list-style-type: none"> • Step by step instruction with video. • Build in search function. • Medical Profiles 	<ul style="list-style-type: none"> • Simple navigation • Large quantity of video. • Create medical profiles for user and their family 	<ul style="list-style-type: none"> • Paid Application • Installation require large storage space.
Drop First Aid	<ul style="list-style-type: none"> • Step by step instruction with video. • Can directly call 911 inside the app. • Progress Features • Monthly Reminder 	<ul style="list-style-type: none"> • Simple and clean interface design. • Different level of tutorial provided for beginner and novice learner. 	<ul style="list-style-type: none"> • Not many topic is covered. • Paid application. • Only available in iOS.

2.4 Technology

2.4.1 Mobile Application

A mobile application is a software program that can be download and access by using mobile devices. A mobile apps usually cannot work on all mobile devices.

Different mobile phones will have different operating system such as Windows, iOS or Android. For each different mobile operating system, there will be a different app store online for user to download the mobile application ("Understanding Mobile Apps"). An American Internet analytics company, comScore in 2012 stated that showed that 82% of mobile media time on smart phones is via apps (Danyl Bosomworth, 2015). Currently, the two most famous mobile operating system are Android and iOS. Android operating system is used on many brand of the phone nowadays such as Samsung, Motorola, Sony and more. IOS operating system is only available in Apple product. In this project, three type of mobile application will be discussed, which are native apps, mobile web apps and hybrid apps.

2.4.1.1 Native Apps

Native apps are type application that built for specific operating system (OS). It is install through service such as Google Play or App Store. Native apps can directly interfacing with the hardware such as GPS, camera, or compass. It also can access the data and information in phone, including video, music and photo (Byron Warner, 2014). A native app is based on a binary code. Once the application is start, it will interacts directly with the underlying mobile OS. The application programming interfaces (APIs) that a mobile system and its hardware have to offer can therefore be accessed, which allow the developer to access to the integrated sensors inside the mobile phone (Stefan von Gagern, 2013). Furthermore, native apps also can work offline and having access to the notification system of the device (Raluca Budiu, 2013). It only need internet connection once they installed.

However, in native app, the code written for a particular mobile platform is not compatible with other platform. Each mobile platform has its own native programming language such as Java, Objective-C or Visual C++ (JT Mudge, 2012). Furthermore, the development cost for native apps is high. It tends to be costlier to find and hire talented mobile developers; there are usually more web developers available in a marketplace. The code required for native apps also has to be developed for multiple platforms (iOS and Android), thus increasing the amount of work and also the cost required (Byron Warner, 2014).

2.4.1.2 Mobile Web Apps

Mobile web apps are actually a website that designed to work on mobile devices. The look and feel is similar to a native app. The difference is, it run in a browser and don't have full access to the device's operating system, data, and hardware (Byron Warner, 2014). Special expertise is not required for mobile web apps. App updates for mobile web app are easier. By simply install the update on the server, users can easily access to the up-to-date data. There is no need to download and install the update from the app store. This can help to reduce the deployment and maintenance cost (Stefan von Gagern, 2013). Beside, mobile web app does not require to publish to apps store to allow user to use. It just only need to upload the contents to server so that user can access the contents online, through browser.

Mobile web apps also have it cons. The application need internet connection to operate. This is because all the contents of the apps are store at the server. In-browser caching is available in HTML5, which allow user to store the contents as cache in local storage of mobile device (Raluca Budiu, 2013). However, the application cache can be tricky to use. The local storage of the application cache is more limited than that of the native apps (Byron Warner, 2014). Furthermore, every web app always runs as part of an external native app, the web browser. Due to this reason, the apps only has limited access to APIs. It only can access partial function of the mobile device. This cause its performance become slower as compared to native apps (Stefan von Gagern, 2013).

2.4.1.3 Hybrid Apps

A hybrid app is a mobile application that is developed by using web technologies and then packaged up into a native app. Hybrid apps solve the problem of accessing mobile devices' operating system by bundling the website inside a native application. The coding inside website such as HTML, JavaScript, and CSS are bundled into the application binary where it is displayed in a Web View. Hence, developer can use their familiar web technologies, at the same time also can access to the device's operating system (Byron Warner, 2014). Hybrid apps is allow for cross-platform development.

The same HTML component can be reuse for different operating systems. Hence, it can reduce the development cost (Raluca Budiu, 2013).

A hybrid app is still access the content online. Hence, it performance will slower when compared with a native app which can access the contents without internet connection (Pietro Saccomani, 2012). Developer for hybrid app have to learn the details of building on different platform (iOS, Android). Even though the code base is the same, a different configuration is still needed to build for different platform.

2.4.1.4 The Comparisons between Types of Mobile Application

Table 2.1 shows the comparison between different types of mobile application.

Table 2.1 Advantages and Disadvantages of Different Types of Mobile Application.

Type of Mobile App	Characteristics	Advantages	Disadvantages
Native Apps	Built specifically to the needs of the different type of mobile OS	<ul style="list-style-type: none"> • Works without internet connection • Can directly interfacing with the hardware • Easier access to the integrated sensors 	<ul style="list-style-type: none"> • Higher development cost. • A specific app is need to build for each different operating systems.
Mobile Web Apps	Websites built using HTML that are designed specifically for smaller screens	<ul style="list-style-type: none"> • No need to distribute using iTunes or Google Play. • Lower deployment and maintenance cost. 	<ul style="list-style-type: none"> • Slower performance. • Require internet access.
Hybrid Apps	A native app shell that consist of feeds from the website	<ul style="list-style-type: none"> • Allow cross-platform development. • Can access mobile device's operating system by using web coding. 	<ul style="list-style-type: none"> • Slower performance than native apps. • Built to specific operating systems.

2.5 Techniques

2.5.1 Augmented Reality

Augmented reality (AR) is defined as a form of technology where an image that generated by computer generated is superimposed onto objects. AR is more realistic or near to the real world as compared to virtual reality (" What is augmented reality?").

Generally, there are 2 method in which AR is can be achieved: Marker-based, and markerless. Marker based use physical-world symbols as a reference point. The computer generated image or graphic will be overlaid into that point. For example, a 2-dimensional marker in printed and place in front of a webcam. The computer will interpret the marker and overlay an on-screen graphic. User will look like the graphic is directly located above the marker in the real world ("What is Augmented Reality?", 2010). Figure 2.10 show the augmented reality using marker-based method.



Physical real-world 'marker'



Marker transformed into 'augmented reality' when held in view of a webcam. Output as displayed on a computer screen.

Figure 2.10 Augmented Reality using Marker-based method.

Another categories of AR, markerless approach, combine the electronic device's accelerator, compass and location data to determine the position in the physical world. It can determine which device is pointing in which way and operating in which axis. The

location data can use to compare to the database to determine what the device is looking at, and thus allow the computer generated image to display on the screen. Figure 2.11 shows the navigation using AR in London.

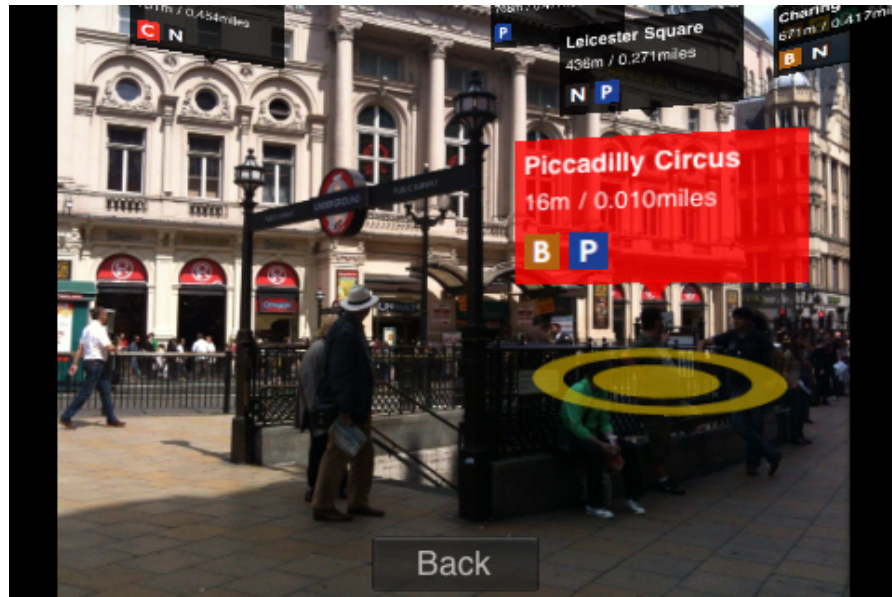


Figure 2.11 Navigation using AR in London.

2.5.2 Virtual Reality

Technically, virtual reality is used to describe a computer generated three-dimensional (3D) environment. The 3D environment can be explored and interacted with by an individual. That individual will immerse into the environment, manipulate objects and performing certain action inside the 3D environment ("What is Virtual Reality?").

In order to interact with the 3D environment, an individual needs to wear a specific gadget. One of the common gadgets is Head Mounted Display (HMD). HMD is a computer display device used to display the virtual reality scene. Users need to wear it on their head. The HMD is designed to ensure that the display monitor will always stay in front of the user's eye, no matter the user looks in which direction. In most of the HMD there will be a screen for each eye. This will make users have senses that the image they are looking at is having a depth. This can make the 3D environment become more realistic. Liquid Crystal Displays (LCD) are the commonly used monitors in an HMD. LCD

monitors are cheaper in price, lightweight and more compact. Many HMD will also include speakers or headphones in order to provide both video and audio output. There is also a tracking device in HMD to tracking the motion of the user. This is to make sure that the point of view inside the monitor will be adapted to the user movement (Jonathan Strickland). Figure 2.12 shows a person wearing the HMD.



Figure 2.12 A person wearing the HMD

2.5.3 The Comparison between Techniques

Table 2.2 show the comparison between the discussed techniques.

Table 2.2 Advantages and Disadvantages of Different Types of Techniques.

Techniques	Example of Application	Advantages	Disadvantages
Augmented Reality	<ul style="list-style-type: none"> Autodesk Showcase 2014 Zombies, Run! InfinityAR 	<ul style="list-style-type: none"> Produce a realistic computer generated image inside the real world. Can be implemented into mobile apps 	<ul style="list-style-type: none"> Content may obscure and/or narrow a user's interests or tastes. Spam and security.
Virtual Reality	<ul style="list-style-type: none"> Ship simulators Anxiety Therapy VR Training Simulators 	<ul style="list-style-type: none"> Can create any realistic environment and immerse into it via certain gadget (such as HMD) can be used in training system. (Pilot simulation system) 	<ul style="list-style-type: none"> No implement into mobile apps High cost High complexity.

2.6 Methodologies

There is various type of Software Development Life Cycle (SDLC) models have been created to help in improve the understanding on the SDLC phase. This subtopic will explained about the methodologies of the existing SDLC.

2.6.1 The Waterfall Model

This type of model is a linear sequential flow model. The progress inside the software implementation's phases is seen as flowing steadily downwards like a waterfall. Every phase need to wait for previous phase to complete in order to start. This type of model does not allow the process to return back to the previous phase (Mohamed Sami, 2012).

The stage inside the waterfall model includes requirement specifications, system design, implementation, testing, and maintenance. The testing process is only carry out after the development processes are finish. This model is risky because sometime the client of the system may want to change or improve their idea. If this is happen, the process of waterfall method need to repeat as we cannot go back to the previous process. This will cause the wasting of time. Hence, this model is usually not encourage to use unless the project already have a clear and confirm requirements. Figure 2.13 shows the phases in waterfall model.

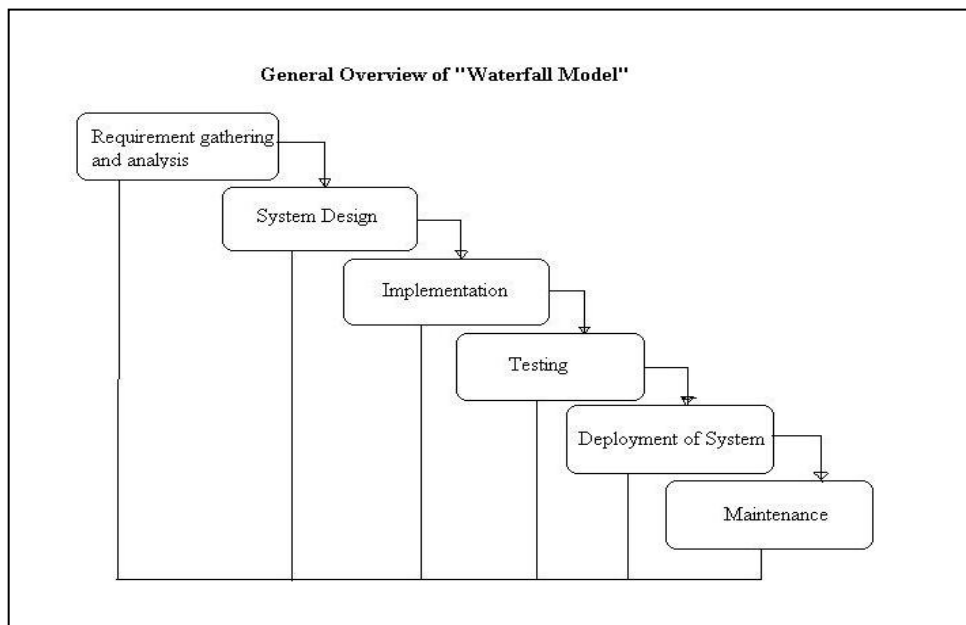


Figure 2.13 Phases in Waterfall Model.

2.6.2 The Spiral Model

Spiral model is a model that includes the iterative nature of the prototyping model and the linear nature of the waterfall model. This approach is ideal for developing software that is revealed in various versions (Tutor, 2011). Spiral model is mostly used in large projects. It is also in projects where business goals are unstable but the architecture must be realized well enough to provide high loading and stress ability (Rahul Tilloo). This model it is not suitable for low risk project and it involve high cost.

There are 6 approach phases in the spiral models. First phase is customer communication. Customer and the system analyst will communicate with each other to understand the system requirement. Second phase is planning. In this phase, the cost, schedule and resource will be estimated. The next phase is risk analysis where technical and management risks will be analyzed. After that, the following phase is engineering phase. In this phase, requirements and designs of the software system will be gathered. The following phase is construction and release. Coding, testing and deploying software will be undergoes in this phase. User-support documents is also provided in this phase. The last phase in this model is customer evaluation. Customer will evaluate and giving feedback on the system (Tutor, 2011). Figure 2.14 shows the phases in spiral model.

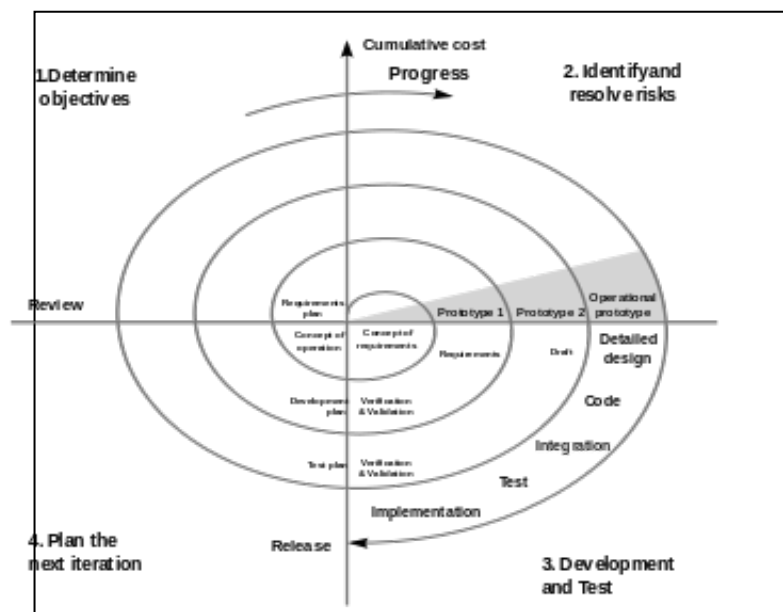


Figure 2.14 Phases in Spiral Model.

2.6.3 Rapid Application Development (RAD)

RAD is a type of incremental model. The function or component of project are developed parallel inside this model. The developments will be time boxed, delivered and assembled into a working prototype. The customer or user can quickly see something through the prototype and hence provide their feedback regarding the requirements (“What is RAD model- advantages, disadvantages and when to use it?”). RAD is often used in situations where there is a time constraint in which a shorter development time have higher priority than functionality and performance (“Rapid Application Development (RAD) and Novulo”).

RAD model consists of 4 phases. First phase is requirements planning. Inside this phase are the outline system area model of the area under study, definition of system's scope and also cost justification for new system. The next phase is user design. This phase consists of analysis of the business activities related to the proposed system. The following phase is construction phase. In this phase, system design will be finalized and the system will be built. This phase allow user to adjust or improve their requirement and also review the resulting software implementation. The last phase is cutover phase. In this phase, the new system is implemented and the changes from old system environment to the new one is also being managed. This phase also includes converting data and also use training (Parthenopi Konstantinou). Figure 2.15 shows the phases in RAD.

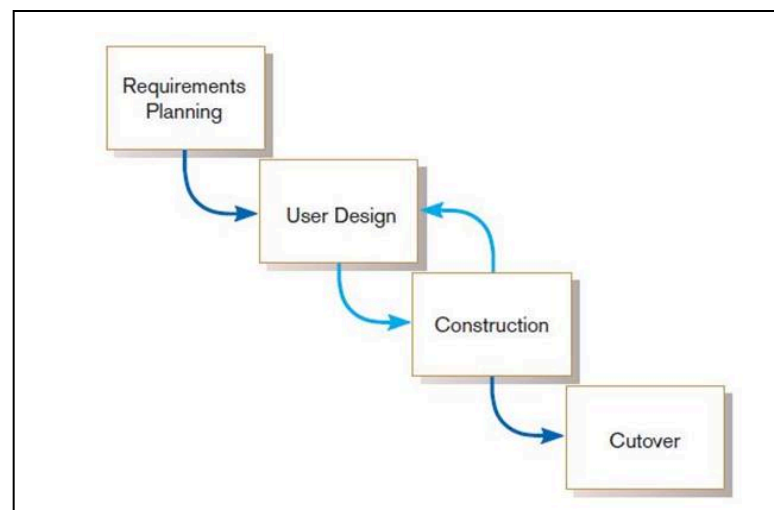


Figure 2.15 Phases in RAD.

2.6.4 Comparison between Methodologies

The table 2.3 show comparison between the discussed methodologies.

Table 2.3 Advantages and Disadvantages of Different Types of Methodologies.

Methodologies	Suitable Systems	Advantages	Disadvantages
The Waterfall Model	<ul style="list-style-type: none"> • Short project. • Project with clear and predefined requirement. 	<ul style="list-style-type: none"> • Easy to understand. • Clearly defined stage. • Easy to arrange task. 	<ul style="list-style-type: none"> • Each phase is not reversible. • Not suitable for large project.
The Spiral Model	<ul style="list-style-type: none"> • Project with high risk. • Project with complex requirement. 	<ul style="list-style-type: none"> • Able to associate with other methodologies. • Good risk management. 	<ul style="list-style-type: none"> • Not suitable for low risk project. • High in cost.
Rapid Application Development (RAD)	<ul style="list-style-type: none"> • Small project that need to be produce in short span of time (2-3 month) 	<ul style="list-style-type: none"> • Flexible and adaptable to changes. • Reduce development time. • Encourage customer feedback. 	<ul style="list-style-type: none"> • Requires highly skilled developers/designers. • High dependency on modeling skills. • Unknown cost of product.

CHAPTER 3

METHODOLOGIES

In this chapter, it will briefly discuss about the methodologies used during the development of Mobile Application on Learning Cardiopulmonary resuscitation (L-CPR). This chapter will also discuss about software and hardware specification of the project development.

3.1 Introduction

In this chapter, the steps in the development phase of Mobile Application on L-CPR will be discussed. Rapid Application Development (RAD) is used for this project. Justification on this chosen methodology will be discussed on next topic. This chapter also discussed briefly about the hardware and software requirements of the project.

3.2 Project Methodology

This project applied RAD for project development. RAD is one type of incremental model. The functions or component is being modeled and developed in parallel. The development will be time boxed and delivered into a working prototype.

This can help the user or customer to be able to easily give their opinion or feedback on the project requirements ("What is RAD model- advantages, disadvantages and when to use it?").

RAD is based on the idea of reusing codes and tools from previous development. For RAD, instead of create own unique coding, the developer will use other software or tools and also other graphical user interface (GUI) to create a system. Beside RAD also rely on reusing the available code and fit in into the intended system. Hence it development time will be shorter ("Rapid Application Development", 2008).

The development cycle of RAD also enlists the help of the users. The user will give feedback from time to time to ensure the system being developed could match preferences. A good user feedback can be ensure since user ideas will be acknowledged. Besides that, RAD also reduces stress in creating GUI, coding and structure. This is because it have a remote possibility of being trashed by users ("Rapid Application Development", 2008).

3.3 Justification of Chosen Methodology

RAD is one type SDLC model. It is a model that is suitable for small project which need to be finish on short period of time. Mobile Application on L-CPR is about creating a mobile application for teaching CPR. It is not consider as a large project as it complexity is not that high. Besides that, this project also does not require some expensive and high technology gadget which will cause a high risk in the project.

RAD is a better development model as compared to the traditional SDLC model. The traditional SDLC model follows a rigid process model which more emphasize on requirement analysis and gathering before the coding process start. The customer has to make a confirm requirement which usually cannot be change at later time. Due to this, user will not get the feel of the products as there is no working prototype for a long period of time ("SDLC - RAD Model"). In term of this problem, RAD is more flexible. There will be a prototype being build to allow user see the progress of the project.

Sometime user might feel that their original requirement is not suitable after seeing the prototype. In this case, they can give feedback to developer. Developer can go back to the design phase all update any requirement in the design phase of RAD. This make RAD is flexible as it can always swap between the construction phase and design phase in order to satisfy user requirement.

Furthermore, the development time in RAD is faster. This is due to the prototype is being created during the project development. All the prototype that being build during the project development is kept for future use. If a component is being picked from previous prototype and it is tested before, the testing time can be saved as it no need to be tested for second time. Hence, the reusability of the component can help in reduce the development time. In relation to this, the cost for development will also reduce ("The Advantages and Disadvantages of RAD Software Development").

In conclusion, all the above is the justification of choosing RAD as the SDLC model for this project.

3.4 The Stages of Chosen Methodology

RAD consists of 4 phases which are requirements planning, user design, construction and cutover. There is a multipath between user design phase and construction phase. This meant that we can always swap between user design and construction phase.

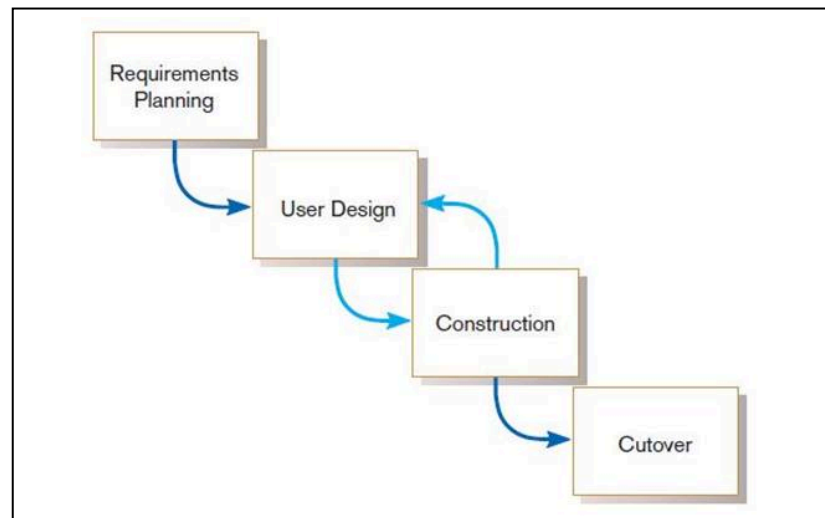


Figure 3.0 Phases in RAD.

3.4.1 Requirements Planning

The requirement planning stage consists of a review of the areas that related to the proposed system or project. According to the review, we can get the definition of the system requirements in term of what function the system will support. An interview with client is carry out. Refer Appendix B for client approval letter. Then, the problem statement, objective and scope of the project will be identified. The main objective of the project is to develop a mobile application to teach the technique of Cardiopulmonary resuscitation (CPR). The main problem statement is that many people don't know the basic step to apply CPR when there is an emergency happen. The target user of this project is people from all ages. Literature review is also carry out in this phase. In literature review there will be a comparison between different technology, techniques and also similar existing system. For existing system, 3 existing systems are chose for comparison, which are First Aid - American Red Cross, Pocket First Aid & CPR and Drop First Aid. These existing systems are compare in term of feature, advantages and disadvantages. Through the comparison, the basic requirement of the project is obtained. During this stage, software requirement specification (SRS) is created. Refer Appendix D for SRS.

3.4.2 User Design

In this stage, a prototyping of system input, process and output are being designed. Base on the all the requirement collected from literature review and user, the proposed system will be illustrate in term of user interfaces, structures and contents. Story Board and Data Flow Diagram (DFD) will be create to explain the graphical user interface of the proposed system. Story board will describe briefly the layout and content of each screen of the propose system. DFD will be use to explain the input. Process and output require to interact with the user interface of the proposed system. The content of the proposed system consist of 4 part, which are traditional note, video tutorial, Augmented Reality (AR) tutorial and also quiz. During this stage, software design document (SDD) is created. Refer Appendix E for SDD.

3.4.3 Construction

In this stage, the real system will be build based on the prototype created in user design phase. However, any changes or modification still can be carried out to improve the functionality and quality of the system. User can giving feedback so that the system can still be adjusted to favor the user's requirement. Before this stage finish, the system will be put through a series of test. This is to make sure that each component of the system work well, according to the user's requirement.

The unique of the project is the implementation of AR technique. AR technique is actually divide into 2 type: marker-based and markerless. Marker-based method is being chose to create the AR in the project. Marker-based AR using some physical symbol (marker) which act as a reference point. The marker is then used to display the computer graphic (What is "Augmented Reality?", 2010).

The marker based AR has an architecture which contain 5 modules, which are Camera Module, Image Capturing Module, Image Processing Module, Marker Tracking Module and Rendering Module. In first module, a live scene captured by the camera and act as the input to Camera Module. The second module is the Image Capturing Module. This module analyze the scene and generate it into a binary image which only consist of two values for every pixel (black or white). This binary image is act as an input for the

next module which is the Image Processing Module. In Image Processing Module, an image processing technique is used to process the binary image. The purpose of this process is to detect the AR marker. Detection of marker can help to determine the position of the marker, which allows us to place the object onto the marker correctly. The location of the marker will act as the input for the Rendering Module (Raviraj S. Patkar, 2013).

In the Marker Tracking Module, the relative pose of the camera in real time is calculated. The word "pose" refers to the degree of freedom (DOF) position. The value of pose calculated will become the input for the Rendering Module. There are two inputs inside the Rendering module: the pose value from the Marker Tracking Module and the Virtual Object that will be augmented. The virtual component will be combined with the original image by using the value of pose. The augmented image is then rendered on the screen of the mobile phone (Raviraj S. Patkar, 2013). Figure 3.1 shows the AR system architecture.

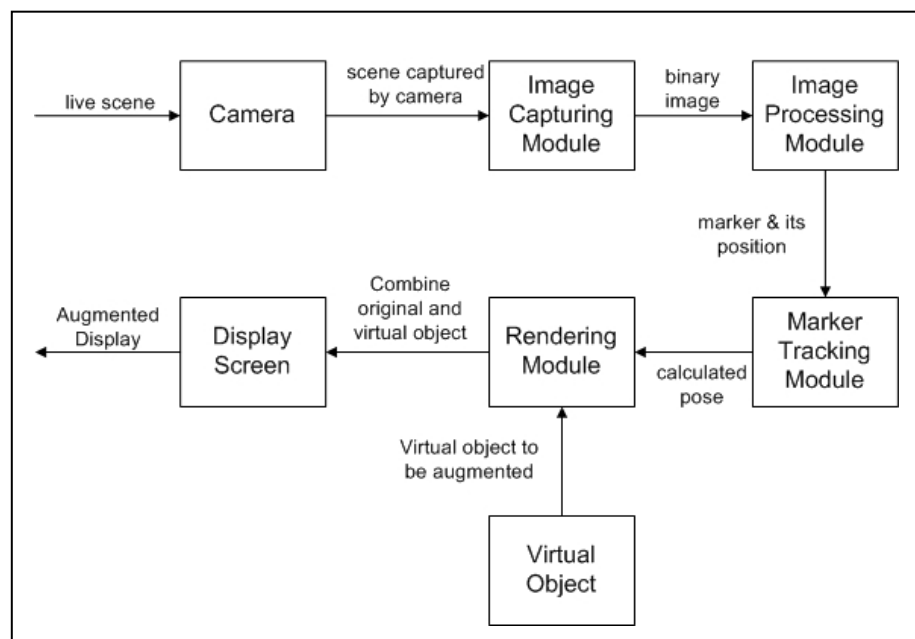


Figure 3.1 AR System Architecture.

3.4.4 Cutover

A completed version of Mobile Application on L-CPR will be executed in this stage. The validation and testing process will also carry out by user in this phase. The testing will be test in term of functionality, acceptability and user-friendly. After user test the system, the evaluation and feedback from user will be recorded. There is also documentation occur in this stage. During this stage user acceptance test (UAT) will be carry out and documented for future use. Refer Appendix F for the UAT.

3.5 Hardware Requirements

This subtopic discuss about the hardware required for L-CPR development environment. The hardware requirements to be used are listed as below:

- a. For developer, the hardware specifications are:
 - i. At least 2.00 GHz of Central Processing Unit (CPU)
 - ii. At least 2GB of Random Access Memory (RAM)
 - iii. 64-bit performance, 1024 x 678 resolution.
- b. For user's mobile phone, the minimum hardware specifications are listed as below:
 - i. At least 4.0 screen size
 - ii. At least 1GHz Central Processing Unit (CPU)
 - iii. At least 512MB Random Access Memory (RAM)
 - iv. At least 100MB internal Storage

3.6 Software Requirements

This subtopic discuss about the software required for Mobile Application on L-CPR development environment. The developer's software requirements to be used are listed below:

Purpose	Software
Operating System	Microsoft Windows 8.1 Professional
Develop prototype of L-CPR	Android Studio, Wikitude SDK, Autodesk Maya 2015
Screen interface design	Adobe Photoshop CS 5
Documentation	Microsoft Office 2013/2
Modeling and Designing	Microsoft Visio 2007
Planning for milestone of project	Microsoft Project 2007

For user's software requirements, the mobile phones is should be at least Android 4.0 or above.

3.7 Gantt Chart

The Gantt chart is create by to show the timeline planning for the whole project. It timeline is follow the phrase included inside the RAD model, which are requirement planning, user design, construction and cutover. First 2 phrase is carry out during Undergraduate Project 1 while the other phrases are carried out during Undergraduate Project 2. Refer Appendix A for the Gantt chart.

CHAPTER 4

IMPLEMENTATION, TESTING AND RESULT DISCUSSION

This chapter discussed about the implementation of the project named Mobile Application on Learning Cardiopulmonary resuscitation (L-CPR). Detailed process which were carried out in the project will be discussed in this chapter.

4.1 Introduction

This chapter will describe the process inside the mobile application. This chapter will also discussed deeper about the issue while developing the Mobile Application on L-CPR, including some source code.

4.2 Implementation on data / model / process / hardware

Figure 4.0 shows the home page of the Mobile Application on (L-CPR). There are 4 button available in home page, which are notes, videos, AR and quiz. Every button will be navigate user to different new page. A function `OnClickButtonListener()` is declared. Inside the function, method `Intent intent = new Intent("com.example.lai.l_cpr.Notes");` is being used to navigate user to a specific space

when the button is being clicked. Figure 4.1 is showing the code inside the button to navigate to other page.

Furthermore, there is an exit icon which located at right corner of the screen. It is an image Button which produce a dialog box, asking user confirmation to close the application. Figure 4.2 shows the confirmation dialog box for exit. Figure 4.3 shows the source code using to create confirmation dialog box when user click the exit image button.

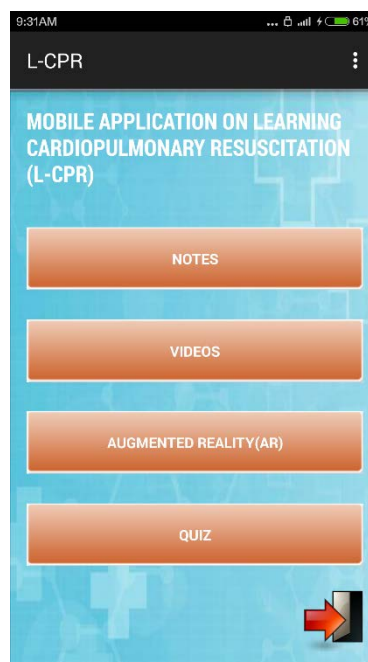


Figure 4.0 Home Page for Mobile Application on L-CPR.

```

public void OnClickButtonListener() {
    buttonNote=(Button)findViewById(R.id. btnNotes);
    buttonNote.setOnClickListener((v) -> {
        Intent intent = new Intent("com.example.lai.l_cpr.Notes");
        startActivity(intent);
    });

    buttonVideo=(Button)findViewById(R.id. btnVideos);
    buttonVideo.setOnClickListener((v) -> {
        Intent intent = new Intent("com.example.lai.l_cpr.Videos");
        startActivity(intent);
    });

    buttonAR=(Button)findViewById(R.id. btnAR);
    buttonAR.setOnClickListener((v) -> {
        Intent intent = new Intent("com.example.lai.l_cpr.Augmented_Reality");
        startActivity(intent);
    });

    buttonQuiz=(Button)findViewById(R.id. btnQuiz);
    buttonQuiz.setOnClickListener((v) -> {
        Intent intent = new Intent("com.example.lai.l_cpr.Quiz");
        startActivity(intent);
    });
}

```

Figure 4.1 Coding for Button in Home Page.

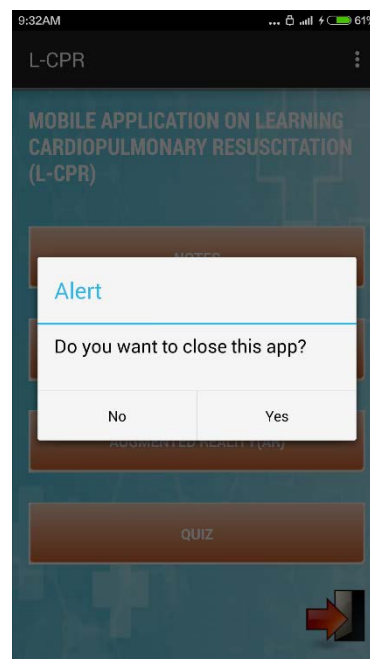


Figure 4.2 Confirmation Dialog Box for Exit.

```

        buttonExit=(ImageButton)findViewById(R.id. imgBtnExit);
        buttonExit.setOnClickListener((v) -> {
            AlertDialog.Builder a_builder = new AlertDialog.Builder(Home.this);
            a_builder.setMessage("Do you want to close this app?")
                .setCancelable(false)
                .setPositiveButton("Yes", (dialog, which) -> {
                    finish();
                })
                .setNegativeButton("No", (dialog, which) -> {
                    dialog.cancel();
                });
            AlertDialog alert = a_builder.create();
            alert.setTitle("Alert");
            alert.show();
        });
    }

```

Figure 4.3 Coding for Exit Function.

When user choose the “NOTES” button in home page, user will navigated to note menu page. Figure 4.4 shows the notes menu page. There is a list of item inside the screen. The items are created by using list view. Figure 4.5 shows the code to create items inside the list view. ListAdapter is used to create and assign the name and size of the item inside the list view. Apart from that, a new java class MyAdapter is also created to insert the arrow shaped bullet point and align it with each list view’s item. Figure 4.6 shows the coding of MyAdapter java class.



Figure 4.4 Note Menu Page

```

public void listView() {
    list_view= (ListView)findViewById(R.id.listView);
    ListAdapter adapter = new MyAdapter(this,CONTENT);
    list_view.setAdapter(adapter);
    list_view.setOnItemClickListener(new AdapterView.OnItemClickListener() {
        @Override
        public void onItemClick(AdapterView<?> parent, View view, int position, long id) {
            String value = (String)list_view.getItemAtPosition(position);
            Toast.makeText(Notes.this,value, Toast.LENGTH_SHORT).show();

            if(value.equals("Introduction")){
                Intent intent = new Intent("com.example.lai.l_cpr.Note_Introduction");
                startActivity(intent);
            }
            else if(value.equals("CPR on Adult")){
                Intent intent = new Intent("com.example.lai.l_cpr.Note_Adult");
                startActivity(intent);
            }
            else if(value.equals("CPR on Children")){
                Intent intent = new Intent("com.example.lai.l_cpr.Note_Children");
                startActivity(intent);
            }
            else if(value.equals("CPR on Infant")){
                Intent intent = new Intent("com.example.lai.l_cpr.Note_Infant");
                startActivity(intent);
            }
        }
    });
}

```

Figure 4.5 Code to Create Items Inside the List View.

```

class MyAdapter extends ArrayAdapter<String>{
    public MyAdapter(Context context, String[] values){
        super(context, R.layout.row_layout_2, values);
    }

    @Override
    public View getView(int position, View convertView, ViewGroup parent) {
        LayoutInflater theInflater = LayoutInflater.from(getContext());
        View theView = theInflater.inflate(R.layout.row_layout_2, parent, false);
        String content = getItem(position);
        TextView theTextView = (TextView)theView.findViewById(R.id.textView1);

        theTextView.setText(content);
        ImageView theImageView = (ImageView) theView.findViewById(R.id.imageView1);

        theImageView.setImageResource(R.drawable.arrow_bullet);
        return theView;
    }
}

```

Figure 4.6 Coding for MyAdapter Java Class

When user click the item inside the list view, it will redirect user to another page. For example, when user click the “Assess Situation” item inside the list view, it will redirect user to assess situation note page. Figure 4.7 shows the assess situation note page. There are few fragment layout being created, each fragment represent one page of the notes. The assess situation page will display different fragment when user click on the next arrow at the bottom right corner. There is a box at the bottom of page, telling user they are reading which fragment of content. Figure 4.8 shows the coding for display different fragment when user click on the next arrow.



Figure 4.7 Introduction Note Page

```

public void changeFragment(View view){

    page=(Button)findViewById(R.id.btnPage);
    next=(ImageButton)findViewById(R.id.imgBtnNext);

    if( view == findViewById(R.id.imgBtnNext)){

        if(page.getText().toString().equals("1/6")){
            fragment = new AssessSituation_Frag2();
            FragmentManager fm = getFragmentManager();
            FragmentTransaction ft = fm.beginTransaction();
            ft.replace(R.id.fragment_place, fragment);
            ft.commit();

            page.setText("2/6");
        }
        else if(page.getText().toString().equals("2/6")){
            fragment = new AssessSituation_Frag3();
            FragmentManager fm = getFragmentManager();
            FragmentTransaction ft = fm.beginTransaction();
            ft.replace(R.id.fragment_place, fragment);
            ft.commit();

            page.setText("3/6");
        }
    }
}

```

Figure 4.8 Coding for Loading Different Fragment

When user choose the “VIDEOS” button in home page, user will navigated to video menu page. Figure 4.9 shows the video menu page. There is a list of item inside the screen. The items are created by using list view. The items and the arrow shaped bullet points inside the list view are create by using the same method as that inside the note menu page. When user click the item inside the list view, it will redirect user to another page. For example, when user click the “CPR on Adult” item inside the list view, it will redirect user to assess video of adult CPR page. Figure 4.10 shows the video of adult CPR page.



Figure 4.9 Video Menu Page.

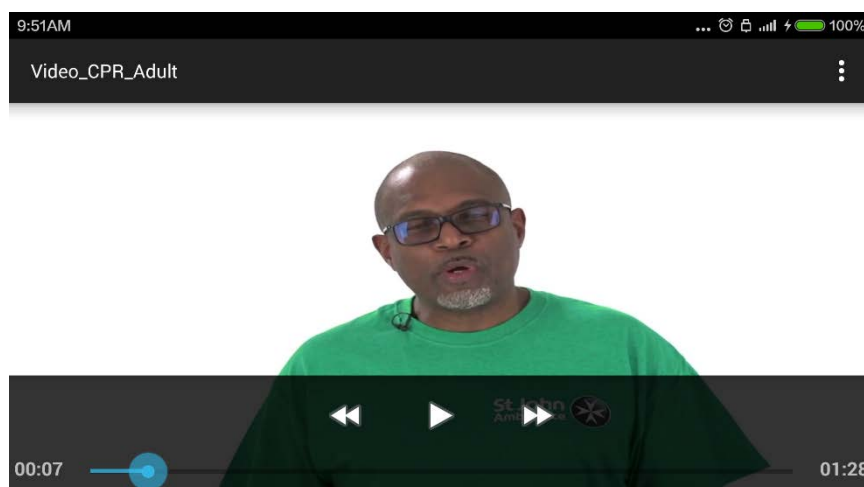


Figure 4.10 Video of Adult CPR Page.

When user choose the “QUIZ” button in home page, user will navigated to video menu page. Figure 4.11 shows the video menu page. There is a list of item inside the screen. The items are created by using list view. When user click the item inside the list view, it will redirect user to another page. For example, when user click the “Quiz 1” item inside the list view, it will redirect user to assess video of adult Quiz page. Figure 4.12 shows the video of adult CPR page. After user finish all the quiz, they will be redirected to quiz result page to check their score. Figure 4.13 show the quiz result page.

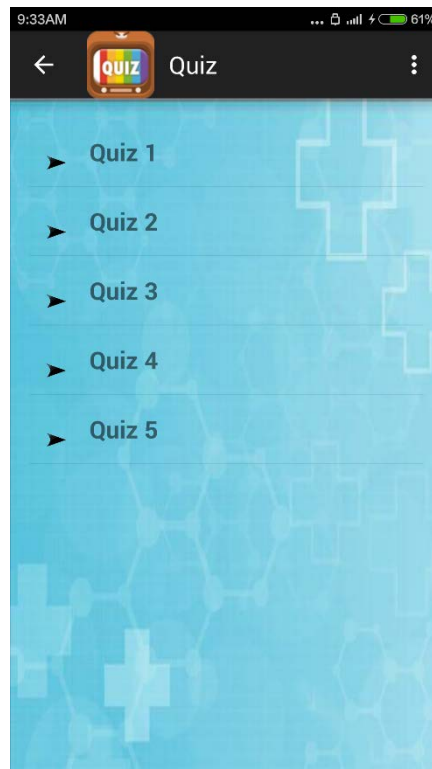


Figure 4.11 Quiz menu page.

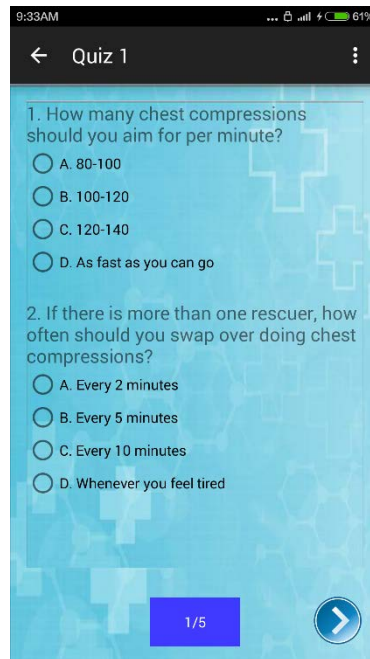


Figure 4.12 Quiz page.

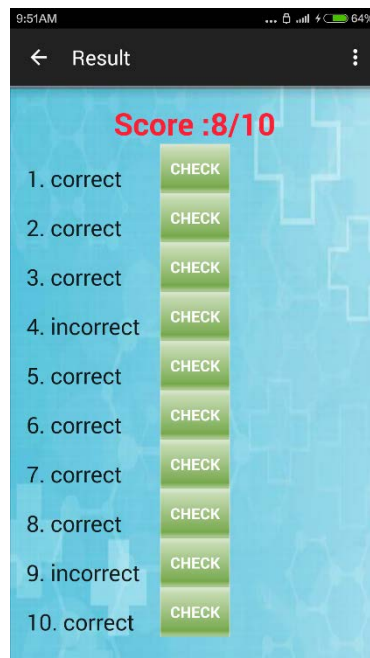


Figure 4.13 Quiz result page.

For the Augment Reality part, user see 3D animation appear when they scan the given marker with their phone camera. The animation and the 3D model are built by using Maya 2015. The 3D human model rigged with skeletons which allow the model can have more natural movement, similar to the movement of real human. The animation is created by using key frame. Figure 4.14 shows the example scene inside the Maya 2015 when creating the 3D animation.

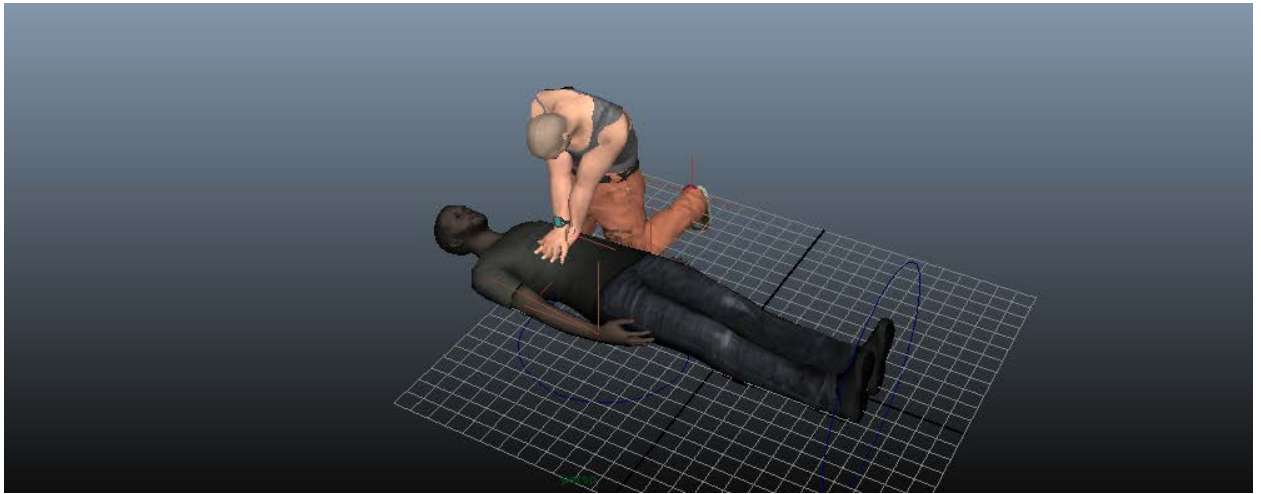


Figure 4.14 Animation Scene Inside Maya 2015.

Wikitude SDK is import into android studio in order to display the Augmented Reality inside the mobile application. Figure 4.15 show some part of coding in android studio on importing the SDK library file into android studio and load the 3D animation. Figure 4.16 shows the coding in javascript for setting marker and loading specific 3D animation through the marker. Figure 4.17 is the output of the mobile application when scan the targeted marker.

```

ArchitectView architectView;

@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.activity_augmented_reality);

    this.architectView = (ArchitectView) this.findViewById(R.id.architectView);
    final StartupConfiguration config = new StartupConfiguration("RfWS00v1b7bwZzdogsCs/IC2fQ3GRkp4/YMaLMngxjfb0+o7PKB/ePT
    this.architectView.onCreate( config );
}

@Override
protected void onStart(Bundle savedInstanceState) {
    super.onStart(savedInstanceState);

    if (this.architectView != null) {

        // call mandatory live-cycle method of architectView
        this.architectView.onStart();

        try {
            // load content via url in architectView, ensure '<script src="architect://architect.js"></script>' is part of this HT
            this.architectView.load("CPR/index.html");
        } catch (Exception e) {
            // TODO: Handle exception
        }
    }
}

```

Figure 4.15 Coding for Loading Wikitude SDK.

```

var World = {
    loaded: false,
    trackableVisible: false,

    init: function initFn() {
        this.createOverlays();
    },

    createOverlays: function createOverlaysFn() {
        /**
         * First an AR.Tracker needs to be created in order to start the recognition engine. It is initialized with a URL specific to the target collection. Op
         * Important: If you replace the tracker file with your own, make sure to change the target name accordingly.
         * Use a specific target name to respond only to a certain target or use a wildcard to respond to any or a certain group of targets.
         */
        this.tracker = new AR.Tracker("assets/cpr.wt3", {
            onLoaded: this.loadingStep
        });

        /**
         * 3D content within Wikitude can only be loaded from Wikitude 3D Format files (.wt3). This is a compressed binary format for describing 3D content whi
         * Create an AR.Model and pass the URL to the actual .wt3 file of the model. Additional options allow for scaling, rotating and positioning the model i
         * A function is attached to the onLoaded trigger to receive a notification once the 3D model is fully loaded. Depending on the size of the model and w
         */
        this.model = new AR.Model("assets/cpr.wt3", {
            onLoaded: this.loadingStep,
            /**
             * The drawables are made clickable by setting their onClick triggers. Click triggers can be set in the options of the drawable when the drawable i
             * Inside the toggleAnimateModel() function, it is checked if the animation is running and decided if it should be started, resumed or paused.
             */
        });
    }
};

```

Figure 4.16 Javascript Coding for Loading 3D animation.



Figure 4.17 Output of Screen Scanning the Targeted Marker.

4.3 Testing and Result Discussion

After the system is develop, some test case in carry out for the testing purposes.

Tables below show the test case related to the project. Table 4.0 Test Case 1

No.	1
Test Case	Launch the application
Description	<p>The application should launch smoothly in mobile device.</p> <p>Prerequisite:</p> <ol style="list-style-type: none"> 1. The application must be installed inside the mobile device.
Test Steps	<ol style="list-style-type: none"> 1. Tap the icons of the application on the mobile device.
Expected Results	<ol style="list-style-type: none"> 1. Home page will be displayed.
Result: (Pass/Fail)	PASS

Table 4.1 Test Case 2

No.	2
Test Case	Home page
Description	<p>The application should display the home page with Title , 4 button (NOTES, VIDEOS, AR,QUIZ)and an image button</p> <p>Prerequisite</p> <ol style="list-style-type: none"> 1. All the button must be set to function. 2. The Image button must be set to function.
Test Steps	<ol style="list-style-type: none"> 1. Click each of the 4 Button. 2. Click the image Button.
Expected Results	<ol style="list-style-type: none"> 1. For each of the 4 button, it will navigate to different page respectively. 2. For clicking image button, there will be pop out message displayed.
Result: (Pass/Fail)	PASS

Table 4.2 Test Case 3

No.	3
Test Case	Note menu page
Description	<p>The application should display a list view with a list of note title.</p> <p>Prerequisite</p> <ol style="list-style-type: none"> 1. Click the NOTES button in home page.
Test Steps	<ol style="list-style-type: none"> 1. Click the item inside the list view.

Expected Results	1. For each item inside the list view is being clicked, it will navigate to different note page respectively.
Result: (Pass/Fail)	PASS

Table 4.3 Test Case 4

No.	4
Test Case	Note page
Description	<p>The application should consist content of note in form of textview, a text box showing current page, and 2 image button with arrow back and arrow next image.</p> <p>Prerequisite</p> <ol style="list-style-type: none"> 1. Click the item of the list view in note menu page.
Test Steps	<ol style="list-style-type: none"> 1. Click both of the image button
Expected Results	<ol style="list-style-type: none"> 1. For clicking both image button, it can be navigate to different page inside the note. 2. The text page will showing the correct current page.
Result: (Pass/Fail)	PASS

Table 4.4 Test Case 5

No.	5
Test Case	Video menu page
Description	The application should display a list view with a list of video title.

	Prerequisite 1. Click the VIDEOS button in home page.
Test Steps	2. Click the item inside the list view.
Expected Results	2. For each item inside the list view is being clicked, it will navigate to different note page respectively.
Result: (Pass/Fail)	PASS

Table 4.5 Test Case 6

No.	6
Test Case	Video page
Description	The application should play the video in landscape more Prerequisite 1. Click the item of the list view in video menu page.
Test Steps	1. Check the pause, play fast forward and back forward function inside the video.
Expected Results	1. The pause, play fast forward and back forward function inside the video function well.
Result: (Pass/Fail)	PASS

Table 4.6 Test Case 7

No.	7
Test Case	AR page
Description	The application should open the mobile phone's camera Prerequisite 1. Click the AR button in home page.
Test Steps	1. Scan the 3D marker given with the camera 2. Click on the 3D model if the first step is success.
Expected Results	1. 3D model display when scan the target using camera. 2. There is animation displayed when click on the 3d models
Result: (Pass/Fail)	PASS

Table 4.7 Test Case 8

No.	8
Test Case	Quiz menu page
Description	The application should display a list view with a list of Quiz title. Prerequisite 1. Click the QUIZ button in home page.
Test Steps	3. Click the item inside the list view.
Expected Results	3. For each item inside the list view is being clicked, it will navigate to different note page respectively.
Result:	PASS

(Pass/Fail)	
-------------	--

Table 4.8 Test Case 9

No.	9
Test Case	Quiz page
Description	<p>The application should consist content of quiz in form of text view and radio button. There is a text box showing current page, and 2 image button with arrow back and arrow next image. Submit button is available in the last page.</p> <p>Prerequisite</p> <ol style="list-style-type: none"> 1. Click the item of the list view in note menu page.
Test Steps	<ol style="list-style-type: none"> 1. Click both of the image button 2. Click the submit button on the last page of quiz page.
Expected Results	<ol style="list-style-type: none"> 1. For clicking both image button, it can be navigate to different page inside the note. 2. Submit button will navigate user to quiz result page.
Result: (Pass/Fail)	PASS

Table 4.9 Test Case 10

No.	10
Test Case	Quiz result page
Description	<p>The application should consist of large text view showing the score. There is also 10 medium text view showing result of each question (correct/incorrect). Beside reach of the 10 medium text view, there is a check button to showing the question with correct answer.</p> <p>Prerequisite</p> <ol style="list-style-type: none"> 1. Click the item of the submit button in the last page of the quiz page.
Test Steps	<ol style="list-style-type: none"> 1. Check the score and result for each question display on the text view. 2. Click each of the check button.
Expected Results	<ol style="list-style-type: none"> 1. Score and result for each question display correctly. 2. Each check button will have a pop out menu showing the question and correct answer
Result: (Pass/Fail)	PASS

The application is also undergo User Acceptance Test (UAT). The client use the application and given signing the UAT document for evidence. Refer Appendix F for UAT.

CHAPTER 5

CONCLUSION

This chapter discussed about the conclusion of the project named Mobile Application on Learning Cardiopulmonary resuscitation (L-CPR). In this chapter, research constraint will be discussed. Last section on this chapter will emphasize on the future work.

5.1 Introduction

In conclusion, the project with title Mobile Application on Learning Cardiopulmonary Resuscitation (L-CPR) is a project to create a mobile application that teach people the knowledge of CPR. Some part of the application will have the common function such as notes, video tutorial and quiz. There is one additional function being added, which are Augmented Reality (AR). By using AR method, we can created a virtual 3D model to demonstrate the step in performing CPR. AR will attract more people interest to use this application and hence can attract more people to learn the knowledge of CPR.

5.2 Research Constraint

The constraint when in development of the project is limited time. There is some basic function inside of this application such as note, video and quiz. There is an additional function inside the application, which is AR. In order to embed the AR function inside the application. A Wikitude SDK library is need to include inside the application. It take time to link the Wikitude SDK and create code for loading the AR using Wikitude SDK. Furthermore, the creation of 3D animation inside the AR function is also require quite a long time Firstly, the 3D model is created by using Autodesk Maya 2015. The models are then add key frame to create the animation. After that, the animation will be export and load into the mobile application.

5.3 Future Work

For future work, more 3D model should be built to be loaded into the AR. The interface inside the AR scene can also be improve by adding my button, sound and also some stylish text. This application can be further develop so that it also can be running inside different mobile operating system (OS) such as Window or iOS. Furthermore, in order to make the application more interesting and attractive to the user. We can add the hologram technology inside the application. A hologram is a physical structure that diffracts light into an image. The term ‘hologram’ can refer to both the encoded material and the resulting image. A holographic image can be seen by looking into an illuminated holographic print or by shining a laser through a hologram and projecting the image onto a screen. Through hologram, the 3D animation can display directly on top of the mobile phone’s screen. This techniques will increase the level of realistic as compare to the AR.

REFERENCES

1. Andrew H. Travers, (2010). 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Retrieved from <http://circ.ahajournals.org/>
2. Ashraf Anwar, " A Review of RUP (Rational Unified Process)", International Journal of Software Engineering (IJSE), Volume (5) : Issue (2) : 2014
3. Byron Warner,(2014). Mobile Apps: Deciding Which App Type Is Best. Retrieved from <http://techblog.constantcontact.com/software-development/best-app-type-for-mobile-apps/>
4. Cardiac Arrest Symptoms and Causes. (2014). Retrieved from http://www.medicinenet.com/cardiac_arrest_symptoms_and_causes/views.htm
5. Cardiopulmonary Resuscitation (CPR). (2015). Retrieved from http://www.emedicinehealth.com/cardiopulmonary_resuscitation_cpr/article_em.htm
6. Cardiopulmonary resuscitation (CPR): First aid. (n.d.). Retrieved from <http://www.mayoclinic.org/first-aid/first-aid-cpr/basics/ART-20056600?p=1>
7. Charles P. Davis, MD, PhD. (n.d.). Sudden Cardiac Arrest. Retrieved from http://www.emedicinehealth.com/sudden_cardiac_arrest/article_em.htm
8. Claire Peel, "The Cardiopulmonary System and Movement Dysfunction", Physical Therapy. Volume 76 . Number 5 . May 1996
9. CPR (cardiopulmonary resuscitation). (n.d.). Retrieved from <http://www.cardiachealth.org/cpr-cardiopulmonary-resuscitation>.
10. Dan Kricke,(2014). First Aid By American Red Cross is a fix for what ails you. Retrieved from <http://www.appolicious.com/articles/12365-first-aid-by-american-red-cross-is-a-fix-for-what-ails-you>

11. Danyl Bosomworth, MD,(2015) Statistics on mobile usage and adoption to inform your mobile marketing strategy. Retrieved from <http://www.smartinsights.com/mobile-marketing/mobile-marketing-analytics/mobile-marketing-statistics/>
12. Drop First Aid App Review. (2012). Retrieved from <http://www.armenante.co.uk/2012/12/drops-first-aid-app-review/>
13. First Aid App. (n.d.). Retrieved from <http://www.redcross.org/mobile-apps/first-aid-app#accessibletabscontent0-1>
14. Iltifat Husain, MD,(2010). iPhone Medical App Used to Survive Earthquake: Survivor Treated an Open Leg Fracture and Head Laceration Successfully. Retrieved from <http://www.imedicalapps.com/2010/01/iphone-medical-app-treat-earthquake-hait/>
15. Iltifat Husain, MD,(2010). Pocket First Aid & CPR App Used to Save Life – In Depth Look at App [App Review]. Retrieved from <http://www.imedicalapps.com/2010/02/pocket-first-aid-cpr-app-used-to-save-life-in-depth-look-at-app-app-review/>
16. Jonathan Strickland,(n.d.). How Virtual Reality Gear Works. Retrieved from <http://electronics.howstuffworks.com/gadgets/other-gadgets/VR-gear1.htm>
17. Mohamed Sami,(2012). Software Development Life Cycle Models and Methodologies. Retrieved from <https://melsatar.wordpress.com/2012/03/15/software-development-life-cycle-models-and-methodologies/>
18. Native vs. web app vs. hybrid – what is the optimal developer strategy? (2011). Retrieved from <https://www.developergarden.com/en/blog/articles/article/native-vs-web-app-vs-hybrid-what-is-the-optimal-developer-strategy/>
19. Nick Summers, MD,(2012) Drops First Aid is an essential iOS app that could help you save lives. Retrieved from <http://thenextweb.com/apps/2012/12/18/drops-first-aid-is-a-brilliant-iphone-app-that-could-help-you-save-lives/>
20. Parthenopi Konstantinou, (n.d.). Rapid Application Development. Retrieved from <https://mis.uhcl.edu/ROB/Course/SAD/Student%20Papers/RAD%20PAPER.doc>
21. Pietro Saccomani,(2012). Native, Web or Hybrid Apps? What's The Difference? Retrieved from <http://www.mobiloud.com/blog/2012/06/native-web-or-hybrid-apps/>
22. Preshit Deorukhkar, (2013). Drops First Aid — A Must-Have iPhone App to Save Lives. Retrieved from <http://beautifulpixels.com/iphone/drops-first-aid-a-must-have-iphone-app-to-save-lives/>
23. RAD (Rapid Application Development) (n.d.). Retrieved from <http://www-old.novulo.com/Rad.aspx>
24. Rahul Tilloo,(n.d.). What Is Spiral Model? It's Advantages & Disadvantages. Retrieved from <http://www.technotrice.com/what-is-spiral-model-software-engineering/>

25. Raluca Budiu,(2013). Mobile Mobile: Native Apps, Web Apps, and Hybrid Apps. Retrieved from <http://www.nngroup.com/articles/mobile-native-apps/>

26. Rapid Application Development (2008). Retrieved from <http://www.learn.geekinterview.com/it/sdlc/rapid-application-development.html>

27. RUP Summary. (n.d.). Retrieved from <http://www.staffs.ac.uk/COSE/SUNIWE>

28. SDLC - RAD Model. (n.d.). Retrieved from http://www.tutorialspoint.com/sdlc/sdlc_rad_model.htm

29. Spiral Model. (2011). Retrieved from <http://www.sdlc.ws/spiral-model/>

30. The Advantages and Disadvantages / Best Practices of RUP Software Development. (n.d.). Retrieved from <http://www.my-project-management-expert.com/the-advantages-and-disadvantages-of-rup-software-development.html>

31. The Advantages and Disadvantages of RAD Software Development. (n.d.). Retrieved from <http://www.my-project-management-expert.com/the-advantages-and-disadvantages-of-rad-software-development.html>

32. Understanding Mobile Apps. (2011). Retrieved from <https://www.onguardonline.gov/articles/0018-understanding-mobile-apps#basics>

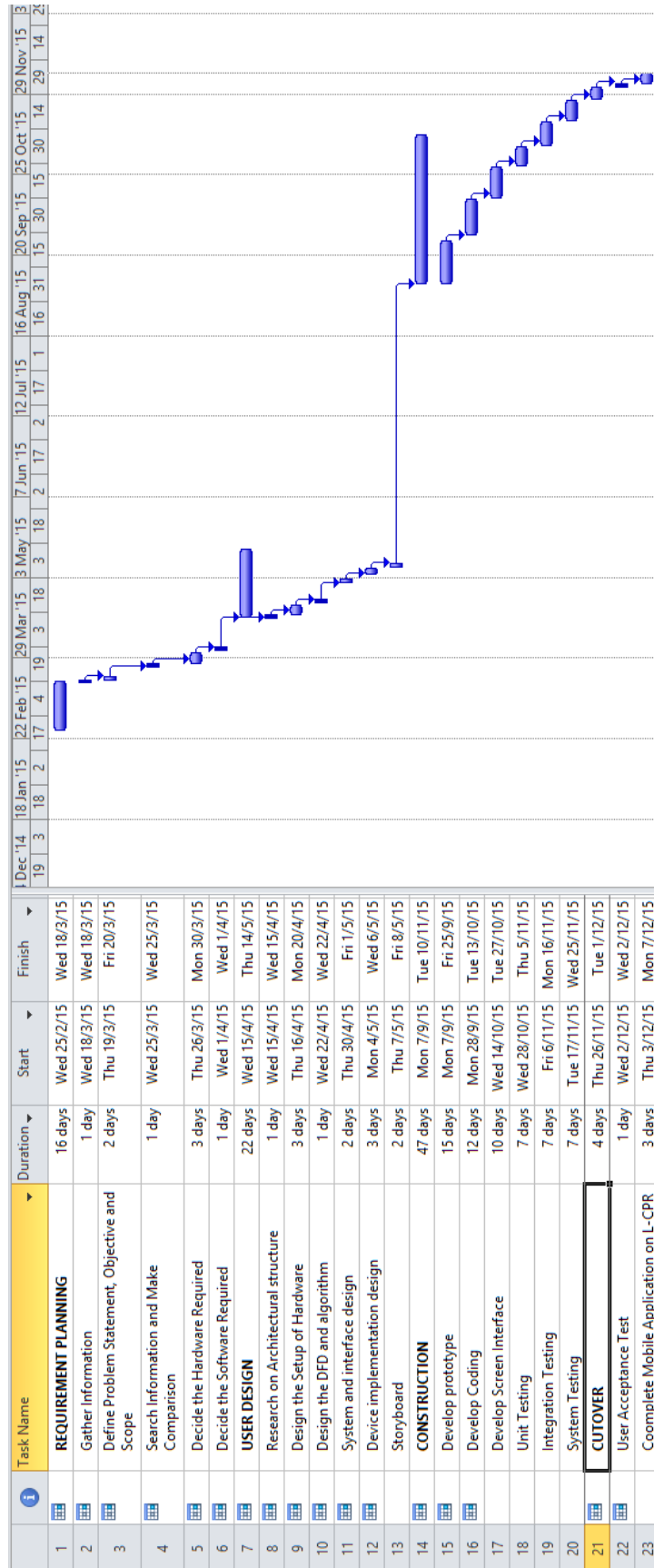
33. What is augmented reality? (n.d.). Retrieved from <http://www.vrs.org.uk/augmented-reality/what-is-ar.html>

34. What is RAD model- advantages, disadvantages and when to use it? (n.d.). Retrieved from <http://istqbexamcertification.com/what-is-rad-model-advantages-disadvantages-and-when-to-use-it/>

35. What is Virtual Reality? (n.d.). Retrieved from <http://www.vrs.org.uk/virtual-reality/what-is-virtual-reality.html>21.

APPENDIX A

PROJECT GANTT CHART



APPENDIX B
CLIENT APPROVAL LETTER

Lai Wui Chung,
Universiti Malaysia Pahang,
Lebuh Raya Tun Razak,
26300 Gambang, Kuantan,
Pahang.

Dr. Khairul Salleh bin Abdul Basit
Medical Officer,
Universiti Malaysia Pahang,
Lebuh Raya Tun Razak,
26300 Gambang, Kuantan,
Pahang.

12 MAY 2015

Dr,

Request on Being the Client and Providing Application Requirement

Regarding the subject above, I would like to request you to be my client for Undergraduate Project, Learning Cardiopulmonary Resuscitation (L-CPR). ✓

2. Basically the project is to develop an mobile application for teaching Cardiopulmonary Resuscitation (CPR). The objective and scope of our project is stated below : ✓

Objective :

1. To develop a mobile application to teach the technique of Cardiopulmonary Resuscitation (CPR). ✓
2. To implement Augmented Reality in the mobile application to enhance the understanding of the CPR techniques. ✓

Scope : User from all ages

Therefore, we need a requirement from you for the application that we are going to develop. We are hoping that you will be agree to becoming our client. If you are agree to be our client, kindly tick the box below, give your comment and signature. Thank you for your cooperation.

Comment :

Very good project.

Tick the box if you are agree or either :

Agree :

☒

Disagree :

☐

Accepted by,

DR. KHAIRUL SALLEH BIN ABDUL BASIT
M.B.B.S. PG D. O. H. (UKA) : CHRA (NIOSH)
KETUA
PUSAT KESIHATAN PELAJAR
UNIVERSITI MALAYSIA PAHANG
JERUH RAYA TUN RAZAK
JERUH RAYA TUN RAZAK
(DR. KHAIRUL SALLEH BIN ABDUL BASIT)
TEL: 09-5493103 FAX: 09-5493152

Medical Officer

Universiti Malaysia Pahang

Your sincerely,

Lai Wui Chung
.....

(LAI WUI CHUNG)

APPENDIX C**FACULTY APPROVAL LETTER**



Universiti Malaysia Pahang
 Lot 26300 Gambang
 Kuantan, Pahang Darul Makmur
 Tel: +609-549 2133 | Faks/Fax: +609-549 2144

Fakulti Sistem Komputer & Kejuruteraan Perisian
Faculty of Computer Systems & Software Engineering

UMP.12.02/13.11/01/08Jld 2(125)

11 Mei 2015

KEPADA SESIAPA YANG BERKENAAN

Tuan/Puan,

TAJUK : LEARNING CARDIOPULMONARY RESUSCITATION (L-CPR)

**NAMA PELAJAR : LAI WUI CHUNG
 (CD12037)**

**TAHUN/PROGRAM : 3/IJAZAH SARJANA MUDA SAINS KOMPUTER
 (TEKNOLOGI GRAFIK & MULTIMEDIA)
 DENGAN KEPUJIAN**

Adalah dengan hormatnya dimaklumkan bahawa pelajar di atas ialah pelajar berdaftar Fakulti Sistem Komputer & Kejuruteraan Perisian, Universiti Malaysia Pahang.

2. Sukacita kiranya pihak tuan/puan dapat memberikan kebenaran bertulis serta data dan maklumat yang berkaitan untuk pelajar menyiapkan projek berkenaan. Untuk makluman tuan/puan, projek ini ialah satu keperluan bagi kandungan kursus berkaitan.

Sekian, segala kerjasama dan perhatian tuan/puan didahului dengan ucapan ribuan terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan tugas,

(DR. MOHAMAD FADLI ZOLKIPLI)
 Timbalan Dekan (Akademik & Hal Ehwal Pembangunan Pelajar)
 Fakulti Sistem Komputer & Kejuruteraan Perisian
 Universiti Malaysia Pahang
 ☎ 609-5492467 / 2147
 ☎ 609-5492144



Universiti Teknologi Pilihan Utama | First Choice Technological University
www.ump.edu.my

APPENDIX D

SOFTWARE REQUIREMENT SPECIFICATION (SRS)

Software Requirements Specification

Version 1.0

1-12-2015

Mobile Application on Learning
Cardiopulmonary resuscitation (L-CPR)

Prepared by
Lai Wui Chung

TABLE OF CONTENTS

Section	Content	Page
1.	INTRODUCTION	2
	1.1 Purpose	
	1.2 Scope	
	1.3 Overview	
2.	OVERALL DESCRIPTION	3
	2.1 User Characteristics	
	2.2 Constraints	
3.	SPECIFIC REQUIREMENTS	4
	3.1 External Interface Requirements	
	3.2 Functional Requirements	
	3.3 Performance Requirements	
	3.4 Design Constraints	
	3.5 Software System Attributes	
	3.6 Other Requirements	
4.	SYSTEM REQUIREMENT APPROVAL	14

1.0 Introduction

1.1 Purpose

This purpose of this project with title Mobile Application on Learning Cardiopulmonary Resuscitation (L-CPR) is to create a mobile application to teach the proper technique of Cardiopulmonary Resuscitation (CPR). This application can be install inside the mobile phone, where user can view the content inside the application to learn the technique of CPR. The application is also implemented with Augment Reality (AR), which help user to easier understand the steps of CPR. With this application, user can easily refer to the method of CPR when an emergency occur.

1.2 Scope

The scope of this project is listed as below:

i. System Functionality

- The mobile application teaching the basic knowledge of CPR which is very helpful when emergency situation happen.

ii. System User

- The mobile application is available for user from all ages.

iii. System Platform

- The mobile application will generate the summary of user result when user doing some test or quiz on the technique of CPR.

1.3 Overview

This document identifies the software requirements in the form of task and system object model. The model presented with this document is an implicit statement of the requirements. It exhibits the boundaries and capabilities of the system to be built.

This document has 3 major sections. Section 1 (Introduction) provides an overview of the document and the product being specified. Section 2 (Overall Description) will describes the product perspective, function, user characteristics and assumption and dependencies. The last section will describe the requirements of the product which consists of external interface requirement, functional requirement and performance requirement. This section also shows the design constraint of the product, software system attributes and other requirements.

2.0 Product Description

2.1 User Characteristic

People from all age: People from all age should learn the knowledge of CPR. Everyone either have knowledge of CPR or not is encourage to use this application to learn CPR or used it as a supporting study material to strengthen their knowledge on CPR.

2.2 Constraints

There are several constraint inside this application. The constraints are described as below:

- This application is only limit to android phone user since it is created by using android studio. Mobile phones with other operating system (OS) cannot use this application.
- This application only support android mobile phone with Android 4.0 or above. This is because some of the function inside the application (AR) will not support android will older version than android 4.0

- The screen size of the phone should be at least 4.0 inch. This is because the application contain a feature called augmented reality (AR). User can see the 3D models and animations inside their phone through AR. If the screen size is too small, it is difficult to see clearly the 3D models and animations.
- User's mobile phone needs to have enough memory space to download this application since this application is included with videos and even AR with 3D animation, it will used up quite big memory space.

3.0 Specific Requirements

3.1 External Interface Requirements

The external interface requirement provides a details description of the input and output of this application. It gives the description of many types of interfaces, which are User Interface, Hardware Interface, Software Interface and Communication Interface.

3.1.1 User Interfaces

Figure 3.0 shows the interface of home page. Home page will appear when user start the application. There are 4 menu available in home page, which are notes, videos, AR and quiz. When user choose "NOTES", the note menu page (Figure 3.1) will be showed. When user choose "VIDEOS", the video menu page (Figure 3.2) will be showed. When user choose "AUGMENTED REALITY(AR)", the AR page (Figure 3.5) will be showed. Furthermore, When user choose "QUIZ", the quiz menu page (Figure 3.6) will be showed. Lastly, When user choose exit icon which located at right corner of the screen, the mobile application will be closed.

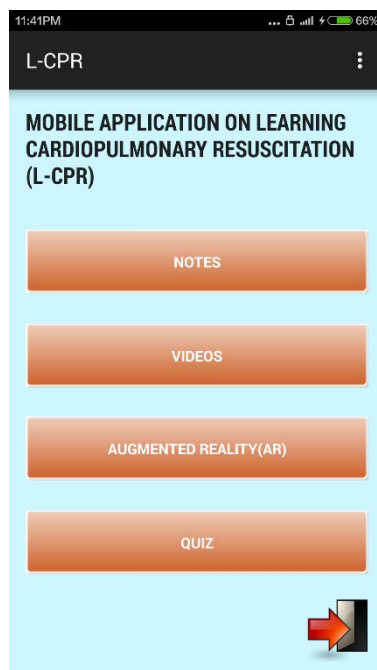


Figure 3.0 Home Page.

Figure 3.1 shows the note menu page. It will be displayed when user choose "NOTES" in home page. Note menu page consist of a list of notes on CPR. Every single note in the list will be directed to different note page as shown in Figure 3.2. There are back and next button to navigate to next slide of the chapter.

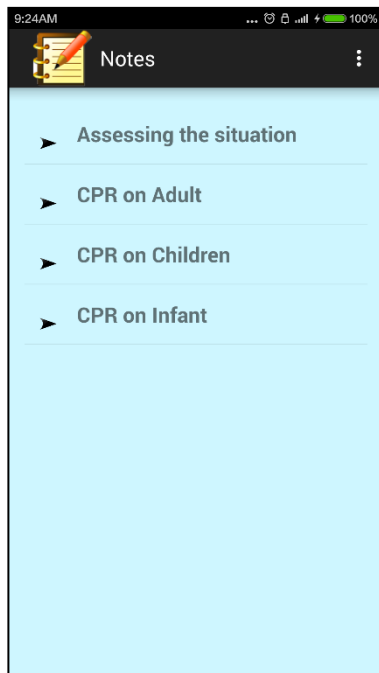


Figure 3.1 Note Menu Page.

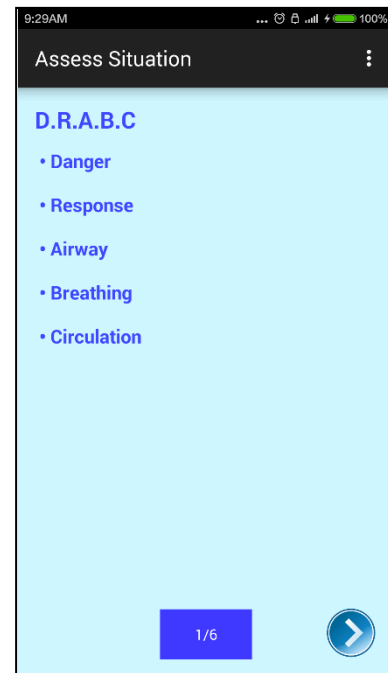


Figure 3.2 Note Page.

Figure 3.3 shows video menu page. It will be displayed when user choose "VIDEOS" on homepage. Video menu page consist of a list of tutorial video to teach the method of CPR. Every single video link in the list will be directed to different video page as shown in Figure 3.4.

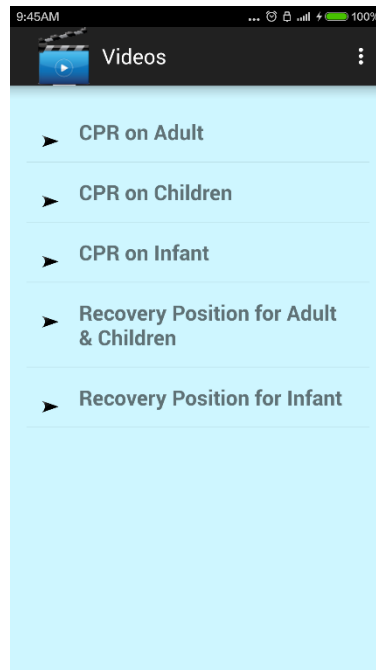


Figure 3.3 Video Menu Page.



Figure 3.4 Video Page

Figure 3.5 shows the AR page. It will be displayed when user choose "AUGMENTED REALITY (AR)" on homepage. In this page, it will displayed the 3D models by scanning a specific marker with camera. The 3D model will demonstrate the steps of CPR. There is a back button to go back to the previous open page.



Figure 3.5 AR Page.

Figure 3.6 shows the quiz menu page. It will be displayed when user choose "QUIZ" on homepage. quiz menu page consist of a different set of quiz question, arranged in a list. Every single set of question in the list will be directed to different quiz page as shown in Figure 3.7. There are back and next bottom of screen. User can navigate between different questions in the quiz. After finish the quiz, result page will be displayed as shown in Figure 3.8. There is a back button to go back to the quiz menu page.

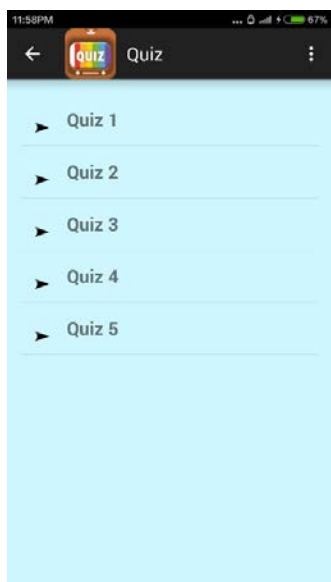


Figure 3.6 Quiz Menu Page.



Figure 3.7 Quiz Page.



Figure 3.8 Result Page

3.1.2 Hardware Interface

Since the mobile application does not have any designated hardware or supported type device, it does not have any direct hardware interfaces. It just needs the mobile devices like smartphone or tablet, with Windows Phone mobile operating system, to access the application.

3.1.3 Software Interface

The software interface of the mobile application is the operating system, which provides support, function or process to the application programs. The application will be interfacing with Android mobile operating system, at least with Android 4.0 OS.

3.1.4 Communication Interface

The communication between all the interfaces of the application is important since they are depending on each other. But how the communication is worked is not really important for the mobile application, this is because the communication is handled by the underlying operating system for the mobile application.

3.2 Functional Requirement

3.2.1 Context Diagram

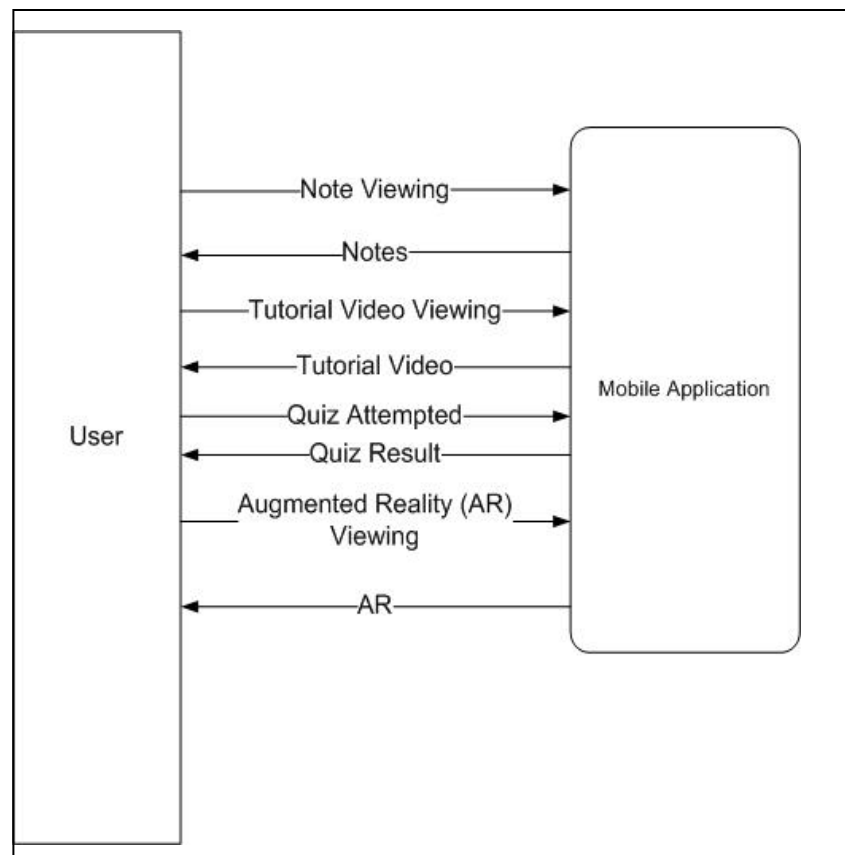


Figure 3.9 Context Diagram for Mobile Application on L-CPR.

Table 3.0 Application Function

Function	Description
Note Viewing	User can use to view the note when the programming techniques apps are finish download
Notes	The application will display the note.
Tutorial video viewing	User use to view the video
Tutorial video	The application will display the video.
Quiz Attempt	User use to attempt the quiz
Quiz Result	User use to see the result
AR Viewing	User use to view the AR
AR	The application display the AR

3.2.2 Data Flow Diagram

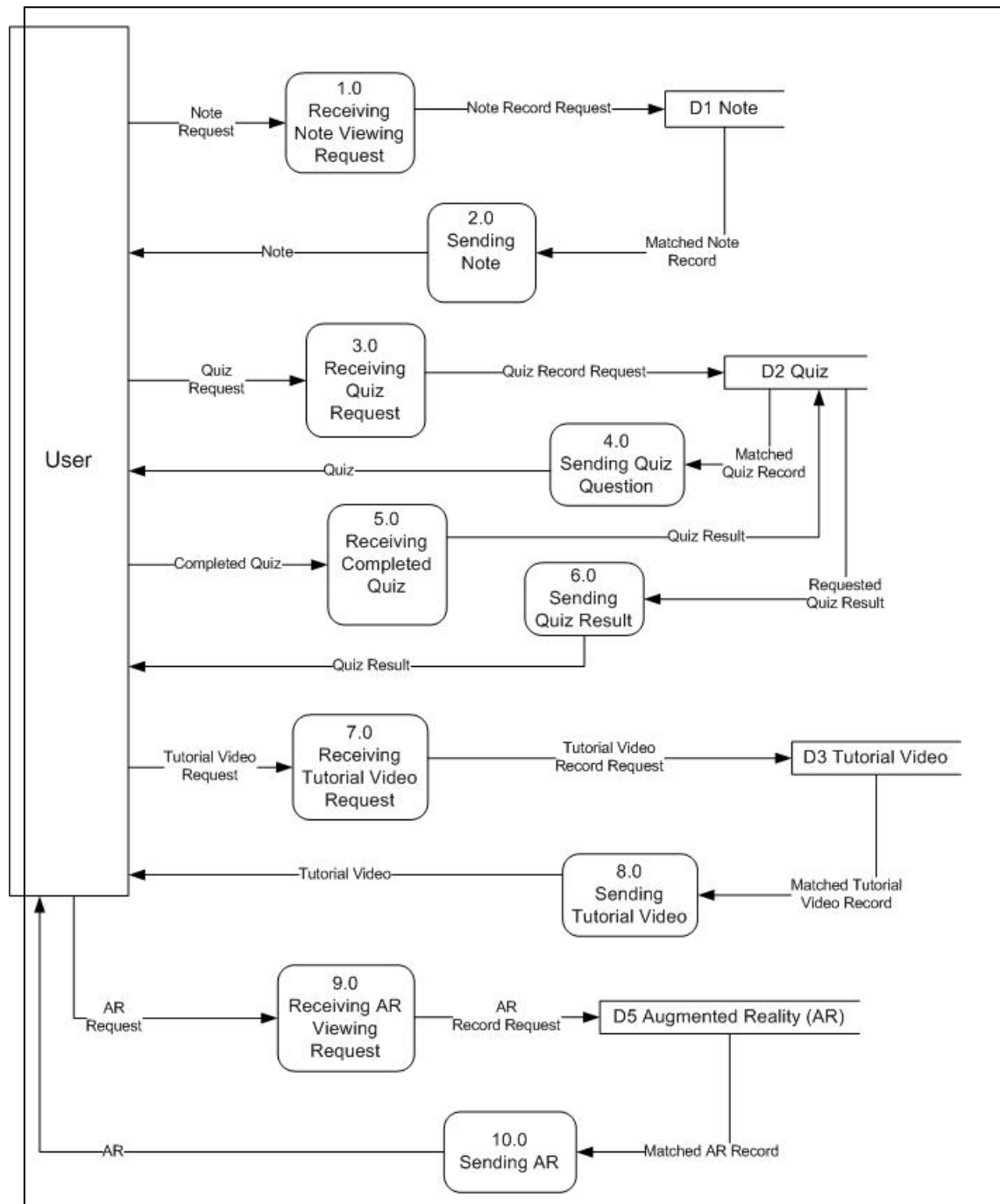


Figure 3.10 Data Flow Diagram (DFD) Level 0 for Mobile Application on L-CPR.

Table 3.1 Process Function

Process	Description
1.0 Receiving Note Viewing Request	User request to receive and for reviewing note.
2.0 Sending Note	Send back the note requested by user to display on the screen.
3.0 Receiving Quiz Request	User request to receive and view the quiz question.
4.0 Sending Quiz Question	To display quiz that are requested by user.
5.0 Receiving Completed Quiz	Received the completed quiz from user.
6.0 Sending Quiz Result	To display the quiz result.
7.0 Receiving Tutorial Video Request	User request to receive and for view the video.
8.0 Sending Tutorial Video	To display tutorial video that are requested by user.
9.0 Receiving AR Viewing Request	User request to receive and for view the AR.
10.0 Sending AR	To display AR that requested by user

3.3 Performance Requirement

3.3.1 Response Time

- The application should not freeze more than 5 second.
- The application should not take more than 5 second to respond to a button click.
-

3.3.2 Mobile application occupies less memory with high performance

Mobile phones memory are limited capacity and not much higher processing power.

3.3.3 Real time and reliable communication

3.4 Design Constraint

3.4.1 Platform Dependency

Most of phones contain the java platform and some phone have windows platform. The system may have a platform dependency constraint.

3.4.2 Development Tool

The system shall be built using a mobile application development tool.

3.4.3 Mobile Application Product

- It require phone memory to store the application.
- The phone must equip with Google Play, App Store or other mobile platform to install the application.

3.5 Software system attributes

There are many software attributes that can serve as requirements. It is important to achieve mobile application objectives. The following items provide a list of software system attributes:

3.5.1 Reliability

The reliability that the system will gives the right result on a search.

3.5.2 Availability

The application should be downloaded first from the Internet.

3.5.3 Maintainability

The application should be easy to extend. The code should be written in a way that it easy to implementation of new functions.

3.5.4 Portability

The mobile application should be portable with iOS, windows and Android.

3.6 Other Requirement


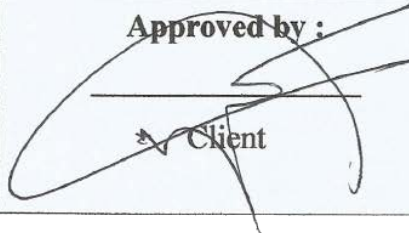
3.6.1 Security Requirement

All the communication information should be encrypted to achieve confidentiality

3.6.2 Safety Requirement

This application will not affect phone data stored nor will it affect any other applications installed on the user's phone. It cannot cause any damage to the phone or its internal components.

4.0 System Requirement Approval

	Name	Date
Verified by :  Developer	Lai Wui Chung	7-12-2015
Approved by :  Client	DR. KYAW MOE AUNG @ YUNOOS GITABOY MEDICAL OFFICER STUDENTS HEALTH CENTRE UNIVERSITI MALAYSIA PAHANG LEBUHRAYA TUN RAZAK 26300 GAMBANG, KUANTAN PAHANG TEL: 09-549 3104 FAX: 09-549 3152	7/12/15

APPENDIX E

SOFTWARE DESIGN DOCUMENT (SDD)

Software Design Document

Version 1.0

1-12-2015

Mobile Application on Learning
Cardiopulmonary resuscitation (L-CPR)

Prepared by
Lai Wui Chung

TABLE OF CONTENTS

Section	Content	Page
1.	INTRODUCTION	2
2.	SYSTEM OVERVIEW	3
3.	SYSTEM ARCHITECTURE	3
	3.1 Architectural Design	
	3.2 Decomposition Description	
	3.3 Design Rationale	
4.	COMPONENT DESIGN	6
5.	HUMAN INTERACTION DESIGN	
12		
	5.1 Overview of User Interface	
	5.2 Screen Objects and Action	
6.	SYSTEM DESIGN APPROVAL	18

1.0 Introduction

1.1 Purpose

This purpose of this project with title Mobile Application on Learning Cardiopulmonary Resuscitation (L-CPR) is to create a mobile application to teach the proper technique of Cardiopulmonary Resuscitation (CPR). This application can be install inside the mobile phone, where user can view the content inside the application to learn the technique of CPR. The application is also implemented with Augment Reality (AR), which help user to easier understand the steps of CPR. With this application, user can easily refer to the method of CPR when an emergency occur.

1.2 Scope

The scope of this project is listed as below:

i. System Functionality

- The mobile application teaching the basic knowledge of CPR which is very helpful when emergency situation happen.

ii. System User

- The mobile application is available for user from all ages.

iii. System Platform

- The mobile application will generate the summary of user result when user doing some test or quiz on the technique of CPR.

2.0 System Overview

This mobile application is independent and totally self-contained. The application mainly consist of 4 parts which are notes, videos, augmented reality (AR) and quiz. The application will be developed by using Android Studio. An additional software called Wikitude SDK will be included inside the application in order to load and display the AR inside the application.

3.0 System Architecture

3.1 Architectural Design

Figure 3.0 shows that simple architectural design of application and also the two packages involved in this mobile application, which are Learning Package and Practise Package. This section will discuss about the detail for each subsystem/ package:

a) Learning Package

This subsystem is used to provide the materials for users to learn the knowledge of CPR. The elements that involved in this subsystem are Note, AR and Videos. Users are able to view all these elements through this package to learn the knowledge of CPR. The classes that will be used in this subsystem are:

- i. Note
- ii. AR
- iii. Videos

b) Practise Package

This subsystem is used to provide the exercise materials to the students for learning and practise purpose. The elements that involved in this subsystem is Quiz. Users are able to access all these elements through this package to view and answer the questions given and also check the result. The classes that will be used in this subsystem is:

- i. Quiz

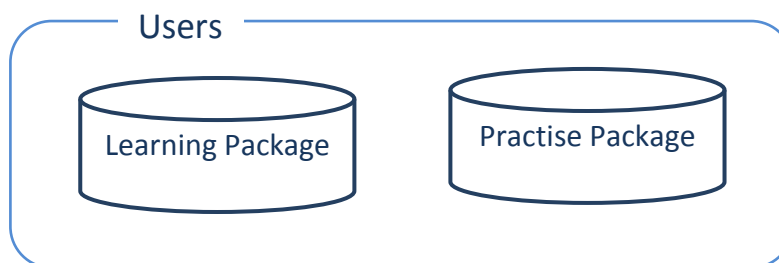


Figure 3.0 Architectural design for Mobile Application on L-CPR.

3.2 Decomposition Description

The architectural design in our application consists of two subsystems that are Learning Package and Practise Package. Each subsystem has its own classes. The following is the object-oriented description of these two subsystems:

3.2.1 Learning Package

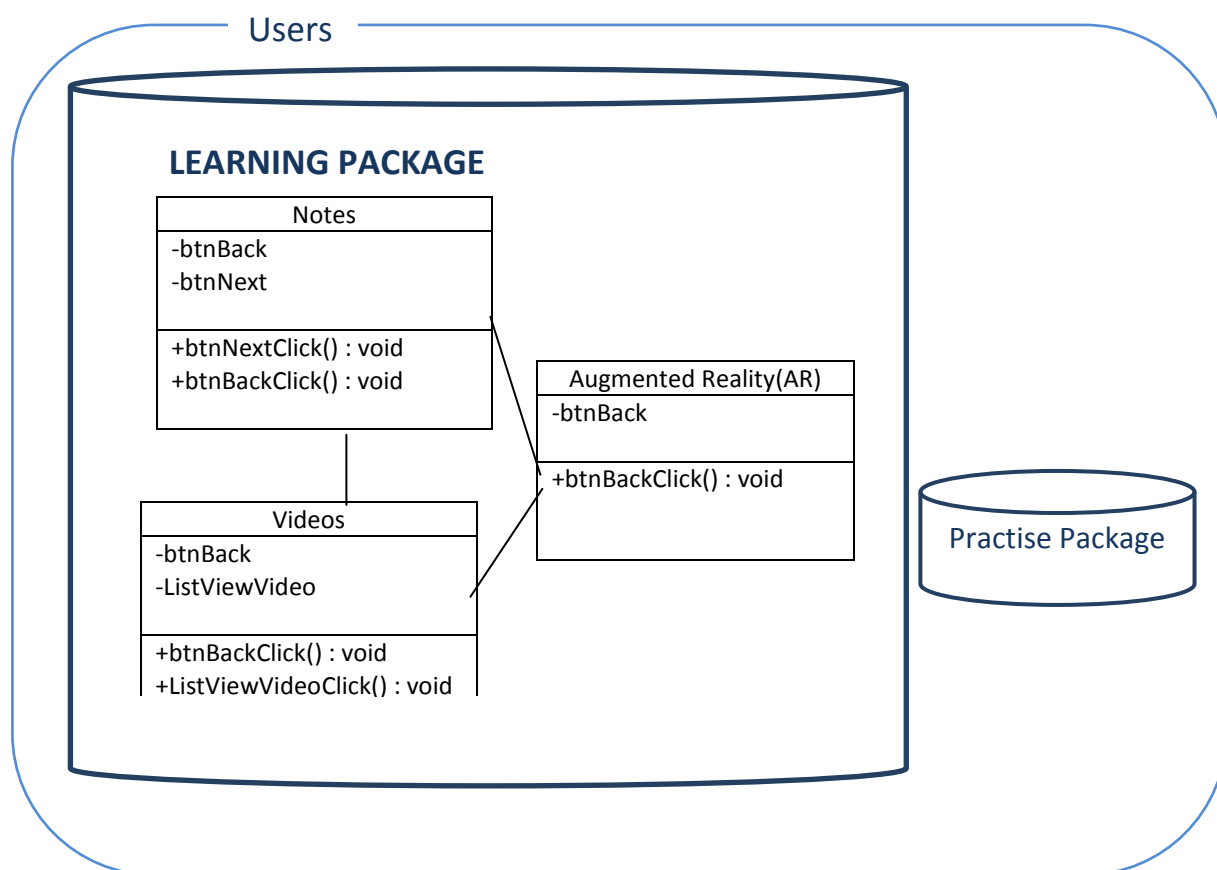


Figure 3.1 Subsystem Learning Package for Mobile Application on L-CPR.

3.2.2 Practise Package

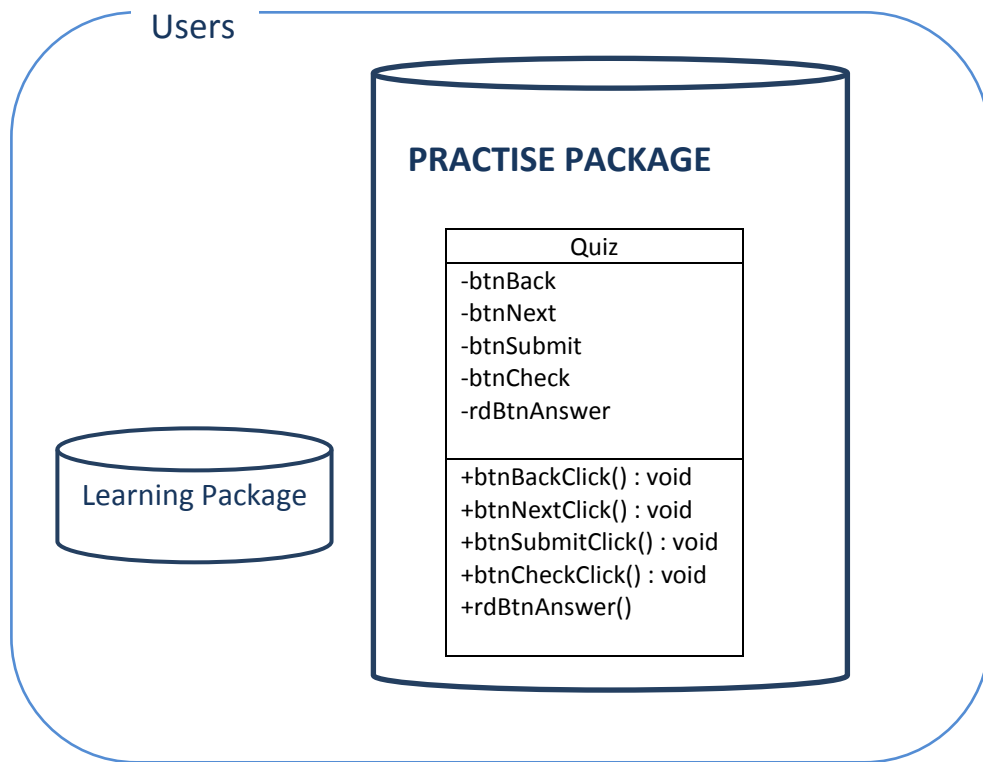


Figure 3.2 Subsystem Practise Package for Mobile Application on L-CPR.

3.3 Design Rationale

Android platform is chosen to create this mobile application as it is one of the biggest android OS platforms. The type of mobile application being chosen is native mobile apps.

We want to use native mobile apps because:

Pros:

- Stable platforms.

- Easier to develop.
- Full use of mobile functionality.
- High security.
- No limitations on functionality.

Cons:

- Need to develop each client independently.

Development Approach

DEVELOPMENT APPROACH	NATIVE
Definition and Tools	Build the app using native Frameworks - Android Phone SDK
Deployment	App stores
Key Use Cases	<ul style="list-style-type: none"> – Apps requiring high-end user experience, more transactional in nature – Large user base on one device (e.g. physicians with smartphone) – Offline usage – Apps requiring extensive device and/or OS

4.0 Component Design

This section is divided into several sections and subsections to explain the detailed design.

4.1 Learning Package

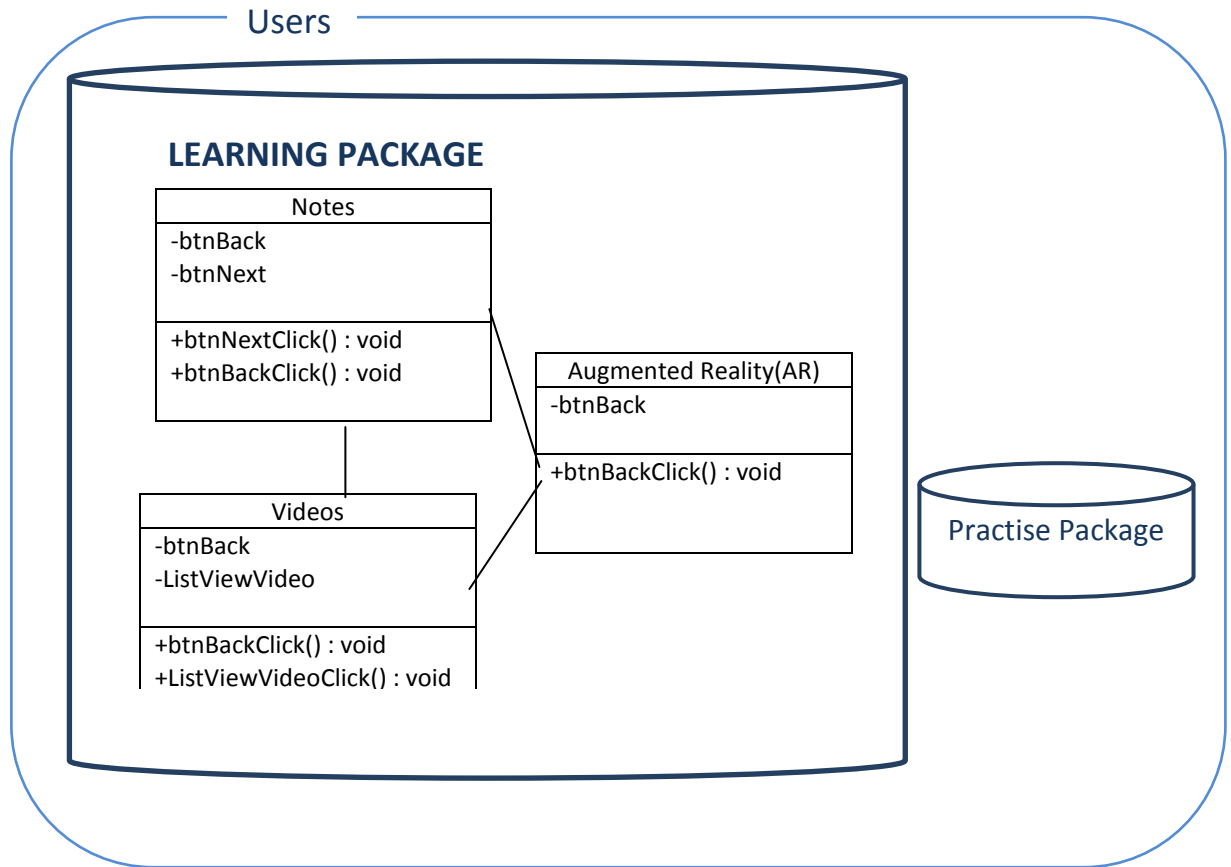


Figure 4.0 Learning Package Class Diagram for Mobile Application on L-CPR

4.1.1 Class Notes Design

(a) Input/ Output Data Elements

Input : ListViewNote, btnNext, btnBack

Output : To display the notes

(b) Local Data Elements

Table 4.0 Local Data Definition for btnHome.

Name	btnBack
Description	Navigate to the previous page of notes.
Data Type	-
Precision / Resolution	-

Table 4.1 Local Data Definition for btnNext.

Name	btnNext
Description	Navigate to next page of notes.
Data Type	-
Precision / Resolution	-

(c) Algorithms

Class Type : Control Class

Responsibility : Enable user to view the notes.

Attributes : No

Methods : -

BEGIN

IF user click btnNext button

Go to next syntax note page

ELSE IF user click btnBack button

Go to previous syntax note page

END

4.1.2 Class Videos Design

(a) Input / Output Data Elements

Input : btnBack, linkVideo ListView ListViewVideo

Output : To display the videos.

(b) Local Data Elements

Table 4.2 Local data Definition for btnBack.

Name	btnBack
Description	Navigate to the previous page
Data Type	-
Precision / Resolution	-

Table 4.3 Local data Definition for ListViewVideo.

Name	ListViewVideo
Description	Navigate to tutorial video page.
Data Type	-
Precision / Resolution	-

(c) Algorithms

Class Type : Control Class

Responsibility : Enable user to view the tutorial video.

Attributes : No

Methods : -

BEGIN

IF user click btnBack button

Go to previous page

ELSE IF user click ListViewVideo listview

Open the tutorial video.

END

4.1.3 Class Augmented Reality Design

(a) Input / Output Data Elements

Input : btnBack

Output : To display the AR.

(b) Local Data Elements

Table 4.4 Local data Definition for btnBack.

Name	btnBack
Description	Navigate to pervious page.
Data Type	-
Precision / Resolution	-

(c) Algorithms

Class Type : Control Class

Responsibility : Enable user to view the AR.

Attributes : No

Methods : -

BEGIN

IF user click btnBack button

Go back to previous page

END

4.2 Practise Package

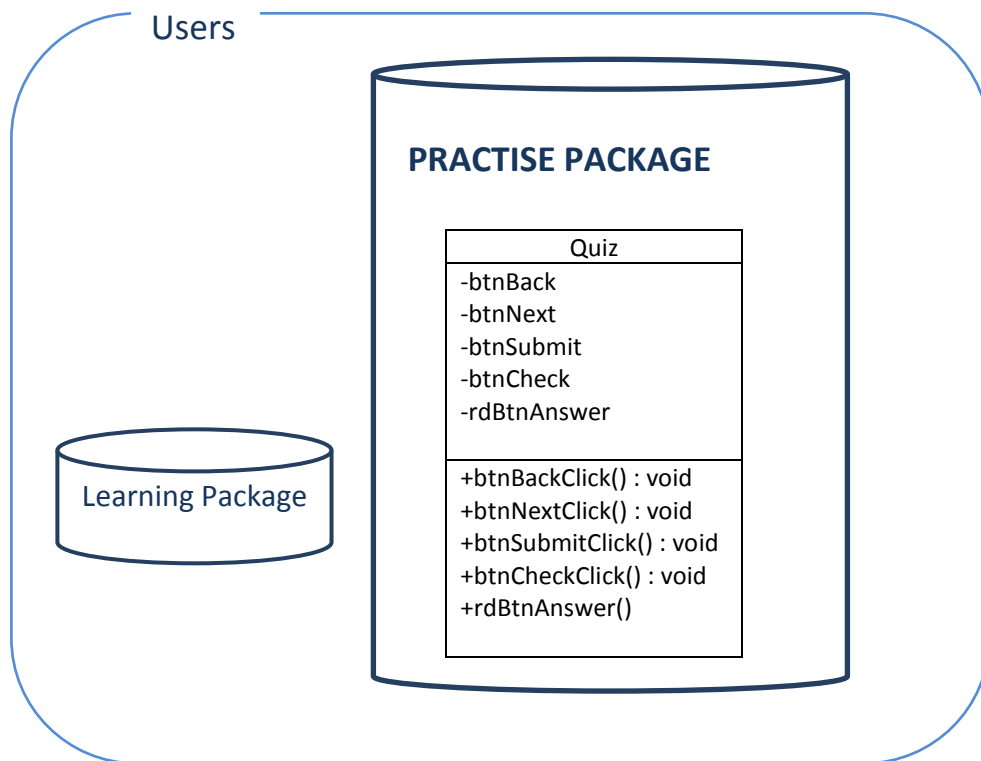


Figure 4.1 Practice Package Class Diagram for Mobile Application on L-CPR

4.2.1 Class Case Study Design

(a) Input/ Output Data Elements

Input : btnBack, btnNext, btnSubmit, btnCheck, rdBtnAnswer,

Output : To display the case study

(b) Local Data Elements

Table 4.5 Local Data Definition for btnBack.

Name	btnBack
Description	Navigate to the previous page of quiz.
Data Type	-
Precision / Resolution	-

Table 4.6 Local data Definition for btnNext

Name	btnNext
Description	Navigate to the next page of quiz.
Data Type	-
Precision / Resolution	-

Table 4.7 Local data Definition for btnSubmit

Name	btnSubmit
Description	Submit the quiz answer.
Data Type	-
Precision / Resolution	-

Table 4.8 Local data Definition for btnCheck

Name	btnCheck
Description	Display the correct answer for quiz question.
Data Type	-
Precision / Resolution	-

Table 4.9 Local data Definition for rdBtnAnswer

Name	rdBtnAnswer
Description	List of answers using radio button.
Data Type	-
Precision / Resolution	-

(c) Algorithms

Class Type : Control Class

Responsibility : Enable user to view the case study.

Attributes : No

Methods : -

BEGIN

IF user click btnBack button

Go back to previous quiz page

ELSE IF user click btnNext button

Go to next quiz page

ELSE IF user click btnSubmit button

Go to the quiz result page for checking score.

ELSE IF user click btnCheck button

Display popup message showing correct answer.

ELSE IF user click rdBtnAnswer button

Go to the list of answer using radio button

END

5.0 Human Interaction Design

5.1 Overview of User Interface

There are 4 function in this application which are notes, videos, AR and quiz.

“Note” will consists of list of note regarding the information of CPR. In “Video”, list of videos will be played to teach users on how to perform CPR. Meanwhile, in “AR”, 3D animation will be displayed on the screen when use scan a given marker with phone camera. Lastly, “Quiz” consist list of quiz question, asking the basic knowledge on CPR. After done, users can click at the submit button to get a score. There is a check button for each question which will display the correct answer for each of the question.

5.2 Screen Objects and Action

The next several pages describe and illustrate the following menus inside the mobile application:

- Home Page
- Note Menu Page
- Note Page
- Video Menu Page
- Video Page
- AR Page
- Quiz Menu Page
- Quiz Page

Figure 5.0 shows the interface of home page. Home page will appear when user start the application. There are 4 menu available in home page, which are notes, videos, AR and quiz. When user choose "NOTES", the note menu page (Figure 5.1) will be showed. When user choose "VIDEOS", the video menu page (Figure 5.2) will be showed. When user choose "AUGMENTED REALITY(AR)", the AR page (Figure 5.5) will be showed. Furthermore, When user choose "QUIZ", the quiz menu page (Figure

5.6) will be showed. Lastly, When user choose exit icon which located at right corner of the screen, the mobile application will be closed.

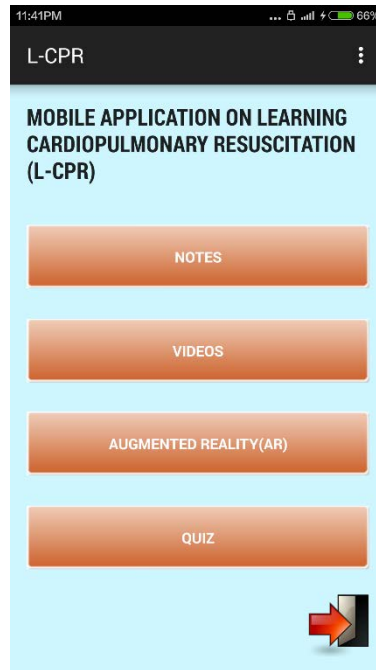


Figure 5.0 Home Page.

Figure 5.1 shows the note menu page. It will be displayed when user choose "NOTES" in home page. Note menu page consist of a list of notes on CPR. Every single note in the list will be directed to different note page as shown in Figure 5.2. There are back and next button to navigate to next slide of the chapter.

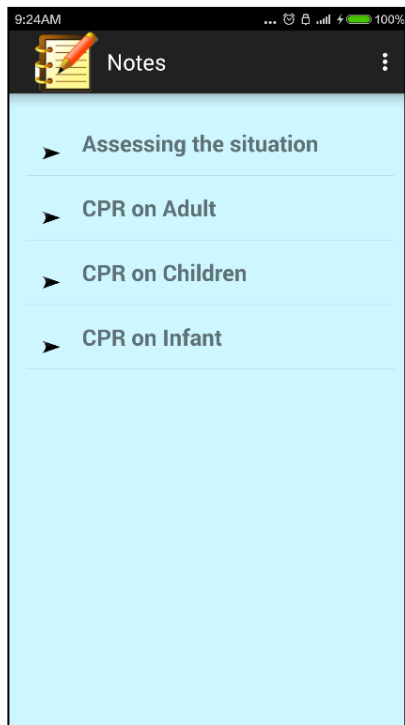


Figure 5.1 Note Menu Page.

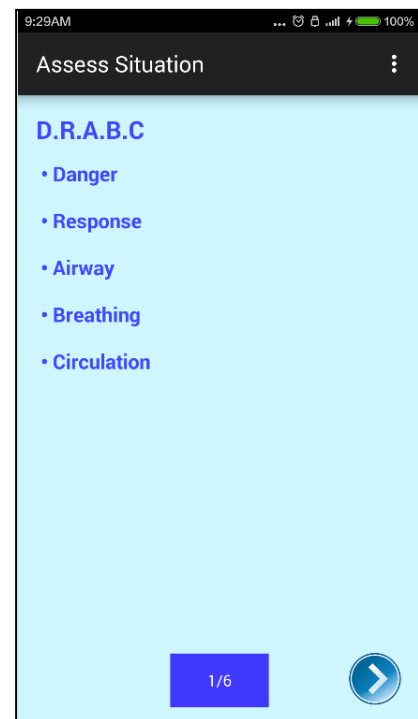


Figure 5.2 Note Page.

Figure 5.3 shows video menu page. It will be displayed when user choose "VIDEOS" on homepage. Video menu page consist of a list of tutorial video to teach the method of CPR. Every single video link in the list will be directed to different video page as shown in Figure 5.4.

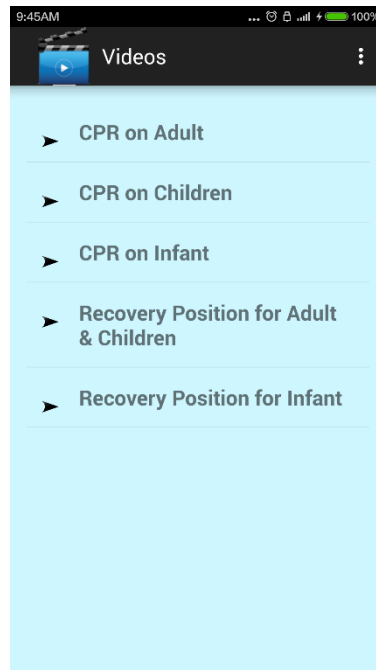


Figure 5.3 Video Menu Page.



Figure 5.4 Video Page

Figure 5.5 shows the AR page. It will be displayed when user choose "AUGMENTED REALITY (AR)" on homepage. In this page, it will displayed the 3D models by scanning a specific marker with camera. The 3D model will demonstrate the steps of CPR. There is a back button to go back to the previous open page.



Figure 5.5 AR Page.

Figure 5.6 shows the quiz menu page. It will be displayed when user choose "QUIZ" on homepage. quiz menu page consist of a different set of quiz question, arranged in a list. Every single set of question in the list will be directed to different quiz page as shown in Figure 5.7. There are back and next bottom of screen. User can navigate between different questions in the quiz. After finish the quiz, result page will be displayed as shown in Figure 5.8. There is a back button to go back to the quiz menu page.

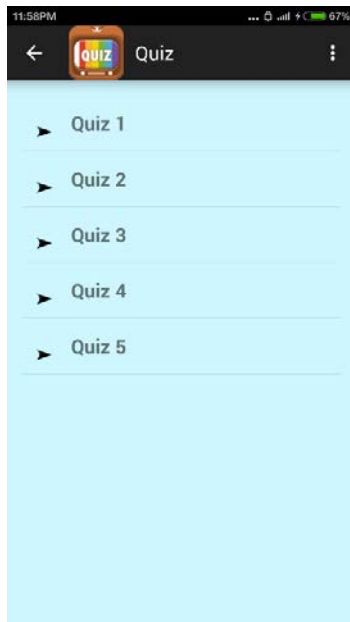


Figure 5.6 Quiz Menu Page.



Figure 5.7 Quiz Page.

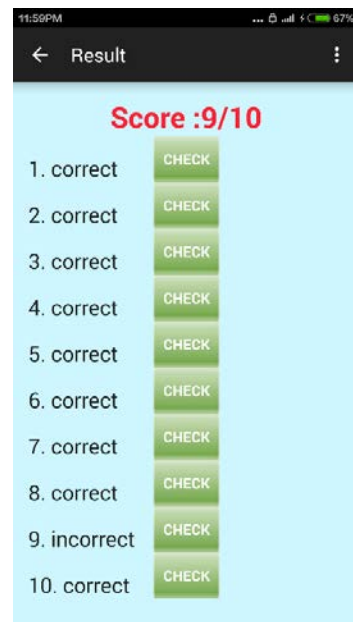
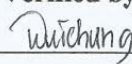



Figure 5.8 Result Page

6.0 System Design Approval

	Name	Date
Verified by :  Developer	Lai Wui Chung	7-12-2015
Approved by :  Client	DR. KYAW MOE AUNG @ YUNOOS GITABOY MEDICAL OFFICER STUDENTS HEALTH CENTRE UNIVERSITI MALAYSIA PAHANG LEBUHRAYA TUN RAZAK 26300 GAMBANG, KUANTAN PAHANG TEL: 09-549 3104 FAX: 09-549 3152	7/12/15

APPENDIX F

USER ACCEPTANCE TEST (UAT)

USER ACCEPTANCE TEST CHECKLIST

[MOBILE APPLICATION ON LEARNING CARDIOPULMONARY
RESUSCITATION (L-CPR)]

Author: [LAI WUI CHUNG]

Date: [07-12-2015]


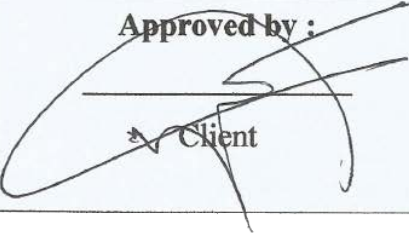
Version: [1]

User Acceptance Test Checklist

Test case name: L-CPR		Reference:
Test case version: 1	Sheet: 1	Date created: 1/12/2015

Task or requirement	Ref. <i>incl page no.</i>	Fail <i>issue no.</i>	Query <i>issue No.</i>	Pass
Note button functioning				✓
Videos Button functioning				✓
Augmented Reality button functioning				✓
Quiz button functioning				✓
Exit image button functioning				✓
Pop put message when clicking exit image button				✓
List View showing list of note available				✓
Note content can be viewed				✓
Next and back image button can navigate between different page of note				✓
Text box showing correct current page of note				✓
Back button in note page is functioning				✓
List View showing list of videos available				✓
Video can be played				✓
Back button in video page is functioning				✓
Camera can be access in augmented reality page				✓
3D model with animation shown up by scanning the given marker				✓
Back button in augmented reality page is functioning				✓
List View showing list of sets of quiz is available				✓
Quiz question can be viewed				✓
Next and back image button can navigate between different page of quiz.				✓
Text box showing correct current page of quiz.				✓
Submit button in last page of quiz is functioning				✓
Quiz result page showing correct score for quiz				✓
Check answer button is functioning for each question				✓

System Requirement Approval

	Name	Date
Verified by :  Developer	Lai Wui Chung	7-12-2015
Approved by :  Client	DR. KYAW MOE AUNG @ YUNOOS GITABOY MEDICAL OFFICER STUDENTS HEALTH CENTRE UNIVERSITI MALAYSIA PAHANG LEBUHRAYA TUN RAZAK 26300 GAMBANG, KUANTAN PAHANG TEL: 09-549 3104 FAX: 09-549 3152	7/12/15