

Augmented Reality Local Attraction Information Guide and Recognition

By

Kee Ming Wei

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements

for the degree of

BACHELOR OF INFORMATION TECHNOLOGY (HONS)

INFORMATION SYSTEMS ENGINEERING

Faculty of Information and Communication Technology

(Kampar Campus)

JAN 2019

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Date : 03 April 2019

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ABSTRACT

This project is a development of a proposed mobile application which in the field of integration of Augmented Reality technology with the local environment attraction information. The scope of this proposed application is determined by the allocated time efficiently and efficiently, resources and the client's requirements. Besides that, the first objective of this proposed application is to deliver innovative information and mobile based solution around the surrounding buildings and the second objective is to integrate augmented reality effect to guide users reach final destination. This mobile application mainly for handling matters related to tourists guide who provide a platform to generate the information regarding the local attraction information when travelling around the country premises, in a non-troublesome way to reduce the expenditure of time, dissatisfaction and to gain efficiency, application friendliness and plausibility of the application around the country site. Besides that, the project will attach some of the reviews of the current mobile application. However, integration augmented reality application and the surrounding local attraction information related field with this project is currently not available and not exists in the App stores or the Google Play store as well. However, the selection of the target review is the type of navigation applications which without the techniques of Augmented Reality as my literature review topics which fall in the field of mobile application such as Waze, Google Map, Map factor and Maps. Me. Moreover, the overall of the development process, methodology that used in this project is the concept of SDLC which is the Software Development Life Cycle. Thus, the project is much more suitable with this concept because it is a process that produces software with the highest quality and lowest cost. Last but not least, the fundamental modules and functions as the project specified had been completed in the final project application in mobile based (Android).

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LIST OF ABBREVIATIONS

APP	APPLICATION
AR	AUGMENTED REALITY
API	APPLICATION PROGRAM INTERFACE
UAT	USER ACCEPTANCE TESTING
GPS	GLOBAL POSITIONING SYSTEM
RAM	RANDOM ACCESS MEMORY
SDLC	SOFTWARE DEVELOPMENT LIFE CYCLE

Chapter 1 : Introduction

1.1 Problem Statement and Motivation

- **Virtual Map information representation**

Current mobile applications involving virtual map functionality are less informative and the map representations are mostly static. For example, users are only able to perform simple interaction with the virtual map present by the developer such as the scenario “input the final destination, instead of having interaction with the environment. Thus, it is less interesting and inconvenient for the users.” Therefore, the existing mobile applications are unable to deliver information regarding of the buildings in the nearby area effectively and the design of the virtual map is not realistic which will create confusion towards the users.

Figure 1.1 shows a typical Google Map display of a destination. It can be seen that the users cannot understand the map easily and cannot imagine how the final destination looks like. The virtual map is somewhat difficult to comprehend for most users. With the current situation, this is why Augmented Reality is a suitable solution for this kind of application.

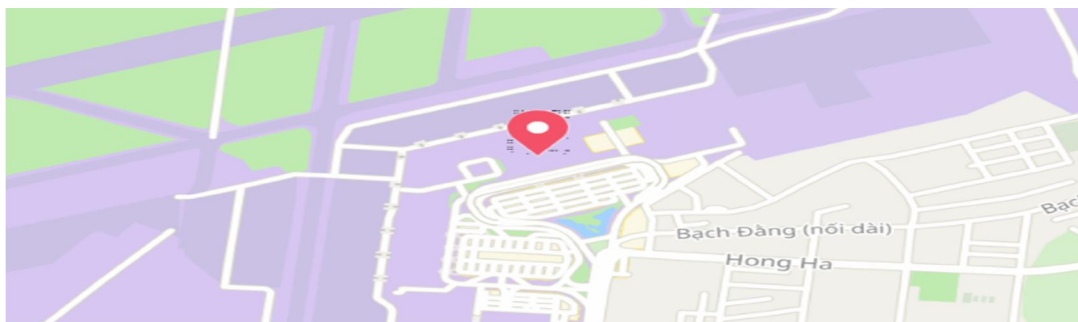


Figure 1-1 Google map display of a destination

- **Lack of information regarding the buildings or location**

Figure 1.2 shows a snapshot from Waze mobile application. The application failed to provide more direct information or description of the particular location. Therefore, user will have no idea regarding the details of that location or any special event happening on that place. As an example, if the user has any question they want to contact with the shop owner, they could not find the contact of the owner due to lack of information appear in the design of the current application. However, most of the current navigation application will only show various route to the final destination instead of helping the shops or destination to promote their buildings.

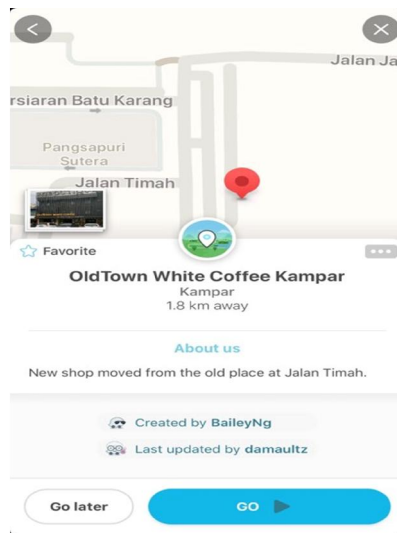


Figure 1-2 Waze Mobile application

- **Lack of Benefits towards tourist**

The target user of the apps is mainly tourist, they might be the first time visiting our country, and hence they aren't really familiar with the direction as well as the unique culture of the specific location. Thus, by referring to the current navigator application would not bring many benefits to them due to the absence of information. They do able to reach the desired location but might not know more detail information regarding the buildings. Thus, it's possible that the users might be lost at the moment and they have neither idea what their destination looks like nor the surrounding as they aren't really at

ease with it. Tourist could search from the web for more info, however this would be time consuming and inconvenient to the user. On the other hand, application created should be intentionally user-friendly and able to provide the fundamental information.

- **Lack of advertisement on company's promotion**

In this situation, the issue of lesser information shown in the current application limits the user on knowing about that specific place. In the current application, it will only display the basic info such as shop names and the address. It would be better if the apps are able to implement Augmented Reality technology where the camera will unlocked automatically and animation of all details will be appeared in the screen will hovering the phone around the area. Moreover, the application would be most favorable when it is able to help in promoting the shop. Given by an example, while the camera scanned on that specific shop, user's phone screen would appears promotion of any kind as well as having the accessibility to know any special event happening on that specific day. As a token of appreciation in aiding to attract customers, the application will be paid some subsidiaries or commission depending of the terms and condition applied.

- **Fail to deliver indication effectively regarding the attractive location**

In addition, current application misses the mark to deliver any sign effectively to the user. As an example, user have reached the particular appointed destination, yet there is no response of any animation or voice produce from the app that are able to grab attention from the users. This unintentionally creates difficulty for users to search and spot the location. Consequently, user required to skim through the virtual map that is complicated and confusing in order to discover the location. This would not be user-friendly and bring annoyance to the user. By referring to Figure 1.3 from Google map, the design of the map is said to be tedious for users to understand the whole map, not to mention the fact that finding route to the nearby location, it would be much more challenging. Thus, the significant reason which prevents users to reach the destination is the complexity of the

maps. Thus, it's hard to let user search through the small icon or logo in the map as the point of interest might be surrounded by other GPS checkpoint of the nearby location.

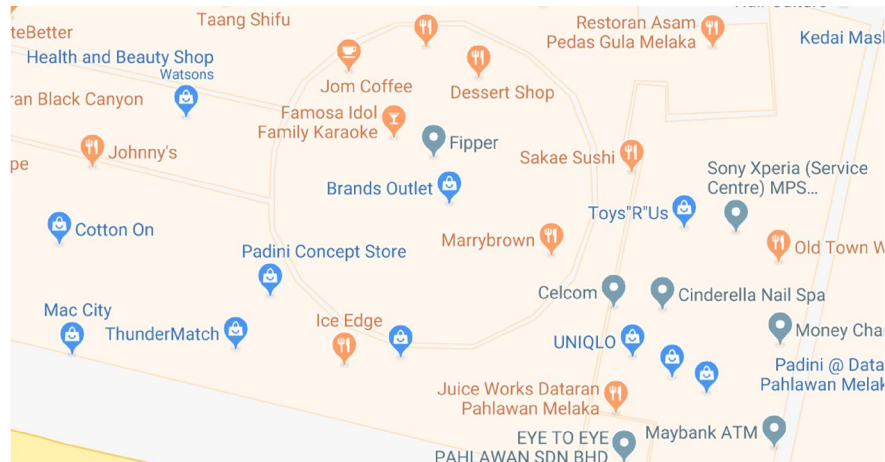


Figure 1-3 Google Map-Nearby location display

From the problem statements above, a successful and innovative mobile application developer will need to develop an application that are able to generate benefits instead of creating more issues to users. The purpose is to reduce the inconvenience of user to practice the application by looking at the virtual map system. Moreover, in this mobile application project it's come with a concept and inspiration to develop an Augmented Reality to replace the current design of the navigation application in the market which reflects with the problem statement of “virtual map system which is less informative”. Implementing this project application by using the AR effects would be able to create more interesting information through the 3D objects and causes the users to pay more attention towards your application.

Furthermore, this new application will also capable in solving the problem statement of “the application not introducing the buildings or promoting the shops.” In a navigation system, users are searching for assistance to know more details information that they might not being explored before. In order to solve this problem, this project generated a

perception to develop an application that is competent to deliver details information about the buildings in the latest technology which is the Augmented Reality.

Last but not least, in order to solve the problem regarding the difficulties to get informed of nearby location by users. With this issue, users actually expect the mobile application developers to use a different way to deliver the hints of the nearby location in an effective way. In order to deliver an innovative and useful application, this project has an idea to integrate 3D animation with the real environment to improve the interaction and it would be more realistic compared to the current techniques as seen in a virtual map display in figure 1.3. By implementing this function, users are able to reach the destination in a shorter time and lead by an interesting AR object to reach the desired nearby locations.

1.2 Project Scope

From this project, the final output of this project would be a mobile base application system which involving the Augmented Reality effects integrate with the surrounding local attraction information. Besides that, augmented reality (AR) is an innovation that superimposes a computer-generated image on a user's view of the present reality, thus providing a composite view. The element that is augmented is generated by computer sensory input such as sound, video, graphics or GPS data. Therefore, it is related to a more general concept called mediated reality, in which a view of the real world is able to modify by a computer. As a result, this technology functions by enhancing user's current perception of reality (Loxtercamp, 2015). Moreover, Augmented Reality mobile application is considered fresh towards the current technology and still in the stage of growth in the market. There are some developers that are trying to implement AR technology but however it is easier said than done, the system are not technically stable and fully developed when being tested. Thus, as an effective and innovative developer, we need to create some mobile application that is unique and different from others. The main focus would be a concept where it should be user-friendly and easily operate so that we are able to catch-up with the current competitive market and capable to stand firm in the future industry. This project will be launched out mainly on Android software base mobile application.

The scope of this project is resolute by the resources, client's requirements and allocation of time effectively and efficiently. This mobile application is mainly designed for handling matters related similar to tourists guide which provide a platform to generate the information regarding the of local attraction while travelling around the country premises. The scope of the system is limited and is planning to expand in a modularized manner. Currently, the system developed will only covered all the Kampar premises in New town. Other area will be further developing after version one being launched and we are able to receive feedback and comment from our user. Hence, version two will be further modified and improve in order to meet our customers requirement.

The output of this project aims to be beneficial in term of advertising which able to cooperate with other company such as shop lots or restaurant to give detail information for tourist at a particular location. Therefore, marketers able to use this proposed application as a tool to promote and advertise their company. This mobile application project is able to practice image processing to analyze and able to see a composite view of the real world by using camera view through virtual annotations. By implementing in this way, this project mobile application is able to help the particular company to deliver and attract more customers to approach towards them.

Besides that, the mobile application will also generate notification and suggestions towards the users when the GPS location is being pinpointed near to a particular famous location. Using a static 2D object effect such as logo or icon to represent the nearby location in the surface of the virtual map like the current navigation system such as Waze and Google Map in figure 1.3 and 1.2 could not catch much attention from the user. . In this project application, it will implement the AR effect which considers as 3D animation object to get better attention from users and provide a better vision of notification. In this way, our application will be more likely to lead the user to approach the particular location effectively and also help a user to reduce the trouble looking at the confusing map. At the same time, this project application provides some other advantage which helps the user to use their time efficiently to know more information regarding the point of interest that they are approaching such as historical information, the menu of the restaurant, booking system and etc.

1.3 Project Objectives

- **To deliver innovative information and mobile based solution around the surrounding buildings.**

In this project mobile application, the first objective is to generate more information and mobile based solution around the surroundings building such as some shops which will contain all the necessary details, in order to ensure easy, accurate navigation and identification of various buildings, departments. Moreover, the user able to know detail historical information about the buildings and latest information for the buildings such as some promotion sales of the shops will be updated to the user. Besides that, this project application has a main goal and aim in order to transform the current technology which the static map system used by Google Map, Waze to the latest technology which is Augmented Reality which the current market still not available.

- **To integrate augmented reality effect to guide users reach final destination.**

Furthermore, the proposed project mobile application able to provide some Augmented reality effect in order guide users for reaching the desired destination, such as implement some of the 3D object from the scene of mobile device display, which does not exist in reality but it actually exists in a virtual view which assist by camera of mobile device. Besides that, it is able to increase the realism of the whole mobile application and resolve any issue regarding the complexity of the conventional navigation system. Besides that, user able to get more information regarding the nearby location surrounds user which represent by the virtual AR 3D object. Hence, users able to be notified by 3D object showing in special animation and lead users to approach the particular location conveniently.

1.4 Impact, significance and contribution.

The purpose of this proposed application which immersed with the concept of augmented reality (AR) with the surrounding environments is to improve the depiction of virtual objects in a real scene. However, instead of looking at a static virtual scene of a map, this application can increase the realism of the surroundings and make users feel comfortable with the function of the navigation system. Therefore, Map system is important to a human, especially a tourist who comes over to our country with little or no knowledge regarding the culture and the history of the building. This project is renovating the current navigation application that in the market towards the latest technology components which are Augmented Reality.

Besides that, this project able to contribute a good economy towards our country since that the users of our mobile application who desire to travel around, tourists are able to use the applications as their smart tools when they travel all the time and use it in a convenient way. The definition of convenient is this proposed application are they able to know more details with historical information and knowledge of a particular building in a way of interesting which instead of the whole bulk of words just describing the information of the whole building which to show towards the users. Thus, the presentation of the information will be programmed with the special animation of augmented reality effect such as some float 3D object, video, company customized banner and so on. Another contributions of this application is to help those users who in the situation of lost in one of the location, which they don't know the names of that location which the user could not tell what is that buildings for and there might not have any GPS and internet signal, in this application the users just to open the application and move around. Moreover, it able to help the users to keep track of the buildings shape, specification and several of features and generate the details information of the particular location.

Furthermore, this project mobile application also able to use as a marketing tool in order to generate some attraction by using Augmented Reality effects. Such as example, through this mobile application, other company has the opportunity to cooperate with our

application in order to help their company to promote and also deliver the message about their special event towards the tourist or users such as their menu of the day, the discount item of the month, special treats and so on. In this situation, it creates a “win-win situation”, which means the company able to increase their profit since the number of customers increase because of the mobile application function.

1.5 Background information

For this project mobile application, mainly focusing with some concept of the navigation system and latest technology of Augmented Reality based. According to resources from (CTI, 2016), the meaning of navigation is about a field of study which emphasizes on the methodology of checking and monitoring the movement of a human or vehicle from one place to another. Thus, the field of navigation distributed into four categories: land navigation, marine navigation, aeronautic navigation, and space navigation. Moreover, all kind techniques of navigational involve locating the navigator's position compared to known locations or patterns. Besides that, navigation is a kind of wider sense, can refer to any skill or study that involves the willpower of position and direction. In this sense, navigation includes orienteering and pedestrian navigation which focus on human needs this application instead of human wants. In fact, this kind applications is about a navigation system which similar to the well-known application such as Google Map, Waze and so on. In order to solve the various problem that existed regarding the current application, this project mobile application integrates the technology of Augmented Reality in order to generate more innovation and contribution to human as well.

According to (Narzt, et al., 2006), they propose a system which augmented reality navigation which similar to this proposed project application would typically work in the following way:

- Obtain the real environment view from the perspective of users.
- Obtain the location information for tracking the use which GPS coordinates is typically the information.
- Produce the virtual world information based on the real world view and the location information.

By referring figure 1.4, according to (Narzt, et al., 2006), they carry out some statement which related to how they solve the problem by implements this kind methodology in order to describe the technology considerations for AR navigation systems. Besides, they also carry out some idea which is implemented in the camera setting as they mention

using the video to look through the scene. Thus, this strength is to let human interact with the video instead of referring with a virtual map, they can refer the real world, it actually improves the realistic of their solution. As they state that, the real world view is captured using a camera which is then combined with augmented information and displayed on the screen, it can be used like 2 way of setup device, one of the hardware camera head mounted display whereas another device for display mode will be face to the user.

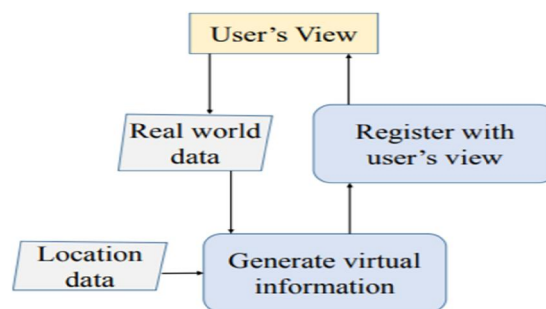


Figure 1-4 Methodology of technology considerations



Figure 1-5 Basic interface from researcher

According to report from (Azuma, Bailiot, Behringer, Feiner, Julier, & MacIntyre, 2001) the main aim of AR is basically integration between the real world with virtual objects such as images, 3D objects, animation and so on that will appear to coexist in the same space as the real world in the screen of the mobile devices. While other researchers encompass the definition and meaning of AR beyond this vision, we define an AR system

to have the following properties: combines real and virtual objects in a real environment; runs interactively, and in real time; and registers (aligns) real and virtual objects with each other.

Besides that, Augmented Reality has a goal at simplifying the user's life by bringing virtual information not only to his immediate surroundings, but also to any indirect view of the real-world environment. With current technology, we able to use AR effects with smart phone nowadays such as the current most famous social mobile application Snap Chat, the application is implements the effect of customized 3D object existed in handheld device screen with integrating with the real environment surroundings with the example to recognize human face. Based on figure 1.6 , the functionality of the SnapChat application that able to keep track a human facial shape and add on some special effects with the AR concept to rise the happiness and enjoyable of user when they using the application. Furthermore, augmented reality is mostly used by marketers to promote new products by using online. Most of the techniques tool that the users present in front of their webcam or other portable camera either on special software or simply on the advertising company's website. With one example from (Mini, 2008), a famous car company which call MINI, implement an augmented reality advertisement in several German automotive magazines (Geekology, 2008). The user just needs to show a piece of paper which with a target image that able to recognize by the website and the screen will appear a car 3D object which shown in figure 1.7.

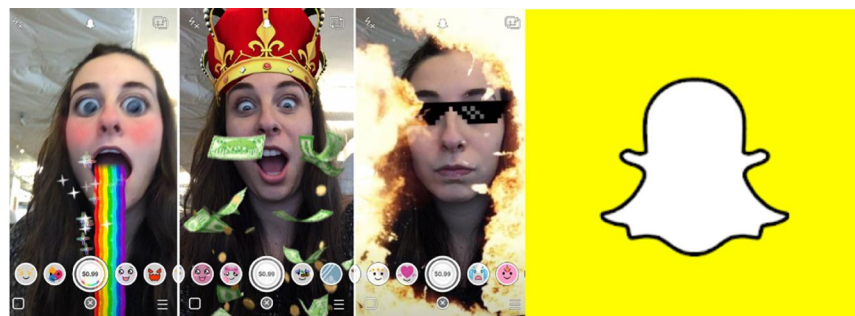


Figure 1-6 Snap Chat AR effect



Figure 1-7 MiniCooper Advertisement

Chapter 2 : Literature Review

In this proposed project application, due to the current technologies in the year of 2019, most of the augmented reality application is not considered mature and it remains with the status of growth which means the developers are starting to climbing up for further figure out the creativity to develop an application that will benefit towards users, the integration augmented reality application and the surrounding local attraction information related field with this project is currently not available and not exists in the App stores or Google Play. Therefore, the selection of the mobile application will focus in navigation apps which without the techniques of Augmented Reality as literature review topics. The four navigation applications are Waze, Google Map, Map factor and Maps.Me.

2.1 Waze

2.1.1 Introduction



According to (Rstudio, 2018), Waze is the largest in this world of community-based traffic and navigation application. Besides that, Waze is a type of GPS navigation system which mainly used in mobile devices such as smart phone and tablets and it's exist in the international market, which mean Waze is able to use in many of country because of the useful functionalities of the application. Furthermore, Waze mobile platform was assimilated by Google in 2013, which is an Israeli company which founded by Ehud Shabtai. Thus, due to the specialisms modules of the application, it is used by around 50 million users worldwide. Besides that, using Waze enables user to build connection other

drivers in your area who share real-time traffic and road info, which able to save user's time and gas money on their daily commute. In order to outwit traffic together with our users, Waze able to collect, run the process and analyze huge amounts of data. On the other hand, Waze relies heavily focus on visions from this data both for making decision and for constantly improving their mobile application quality and promises to users – faster in their routes, better maps, happier users. Besides that, Waze also consider a social navigation application system which assemble navigation data and information from users such as route duration, traffic congestion, road obstacles, and even map layout from users, and then uses this information to route other users

2.1.2 Strength of Waze

According to resources from (Vanessa, 2016), Waze has a kind of strongest feature is its community user-base system application. The main reason is because the application system of Waze is continuously collecting information; Waze can adapt and calculate in quick responses to ensure the fastest route possible towards the users. Besides that, Waze application has the aptitudes to link and bound up the users in order to communicate with each other in the apps. Let's imagine, there are millions of users appear on the roads, working together and exchange information which towards a common goal: to outsmart traffic and get everyone the best route to work and back, every day.

Another special feature of the application is that the users are able to “level up” and get different characters based on their interaction with game-like application. Waze implement a subsystem of point to keep track the use of the Waze user and client application, and the Waze Map Editor. Points will depends on the action from users which mean users assembled point in total is compared to the point totals of other Waze users to determine your Waze rank. It's all depends the behavior and activities perform by users with Waze application such as driving, reporting, editing the map able to lead the user to earn points from Waze.

In order to make the whole application more interactive with users, Waze decided to develop a dashboard to motivate users to compete with each other to often use the application in order to earn more point. However, Waze will keep on updates on the users dashboard periodically normally it will be once a day. If user do not think the points are up to date or the dashboard haven't refreshed by the system, user able refer or check the status page to observe or investigate the real data if Waze is aware of any delays. On the other hand, Waze will calculate all the earnings that all Waze users have earned and display users where their rank compared to other Waze users.

Another specialty or strength of the Waze application is the type of keep the community stay united to each other which in the community theme all the way. Besides that, Waze lets users add their friends so that groups of friends able to discover of their friends on a trip, or facilitate chance encounters if a friend appears in a Waze user's vicinity. Thus, the Waze mobile application provides real-time traffic-related reporting to users to enable them to route around accidents, construction, traffic jams, and other sources of congestion that are reported by users. As we know that, human can't predict future, but when human united, issues able to solve easily. By using this application, users can get alerted and informed before user approach police, accidents, road hazards or traffic jams, all shared by other drivers in real-time, the users able to save a lot of time by getting those information in order to prevent any congestion of roads and choosing other path to reach the final destination as fast as possible. Based on figure 2.1 are showing the sample plots of report by user which use to notify the users that the condition of the road.

2.1.3 Weaknesses of Waze

Too much of report icons will block the vision of users

Somehow, special features will create problems to user instead of beneficial towards them. In a mobile application, User interface plays an important role that will influence an image of an application in the mindset of user. In order to build up a good image in a desire position in users mind, we need to create an application will be more favorite in their taste as well. One of the largest complaints and reason that influence image of the Waze is the ugly and cluttered layout of the maps. In an area with little activity or users, the application loses its community advantage over Google Maps. But, in areas with a large community, the number of icons on the screen can be overwhelming. Thus, a tiny mobile screen can quickly become filled and make it difficult for users to find their routes. It's a serious issue because people having a main goals to get the pathway to reach the final destination instead but Waze design with the way they icon block the user's vision. By referring the figure 2.2, the map is clearly define the meaning of complicated design create burden to user which will generate a feelings that users uninstall the application as well.

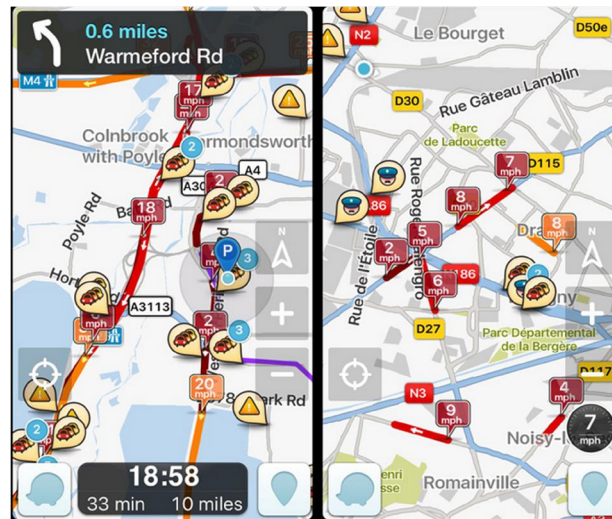


Figure 2-2 (Waze complicated map system)

Waze apps make user distract when driving their car

In a Waze application has a special function those users able to communicate to each other when they travel in their journey and using the apps together, which the Waze has the goals to link up the users together for helping the system to update the situation of traffic and also create a field of community application system. Normally, the friends and user will always retrieved from the phone book of the mobile devices or the user using Facebook account to sign up the system. Waze application will read the data from the sources and showing the occurrence when they being closer to each other in their travel journey as well. Thus, Friends of users will appear with notification which show in figure 8 or the users waving hands with each other and caused user will not focus in the road because the users will increase their curiousness who are they and why they going a same destination at the same time, accumulating points ding, advertisement pop, routes are re-routed, and drive-by incidents beg to be reported. Laws against distracted driving should encourage users to put their phones down when driving, but we all know how difficult it is to ignore a beeping phone.

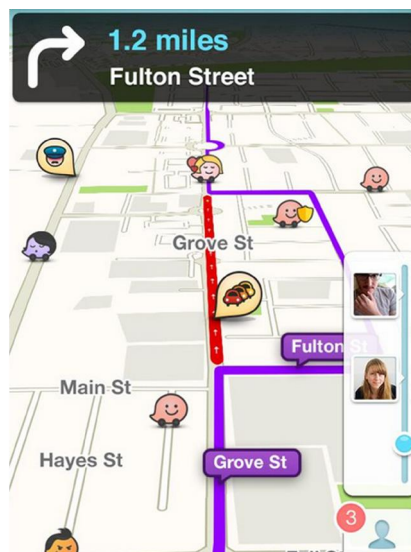


Figure 2-3 Waze show user's friends

Issue regarding the police hints

Lately, police offices across the country have begun to take issue with Waze’s police reporting feature which shown in figure 2.4. Police argue that alerting other drivers to police traps and police presence are making targets of police officers. Based on resources from (Wright, 2015), Sheriff Mike Brown of Bedford County, Virginia, who is also chair of the National Sheriffs Association’s technology committee, told The Guardian, that the police-reporting feature, which he deems a “police stalker,” is dangerous. Both men raised their concerns during a meeting of the organization in Washington. They referred to the Instagram account of Ismaaiyl Brinsley, who is suspect of fatally shooting two NYPD officers last month. He posted a Waze screenshot along with messages threatening police. However, investigators do not believe he used Waze to trap the men. The executive director of the Fraternal Order of Police, Jim Pasco, also says he has concerns: “I can think of 100 ways that it could present an officer-safety issue. There’s no control over who use it. So, if you’re a criminal and you want to rob a bank, hypothetically, you use your Waze.” Waze disagrees, arguing that the police reporting feature of the app increases driver safety because users drive more carefully when in the presence of police.

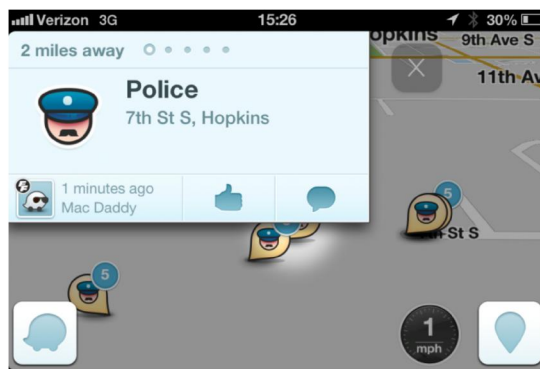


Figure 2-4 Police hint Feature

2.2 Google Map

2.2.1 Introduction



First and foremost, Google maps system is a kind of web mapping service which is developed by Google itself. Besides that, Google map system also offer several type of features which is the street map, the imaginary satellite, 360° panoramic type of street view, another than that, Google map available to other system which required from any sources of the data such as example the real time condition of the traffic which mean it will report the condition whether it's in congestion status or not. Hence, it's also provide the users route planning for the travelling with variable which able to let the user to choose type such as foot, car, bicycle or public transportation also such as MRT/LRT or any bus service.

Besides that, after supplementary acquisitions of geospatial type of data visualization analysis of the company and a real-time traffic analyzer. Then, Based on resources from (Google Company: Our history in depth, 2016), Google Maps system was launched in February 2005. The overall development of the Google map system was implemented the front end utilizes JavaScript, XML, and Ajax. Thus, Google Maps system also provides an API which allows maps to be implanted or integration on third-party websites or mobile application (What is the google map api, 2012). Besides that, Google map system also proposals a locator for urban type of people for doing businesses and other organizations and companies in variable countries around the world. Moreover, Google

Map Maker allowed to work collaboratively expands and update the mapping system service in international but was shutting down from March, 2017. However, crowd sourced contributions to Google Maps were not discontinued as the company announced those features will be transferred to Google Local Guides program (Perez, 2016).

Another special effects of Google Maps' satellite view is a "top-down" or "birds eye" view which able to provide and perform with the perfect resolution with high imagery of cities is take the photo inflight from aircraft flying around at 800 to 1,500 feet which about 240m to 460 m, while most other imagery is from satellites. Thus, various type of the available satellite imagery is less than three years old and is upgraded on a regular basis. (Technamix, 2011) Google Maps uses a close variant of the Mercator projection, and therefore cannot accurately show areas around the poles.

Furthermore, the current redesigned version of the desktop application or was made and launched in 2013, together with the "classic" (pre-2013) version. Besides that, Google Maps for mobile application such as Android and iOS devices was released in September 2008 and features GPS turn-by-turn navigation along with dedicated parking assistance features. On the other hand, Google map android app was first launched in September 2008, though the GPS-localization feature had been in trying on the platform of mobile devices since in year 2007. Thus, Google Maps was Apple's solution for its mapping service on iOS until the release of iOS 6 in September 2012, at which point it was replaced by Apple Maps, with Google releasing its own Google Maps standalone app on the iOS platform the following December.

2.2.2 Strength of Google Map app

Google map provide wealth of Information

In the Google Maps user interface features, it's basically using a design of less complexity and user friendly in order to provide the layout of roads, the locations of cities and towns, state boundaries, geographical features, restaurant reviews and satellite images. One of the strength of the apps is the Google provides the Street View based on figure 2.5 showing the function of perspective which those scene is take the photo inflight from aircraft flying around at 800 to 1,500 feet which about 240m to 460 m, which allow the users to discover the environment in the real life view to observe the housing area, it's also have the display for storefronts buildings and any points of interest and desired from a driver's point of view. Besides that, Google Maps also provide the facility of indoor maps of some airports, museums and other facilities.



Figure 2-5 Google Street View

Sharing location with your family or friends

In the year of 2013, Google map introduced a new features which shown in figure 2.6 which the location sharing into its social network which mean users able to share Maps with family, friends and colleagues, which makes the activity and event of gatherings which is easier to plan and coordinate which lead the users easy to meet in a specific location. Besides that, user can embed Google map information by using emails and Web pages and users can share maps through your Google or Facebook account. Hence, user able to use their Facebook account to share their location directly when they messenger in Facebook to their friends in a short time taken, which mean Google Map system able to

work collaboratively with the third party application which make the chat room more interactive with users.

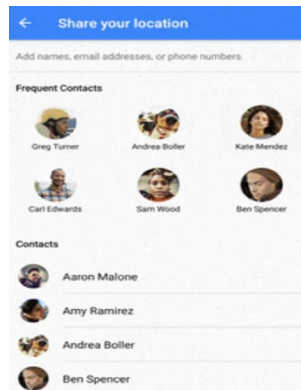
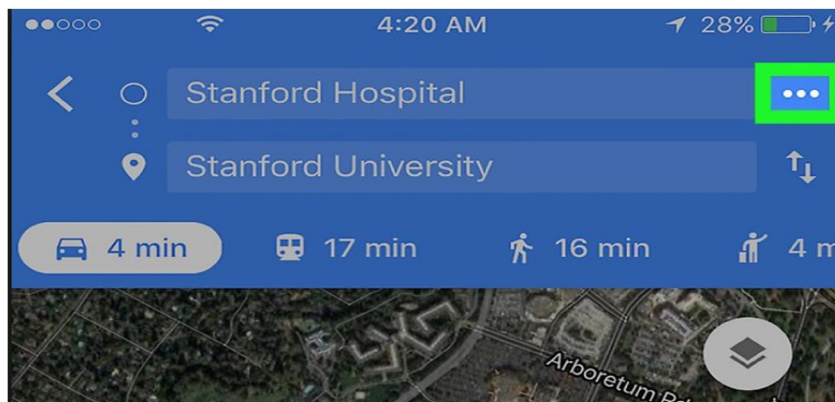


Figure 2-6 Share function of Google map system

Google Map system introduce multiple Transportation mode



The Google Maps able to provide the option to choose their preferable directions for trips by car, bike, foot or public transportation. By using this kind of feature, user can clearly know and understand that by using which kind of transports able reach the destination in a much shorter time and also save their budget of cost to reach the desire destination as well. Thus, the service has local bus and train schedules for many cities including bus and stop numbers and transfer points. For longer trips, Google provides airline information

including ticket price and carriers that serve your destination so that users able to compare the price offering in the market in an easier way.

2.2.3 Weaknesses of Google Map application

Ineffective way to show nearby location

The Google map application have the functionalities that guide the users to get the other extra information of the buildings or location that users might interest with when they searching the path the destination or in the way to approach the desired location. When the users start to search the place, the system will notify the users with other suggested nearby location by appearing in the virtual map system. While look at the virtual static map, the system will just add on some plot of mark with red color to represent the nearby location and expect the users able get the sense to reach there. With this such design is consider not effective and user friendly which will make the user lost the idea path or way to reach the location with such complicated and messy map appearance as well.

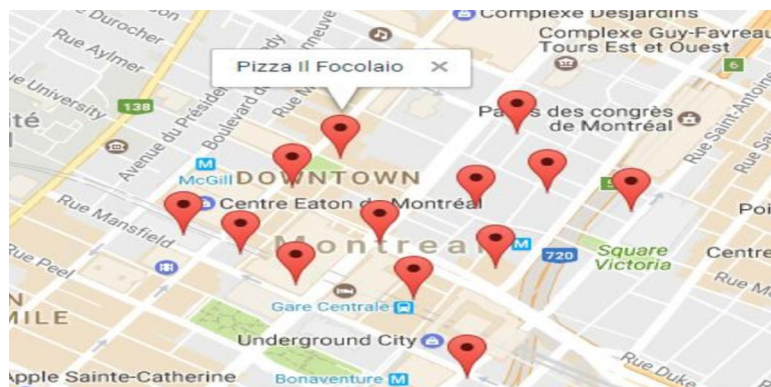


Figure 2-7 Complicated Design show nearby location

Google map as a tools for criminal

As we know, everything will have the pros and cons. one of the features of the Google map is the street view which the 360 degree image was taken by using in flight action of the surroundings and update the capture object to the server. Thus the figure 2.8 shows street view that the users may use it for their reference before they rob a house, this is because the data of the street view is everyone can access to it, which will cause the other malicious users can use the data and information of street view to do some illegal activities. Which mean the convenience afforded by Google Maps is not lost on thieves. However, Street View images can spot belongings momentarily exposed through windows or open doors. Burglars have used Street View and satellite images to find affluent neighborhoods or homes that are easy to break into, or to identify parked cars that might contain expensive possessions. According to a report (Dickinson, 2011), the firm Credit Sesame interviewed 50 ex-burglars in England and discovered 80 percent of the robbers used Facebook, Twitter, Google Street view, and Foursquare. From the data get from the report, there are consist of 74 percent robbers or thief use Google Street View to check out the property before they rob the home, eliminating the need for an physical drive-by.



Figure 2-8 shows the Street-View of Google map

Limited Accuracy of buildings

Information in Google Maps may have errors. Thus, the error of the Google map is that the server of the application will not always update the system which mean the system may will contain some data is consider old which will lead the users misunderstand or the system will always can't get the place to the user desire as they expect to reach which because the location is the latest or new and cause the system fail to present the information as well. Occasionally, ambiguities and flaws in location data may produce a route that doesn't take users to the destination you expect. Google Maps does not have up-to-the-minute information on unusual conditions, such as roads damaged by weather, blocked by street fairs or altered by recent construction work. Some remote locations may not be in Google Maps, user can imagine that, the developer of the Google map somehow can't predict the future how the world looks like and it will store the last update data, such as scenario, today the condition road are just empty nothing been there, but after 2 days later, there some issue happen causing the road are block, human are not able to across the road but the Google map will not alert you that the road are not able to reach, this is because the developer have some limitation to keep update with the surroundings changes. Besides that, the figure 2.9 shows that the changes of the buildings which time passing , the Google map still store the image of the building in 2016, which is the old data that haven't update the latest information or image of the buildings which in the current status in 2018.



Figure 2-9 (the effect of time changes Google map system)

2.3 Map Factor



2.3.1 Introduction

For this mobile application is kind of extremely popular GPS navigation mobile app for smartphone and tablet which consists of over 10 million users downloads in Google Play store – which named **Map Factor GPS Navigation**. Besides that, this application is available for most platforms from Android to Windows CE; it's also available in IOS as well. MapFactor consist two kind of option for users to make their decision. The application also provide the free version which shows in figure 2.10 right hand side of the of the map system called open street Map system which originally attach in the application, it's have the option for the uses to select Tom-tom map system which stated in figure 2.10 left hand side which require users to pay for the charges or fees. The benefit to pay for the maps system is because the navigation system of TomTom is much more accurate compare to the non-paid map system as well.

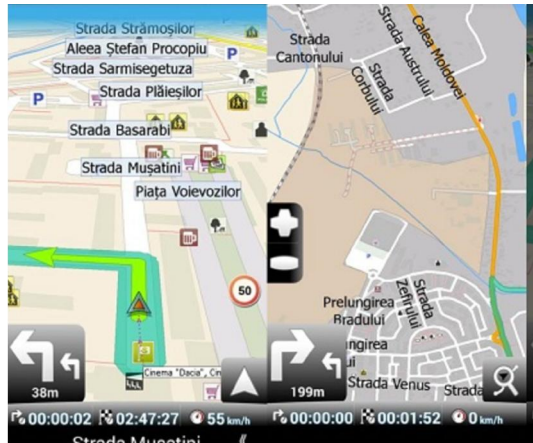


Figure 2-10 type of map system

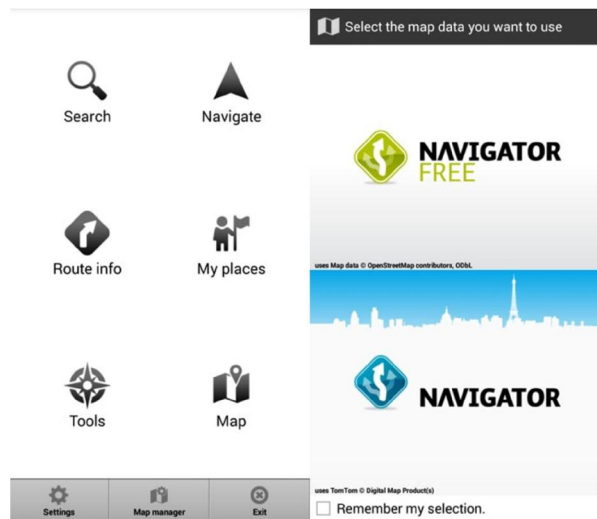


Figure 2-11 map factor appearance

For the application appearance which show in figure 2.11, it is showing the MapFactor GPS Navigation for Android platform in the physical view of the UI design is consider quite simple for the users and they focus in user friendly as well, the probably design this kind of way is because their target user might contain higher ages and they need a simple application for their using purpose. Besides that, the menu consists of a single page where let the user to choose a desire destination, route information, map view and a secondary menu where the users able to simulate a route or receive data via implement the

connection of satellite. By looking at the bottom of the screen, users able to access the overall app's settings and the section provide the users have a chance to download new maps or delete those that users thinks that they will not using it anymore. One of the specialty of the application is it can be installed both on the memory card and on the internal memory of the user's smartphone.

When the user started the system on the application, the map is displayed full- screen version and uses basic colors which can be adjusted in the settings. However, but one of the non-user friendly function is the user can't preview these colors after they setting or choosing the color, so when the users after choosing a particular color scheme, they are required to go back to the map screen to be able to view the output of the result. On the other hand, the display of the route is much easier to follow of a vivid green color way which shown in figure 2.12, and the user able to make some changes in the font used to display street names or points of interest can be expand or enlarged as well by using the settings menu for those who need this info. Thus, users can also switch from 2D to 3D mode from the bottom right corner and on the left we have displayed the next 2 maneuvers users need to do. Besides that, the bottom bar of the map which shown in figure 2.12 is made up of 3 fields which can be modified and setting depends on the user's preference to make the option in order to display any information user prefer to have there. For example user able to set the display such as: user's driving speed, the length of user's route, altitude, or any other GPS data.



Figure 2-12 Map factor map display

In order to observe object more clearly with the component in the map system, user able to zoom in or out on the map we have the pinch-and-zoom feature, after try with function of zoom in, some of the technical problems of the application is that the sensitivity isn't properly adjusted and functioning which causes users facing difficulties to observe the map's component which lead to zoom in and out confusedly. The good things for this problems is that users have the alternative to use the + and – buttons which appear on the left when users tapping the screen.

2.3.2 Strength of the navigation system of Map factor

User able to set their profile before using the map

By using the map factor application, if the user do not select any vehicle before using the map system the application, The Car profile is the default vehicle profile in Navigator, so that the application will pretend the user are using the car to travel to the final destination. The route of the map system will calculate how much time needed to reach the destination in terms of the remaining time, distance; speed needed to reached the final destination as well. Besides that the user able to choose different profiles too such as like Bicycle, Bus, Pedestrian and Truck. Thus, all pre-defined profiles can be customized or used as a template to create your own vehicle profile. This special feature consider a strength for the application is because that the user no need reselect again in the map system, they can directly know the requirement information to reach the final destination, it's quite user friendly and convenient towards them as well, so that they can make the comparison directly in order to reach the desired destination in a budget and non-time wasted way.

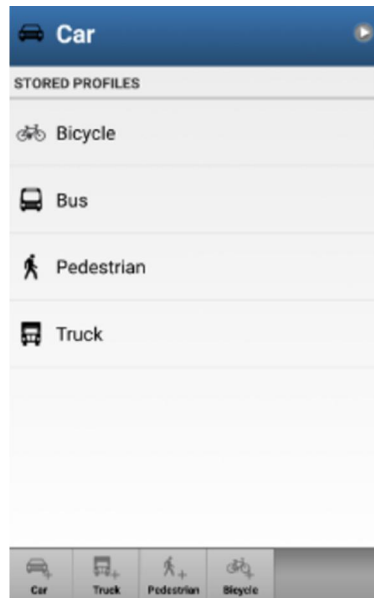


Figure 2-13 Map Factor profile settings

User able to choose which Point-of-interest icons to display on the map

By using the map factor navigation application, its contain a strength that the users can prevent blocking in their vision when they observing the map as well which mean the user can make some modification in Settings then select Map customization last step select Point of interest types which show in the list which is possible to disable individual Point of interest types from displaying on the map. The scenario of the function be like, when user want to go to a pub or café shop only, by default the system will directly bring the user to the destination routing and show all the nearby location in the particular region. It somehow create some issues towards users which is that the users might feel annoying and make the whole map system display in the way of complicated and complex by looking at non interested point towards them since the users just looking for the café or pub only. So, map factor consider this kind of issue happen , the Map factor application provide the users to make the option for turning off irrelevant with user's desired destination or location which user do not wish to see them on the map.

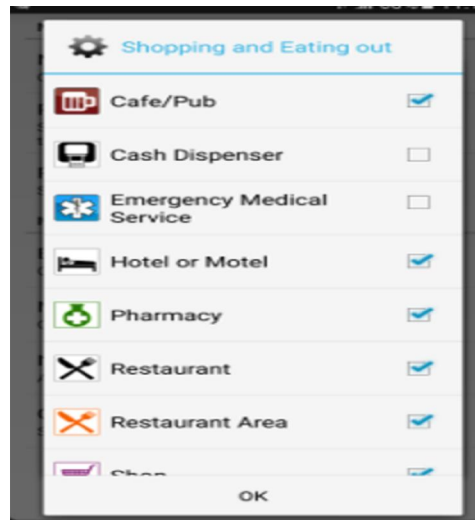


Figure 2-14 Map factor select icon display

The specialty of lane assistance



The application is mostly consider an application that depends on the personality and preference of the users. Somehow, the application can let the users to choose the color of the navigator lane assistance which normally users called it “Arrow” which the function of them is to lead the user to reach the desired destination or location which playing in an important role in the map system as well. Map Factor are focusing in this tiny component

which will affect the user friendliness of the whole application, they let the user have the chance to change the color of the lane assistance as well. The size of the navigator also consider wider and easy to be observed by users. From the upper part of the screen the three components, users have the benefits that they able to predicts the front of the pathway regarding the actions of the users either they need to turn left or right or the path just a straight position only, it's like a hint towards the users as well.

2.3.3 Weaknesses of the Map Factor application system

After review the whole application of map factor, there is consists some weaknesses of the system that need to be figure out and solve it with an effective solution as fast as possible in order to increase the numbers of the users or maintain their preference instead of quite the application. The first issues from the Map factor application is the way of showing the buildings information is kind of low graphic presentation and hard to let the users more make sense about the information that generated by the Map factor system. By referring to the map system in figure 2.15, it's showing the way of showing the information of the nearby shop lots when user travels the path. Thus, with such kind of techniques with the appearance will causes the users feel doubt with the icons and also consider the application are zero contribution towards them. The application are not provide any further information regarding the special promotion or latest information of the building as well.



Figure 2-15 nearby location shown by Map Factor

The second weaknesses are about the fees and charges of the application. Nowadays, the navigation system exists in the current market are mostly Free of charges which mean user can use their service instead of paying any cents for them. In the Map factor applications, it require the user to pay some fees for using a better features of the application system as well, because of this issues, it might causes the user shift their preferences of the navigation to other company such as “Waze and Google map” , which mainly free of charging to use a same features. In the condition for Map Factor in the Truck routing mode is not useful unless you purchase Tom-tom maps, it forcing the user who needs to use the feature become a “must” in order to reach for your wallet. Another issues is about the pathway that provided by the system after users input the destination. With this issues, when the system start to implementing route calculation , users were not offered alternative routes along to reach the desired destination, in order to choose one to their liking or pathway. For example, when the user key in a input as a destination in the Map Factor application , “Utar Kampar”, the application will just directly show up the path only one way to go for , which mean the users have no other option to choose. Thus, this consider a terrible problems which will cause the users directly delete the application as the system are not provide benefits which in term of helping the users save their petrol, use their time efficiently to reach the final destination, which somehow the path that generated from the system might have the issues of traffic congestion, in the end, cause the users need to spend extra hours to reach the final point.

Last but not the least, regarding the function of zooming in or out on the map by using pinch and zoom does not work properly enlarging the map too much if users don't act slow enough. Thus, this is a highly noticeable issue especially if you try to view certain areas while the smartphone is in its dedicated car holder and the zoom starts behaving chaotically. With this issue, it's consider not user friendly approach and consider a burden for the users , it's actually consider a minor issues which came from the programmer technical problems. However, regarding these kind of technical issues it can be solved if the management of the overall development process had been plan properly and the system was tested by the testing group before the developer launch out

the application as well to make sure the system can work properly when they reach the users.

2.4 Maps.Me

2.4.1 Introduction



The last review of the existing mobile application that related to the propose project application called Maps.Me. Firstly, Maps.me is design in styled as 'MAPS.ME' with the meaning of MapsWithMe. Map.me is actually support in three main platforms in mobile application which is for Android, iOS and BlackBerry that provides offline maps using OpenStreetMap data. After review and research MAPS.Me from (Yury Melnichek & Govako, 2014), the main objective of this application or the company is to provide and create the offline maps of different locations scattered around 345 countries to the user. On the other hand, the search program used is based on OpenStreetMap data. This app was developed by a small international company based in Zurich, Switzerland named MapsWithMe.

In November 2014, Maps.me application was successfully acquired by Mail.Ru Group and renovated or changing to become a part of its My.com brand. However, In September 2015 the mobile application was present as open sourced. Furthermore, the whole developer team members have developed an application in Belarus and Switzerland. Maps.me was founded and lead by Yury Melnichek, Alexander Borsuk and Viktor Govako. Under the leadership of Alexander, MapsWithMe successfully achieved a record which is scored its first 2.5M users worldwide. Moreover from the resources from (Frolov, 2016), Yury Melnichek take the responsibility to lead the project from November 2013 until April 2016 the second person which called Evgeny Lisovski took

over. Thus, from the resources from (Petersburg, 2016) stated that the earlier days of 2017 the viewpoint of the Maps.me application changed, foremost it to be supported by inconspicuous adverts, which can be disabled from the settings menu.

In order to let the application to survive in the long term duration, Maps Me comes with a number of effective features that can be used for separate purposes. Some of these features get are:

- **Professional Routing system**

In a navigation application, a specific accurate routing system are needed and required in the current needs of users. Maps.me has a routing system which is a very efficient advantageous feature offer. It helps the user to receive the accurate direction of a particular location offline when the user starts to use the application and make the program run.

- **Download map for the application**

When users start to play around with the apps with any location. Before them referring to the map, they are requiring to download the map for the location. Thus, Maps.me allows its users to download an unlimited number of maps as per their requirement.

- **GPS performance**

When the users lost in a particular place. It's not a problem by directly open the maps.me apps which will provide an accurate GPS data If you are using with the help of GPS tracking function. The system will perform the task in mille-seconds of time

- **Sharing real time location function**

Maps.me gives users the opportunity to share user's location in the real time with family members or friends as bookmarks. Thus, user's friends and family have the benefits when they are going to gather or meet up at a location.

- **Offline activities**

One of the special features of this application is when the apps is in the condition of offline, user will not require an internet connection when searching a certain location. Which mean users will be able to search any possible area by its name, category, coordinates or address.

- **Editing of user menu view**

In order to perform user friendly of the application, Maps.me provides user the occasion to edit the view of the menu anytime users want as per your requirement. Hence, users able to toggle the screen between three separate variables such as old style, light, and dark. Thus, it also offers a considerable number of user-friendly tools for this purpose.

2.4.2 Strength of Maps.Me

Reduce the data roaming cost of user

Nowadays, most of the mobile application needs internet connection or data roaming to access the system to do further service process. Thus, Most of the navigational apps cannot work offline and as a result they require a constant internet connection so that the user able to connect the data center of the apps and retrieve and store map information about various places. Because of this issue, it causes a considerable amount of expenditure as roaming costs. Besides that, Maps.me is an offline app; user's roaming cost will be reduced by a significant amount.

Independency from data or internet connection

Even in this technologically advanced age, somehow users fail to find a strong and stable internet connection in every corner of the world such as some country or places are consider abjection and their technology are not the latest version and their internet service is consider slow. Thus, there are still places where your mobile data facility would become absolutely not functioning well. In such places, Maps.me would be performing a perfect task which is able to help user find the location that users are looking for. However, all the users would need to do is to key in the specific coordinates or an address of the particular location. Thus, because of these functionalities it also able to curtail the unnecessary cost for mobile data as well.

Functioning good in underground train

Underground train station is a system of public transport consisting of **trains** that travel in tunnels below a city. The **Underground** in London is also **called** the Tube and in some other cities it is also **called** the Metro. In underground trains, users have the resistance or wouldn't always get a very good reception or internet connection. In those places, offline apps like Maps.me can be extremely useful in guiding user to your destination safely and in time as well, so that users can avoid the issue of lost in a place which is strange towards them regarding problem of no internet connection still can find the way to reach the destination.

Save time and battery

Maps.me not only saves the user's money, this innovative application also able to help user to save a considerable time as well. When the system start to perform online mapping and tracking, a lot of time gets wasted because of buffering and irksome delay in loading the desired webpage which using the content from the web services to retrieved data . By using this application since it's an application which can operate in the offline status, there is absolutely no chance of such incidents to occur. Besides the saving

of the time of users, Maps.me also saves a considerable amount of battery life in comparison with other online apps.

2.4.3 Weaknesses of Maps.me

From the figure 2.16 which shows that the normal map system of the application which showing the business information of the particular nearby location with the user's input location to the application system However, Maps.me have one of the functionality which is the information of the user are needed to be updated frequently which consider not labor efficient enough to update and maintain the system manually by the technical team. Furthermore, since the system are normally focusing in the offline system , which mean all the data should be store statically in the devices of the user. Because of this issues, users are require to always connect with a stable connection to update the data regarding the business information which always changing and not fixed forever, after that the user only able use the map with full of functionality as well.



Figure 2-16 Maps.me Map

Besides that, about the design for the static map regarding the plotting of the location consider not up to the standard compare with the current application that existed in the market. Thus, the map are added on some text form to describe the name or the description of the buildings by the dialog form of display which will block the vision of user when they referring the path to reach the final destination. However, it's actually

Chapter 2: Literature Review

create user difficult to observe the map as well and they might feel bored and not interesting by just looking at the bulk of text which describing the buildings.



Table 2-1 nearby location presented by Maps.me

2.5 Comparison between proposed applications with other existing reviewed application

	Waze	Google Map	Map Factor	Maps. Me	Proposed Apps
Platform	Android/IOS	Android/IOS	Android/IOS	Android/IOS/Blackberry	Android
Virtual/Static Map	Yes	Yes	Yes	Yes	No
Buildings historical information	No	Less	No	Less	Yes
Augmented Reality Technology	No	No	No	No	Yes
Graphic design	Good	Normal	Normal	Poor	Good
Interactivity with users	Less	Less	Less	Less	Yes
Nearby location shown	Normal	Normal	Not so effective	Not so effective	Good, informative
Marketing tools	No	Yes	No	No	Yes
Location sharing	Yes	Yes	No	Yes	No
Battery Consumption	High	Medium	Medium	Low	Extremely High
GPS module	Yes	Yes	Yes	Yes	Yes
Accuracy of Data	Medium	Medium	Low	Low	High
Complexity Design	Yes	No	No	No	No
Offline / online	Online	Online	Online	Offline/Online	Offline/Online
Multiple Transportation alternative	No	Yes	Yes	No	No

Table 2-2 Comparison between proposed applications with other existing reviewed applicatio

Chapter 3 : System Design

3.1 Block Diagram

A block diagram is a diagram that illustrates the schematic form of the general arrangement of the components or those parts of a particular complex process or system, it mostly used for an industrial apparatus and also the electronic based circuit.

Figure 3.1 shows the system block diagram of mobile application that for local attraction with the involvement of Augmented Reality features. From the block diagram shows, when user wishes to search or discover different category of desire places or destination that near to them, example: restaurant, entertainment or hotel rooms. Next, the application will start to enable the GPS functionality of the user's mobile device and start to operate with Google API to receive the longitude and latitude of the nearby attraction location that current user located. Furthermore, the system will start to process GPS data from Google API and current user's GPS data. Thus, the system will use the AR feature effects to notify user where the user currently locate and will generate some suggestions places to user. Besides that, when user reach their desire destination, they able to use their device camera view and start to track the physical view of the buildings or shop lots. From this application, the system will calculate the buildings physical view and start to recognize them. Lastly, the system will generate user interface such as buttons to let the user to decide, which kind of information they require from the application such as Booking/reservation, Restaurant's Menu, Promotions and detail information. The application will describe the information that decides from user by AR effects.

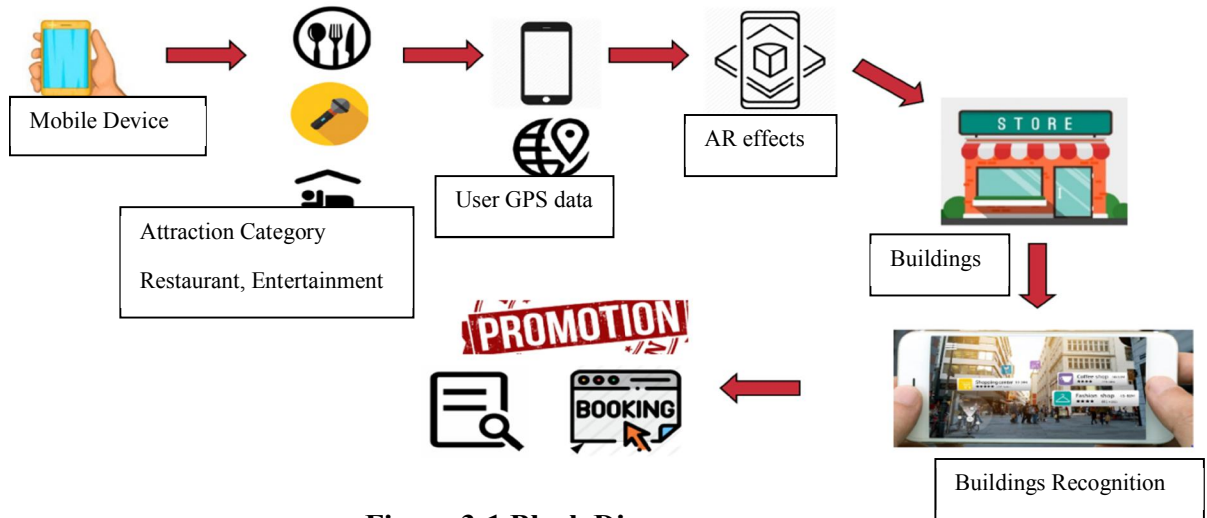


Figure 3-1 Block Diagram

3.2 Use Case Diagram

A use case diagram is a methodology used in system analysis to identify, clarify, and organize system requirements. In this context, the term "system" refers to something being developed or operated. In fact, use case diagrams are employed in UML (Unified Modeling Language), a standard notation for the modeling of real-world objects and system.

Get nearby interest place notification

Based on figure 3.2 use case diagram, after the user experience tutorial session, user requires choosing which kind of category interest location they desire to proceed. Hence, once user selected their category, the system will start to retrieve the GPS data from user's mobile device and also launch the Google API to perform matching process as well. Once the user is near to location category, the system will generate AR effects in the scene of user.

Retrieve building details information

From figure 3.2 use case diagram, when user reach the interest place that around them, they able to use their camera to track the particular buildings physical view. The system will start to calculate by the programs and checking the availability in Vuforia database. Next, if the data is consisting in database, the system will generate details information of the building by applying AR features. Hence, user is requiring to use their device's camera to track the particular shop and the system will generate the upcoming promotions from the shop which represent by AR features.

Retrieve restaurant menu

Based on figure 3.2, the user able to use their device camera track on the particular shop, if the shop is under restaurant category, the system will generate some user interface to let user view the particular restaurant's menu. The menu will show the top rated dishes and the price directly.

Make reservation

From figure 3.2 also shows that, user able to book or make any reservation in the particular shops that user desire to do so. When user chooses the option of "Reservation", user is requiring filling up their personal/customer information such as their name, contact, date and time. Next, once user completes to fill up their personal details, the system will store their information in MySQL database for the reference to the particular Shop lots.

View reservation details

Based on figure 3.2, once user completes to fill up customer information and complete store in database, the system able to let user views their reservation details which the system will retrieve their data from MySQL database system.

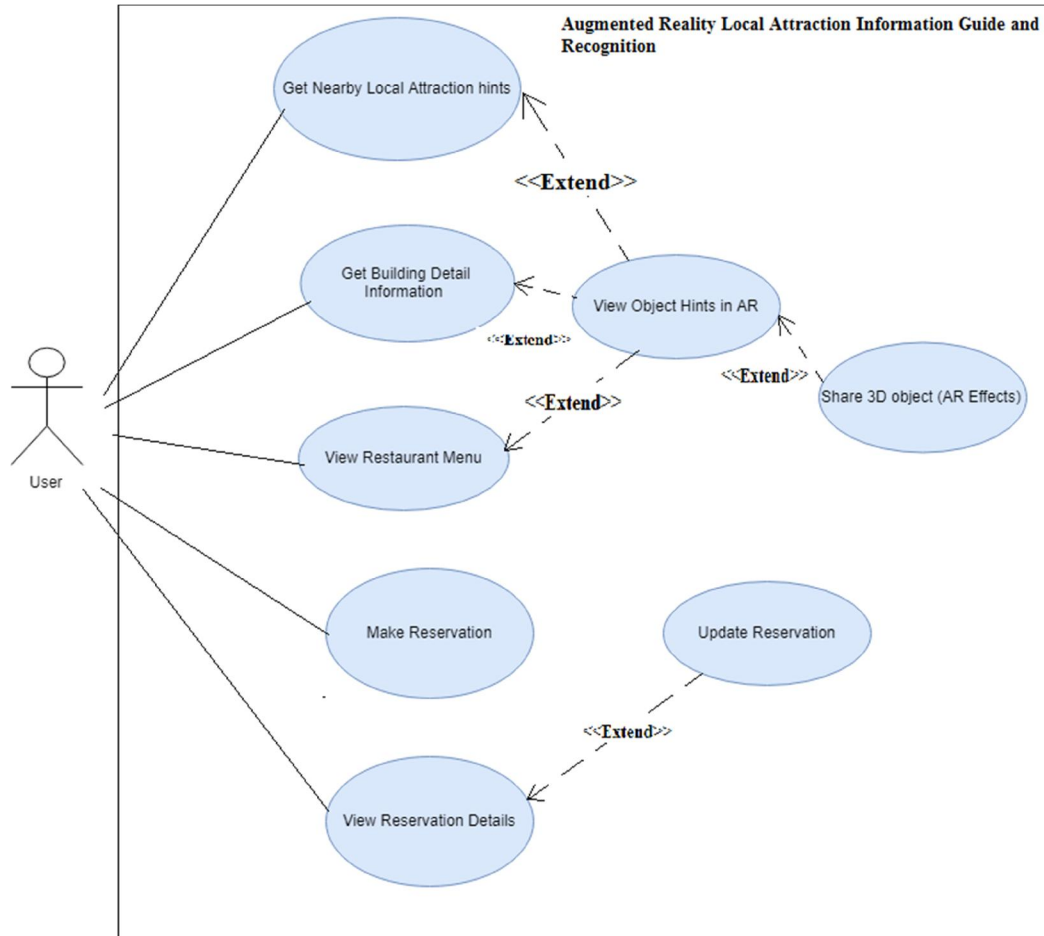


Figure 3-2 Use Case Diagram

3.3 Swim lane Activity Diagram

User Tutorial Module

Proposed Application module Description

By referring figure 3.3 shows that the swim lane activity diagrams for tutorial module. Before the user start the apps system, the user will require to go through a tutorial session of the system. When user selects tutorial option, the system will generate UI design towards user's scene. Hence, once user completes the all the tutorial scene, user able to decide they need to go previous tutorial scene or not. If user select directly start the system, user will navigate to the next scene of the apps.

TUTORIAL MODULE SWIM LANE

KEE MING WEI | February 23, 2019

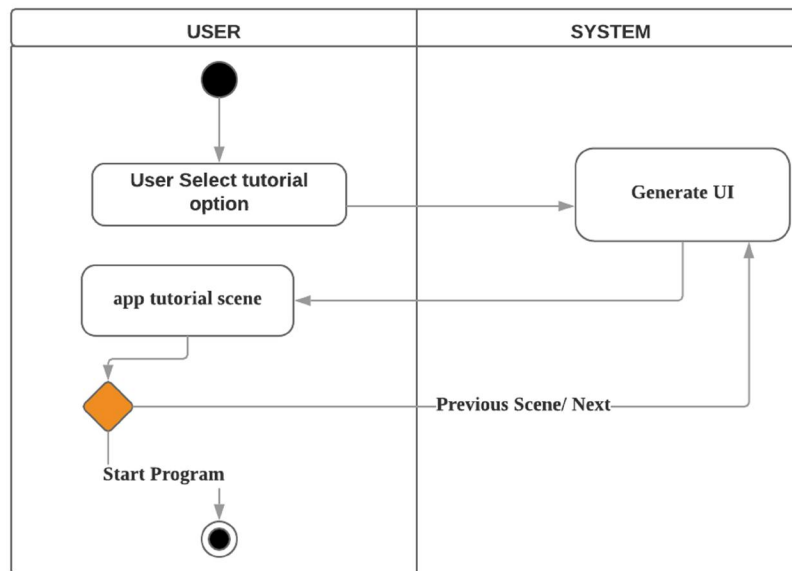


Figure 3-3 User Tutorial Module activity diagram

Nearby Location Hints Generator Module

Proposed Application module Description

Once the user successfully access to the system, users are required to enable the permission of the camera view and also allow the application enable the GPS of the mobile device. Thus, the user needs to walk around the Kampar area and provide the GPS data to the system continuously. When the system receive the GPS data from the user, it will start to perform conditional comparison between the user's GPS data with the nearby interest location GPS's data, if the user are not around the area of the nearby interest location, the system will just remain unchanged for the real environment view in the user scene. Besides that, if the user are under the region of nearby location, the system will generate the AR effects object in order notify user that around user's current location consist some shops lot or buildings that user might interest with.

Hence, the system will start to launch the Google API to get the nearby location that surround user. The system will receive the list of GPS data and convert it into Reference Longitude and Reference latitude. Hence, system always will keep compare the user mobile device GPS data with the configured interested point GPS data (Reference Longitude and Reference latitude).

Basic concept:

```
ReferenceLatitude = 4.329560;//sushi mental
```

```
ReferenceLongitude = 101.146905;
```

```
latitude = Input.location.lastData.latitude;// user GPS data
```

```
longitude = Input.location.lastData.longitude;
```

```
if (the referenceGPS data with userGPS data difference value==50 meter)
```

```
{
```

```

the object hints will be appear in the screen of user view
}
Else
{
The object will not appear at all
}
    
```

SWIMLANE ACTIVITY DIAGRAM

medwinkee97 | June 26, 2018

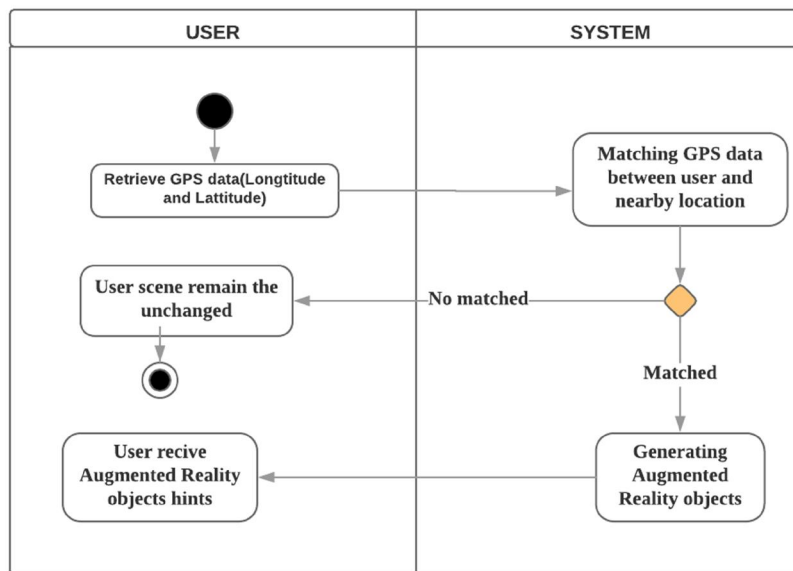


Figure 3-4 nearby Location Hints Generator Module activity diagram

Building’s Information Generator Module

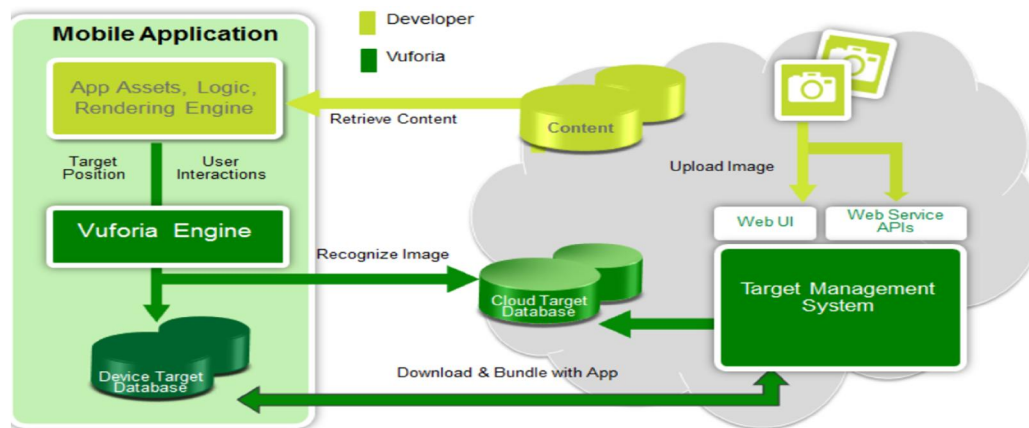
Proposed Application module Description

By referring figure 3.5, the user are assumed already allow the permission towards the proposed application to launch the camera of user’s mobile device. In a normal scene,

user will stay at the real environment with non-integrate with any AR component. On the other hand, user need to scan the buildings with their camera and upload the view data to the system, system will perform some calculating the angle and the shape of the buildings and check whether the scene is a valid buildings or invalid buildings. Thus, if the view data is consider invalid, the user scene will stay normal in real environment scene. If the view data is consider valid, the system will retrieve information data from Vuforia database system in order to generate AR objects or animation and integrate with real environment scene of user.

Basic concept:

Vuforia target database system



The image target from the Vuforia developer database will be the data use to be retrieved and recognize by the program as well.

UserScene = retrieve from user camera view input

If (UserScene == imagetarget (the size and position must be accurate))

{AR effects will be appearing in text, image, and video form towards the user screen.}

Else {the system will remain unchanged in the system ;}

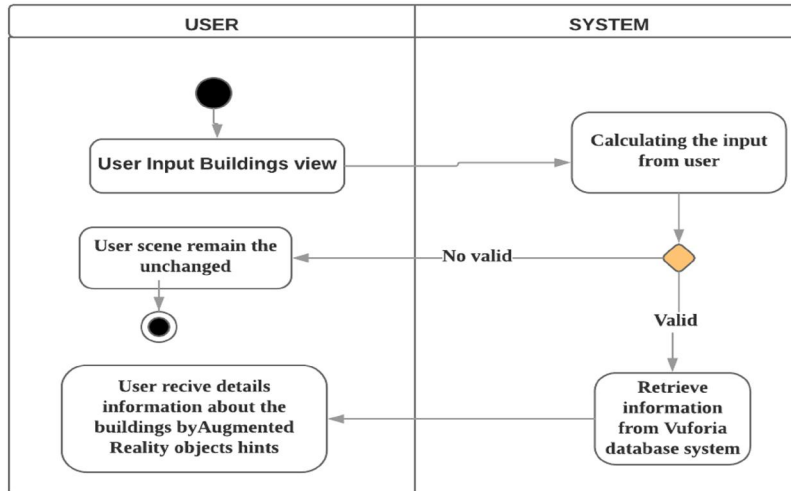


Figure 3-5 Building’s Information Generator Module activity diagram

Customer Reservation Modules

Proposed Application module Description

By referring figure 3.6 swim lane activity diagrams, once user select the option for making reservation or booking process. The system will generate a user interface on the scene of user and user is requiring filling up the entire input field that exists from the form statement such as name, contact, date and time (different kind of shop lots will have different requirement or needs information). Furthermore, once user completes to fill up the input fields, the system will retrieve the data from the input fields and store the data in MySQL database system.

SWIM LANE ACTTIVITY DIAGRAM

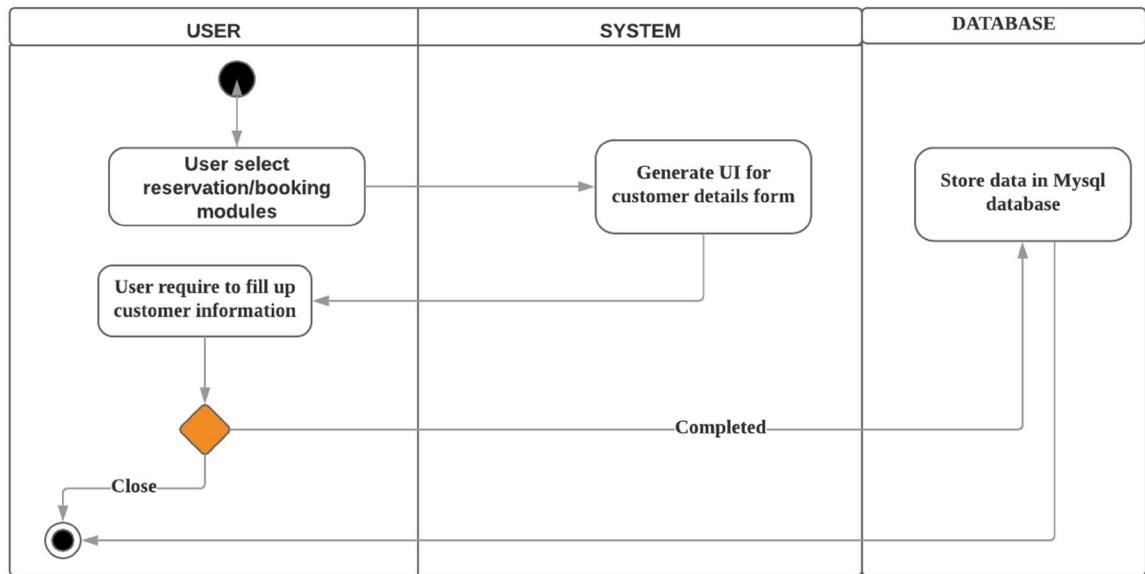


Figure 3-6 Customer Reservation Modules

3.4 Entity Relationship Diagram (ERD)

In this project, an ER model considers a need to form for describing the buildings reservation for the related a business needs that consists in the project application such as hotel, entertainment and restaurant to remember in order to perform business processes. Consequently, the ER model becomes an abstract model, defines a data or information structure which can be implemented in a database, typically a relational database.

Figure 3.16 is basically shows that the reservation module ERD in the project application. Hence, the user of the application will be identified as customer; user will be given a unique key as the distinct value for the user and the personal information will be stored in Customer Database. For the application reservation module, it is segmented to three kind of category which is Entertainment, Hotel and Restaurant due to the commercial requirement suggested that retrieved through the commercial interview session. Hence, different kind of buildings has different kind of category, such as an example, in the hotel reservation, user will require to provide the input for the preferable room no and also the date information in the reservation process. On the other hand, in the buildings of restaurant, user only needs to provide their personal information, the preferable date and time for the reservation. For the relationship between customer and customer_reservation is consider one to many as customer will have many reservation to the particular buildings.

Thus, due to the commercial requirement the buildings of entertainment such as EHUB will consist of three different of category of reservation session (First floor, Second Floor and Third Floor). For this situation, the database will consist a relationship which is one buildings will have one to many of category based on the requirement of the particular buildings customized. Hence, BuildingID will treat as a foreign id from the buildings database in order to link up the whole database system.

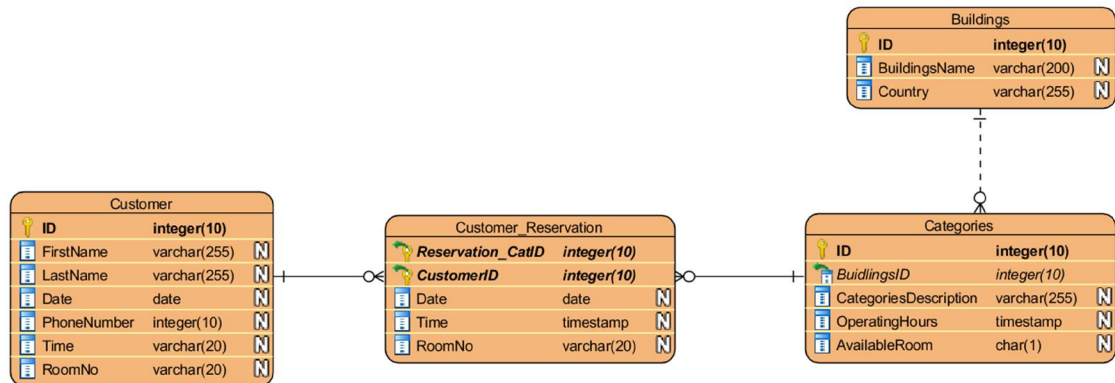


Figure 3-16 Entity Relationship Diagram (ERD)

3.5 User Interface Design

From figure 3.8 shows the very first UI scene of the project application system. This UI provide some alternative option of button to let user to decide. Firstly, of the meaning of “AR CITY” is the Augmented Reality apps based that covered area of Kampar City. Hence, when the user chooses the “Start” option, the system will directly navigate user to the main application program which considers the second scene of the apps. Next, if the user selects the second option button “Tutorial”, the system will change to another scene to provide some guidelines to use application. Besides that, when user selects on the third option “Exit”, the system will directly terminate the application.



Figure 3-7 First Scene UI

Secondly, figure 3.9 shows another user interface when user selects tutorial option. Hence, the first scene of tutorial phase is to guide user about the first step when they launch the application, user is require to choose a local attraction category which classify to entertainment, restaurant and hotel. The system will query the user selection and operate the system based on the category that user selected. Hence, the UI attach with “Next” button which let user for proceed to the next scene of tutorial. Besides that, figure

3.10 shows the next scene of tutorial when user select “Next” in the tutorial first page. The UI for the second scene of Tutorial of the apps is to guide user how to use the AR features (UFO Hints) which appear in 3D shape. Hence, the second scene of tutorial also attached with “Next” and “Previous” button, the “Next” button is to navigate user to the last guidelines while the “Previous” button is to navigate the user to the first tutorial scene. Moreover, figure 3.11 shows the last scene of tutorial module UI, the system provide the basic instruction on how to use the buildings recognition function of the application. Well, the Green button “Start” button will navigate user to the main scene of the application.

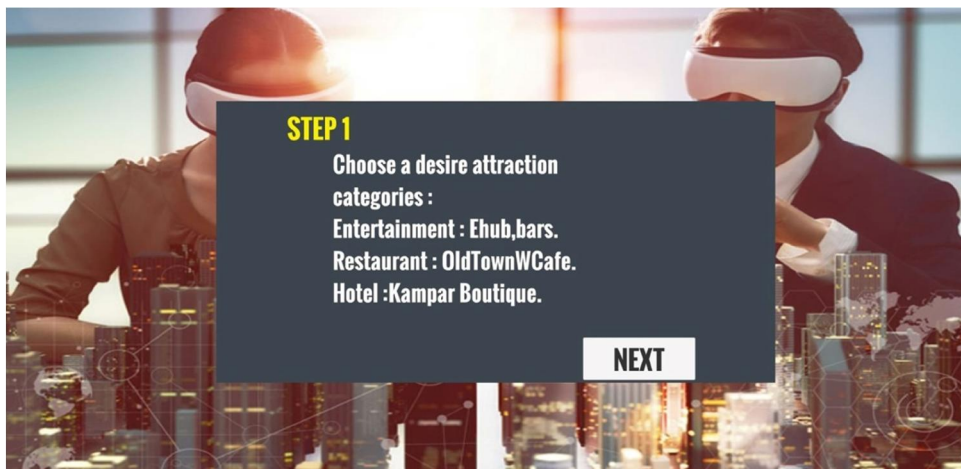


Figure 3-8 Tutorial First Scene UI



Figure 3-9 Tutorial Second Scene UI

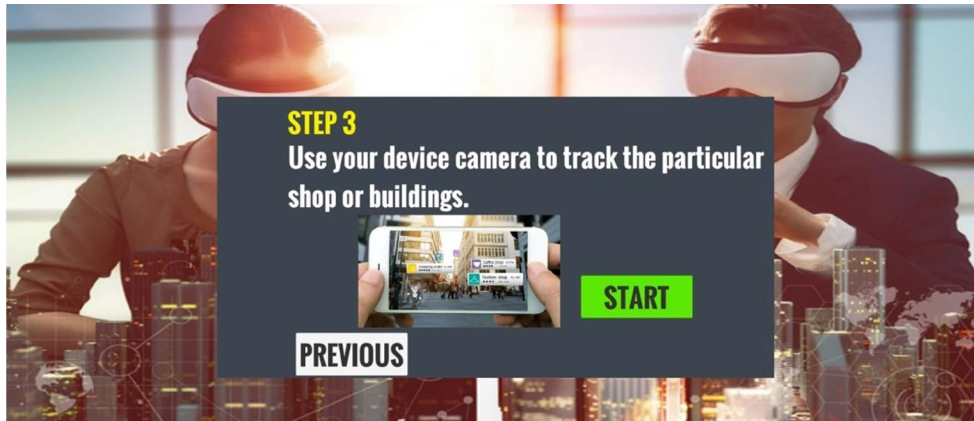


Figure 3-10 Tutorial Third Scene UI

Moreover, once the user is navigated to the main scene of the application, the system will directly activate the user's device camera (if the user allows the usage of camera permission in this app). Based on figure 3.12, the scene will be appearing in the reality environment view and the system will require user to choose one category of local attraction that user desire to approach. Thus, the alternative option appears as UI button which is "Restaurant", "Entertainment" and "Hotel". When user select one of them, the system will start to query or filter out the nearby location based on the category that user selected.

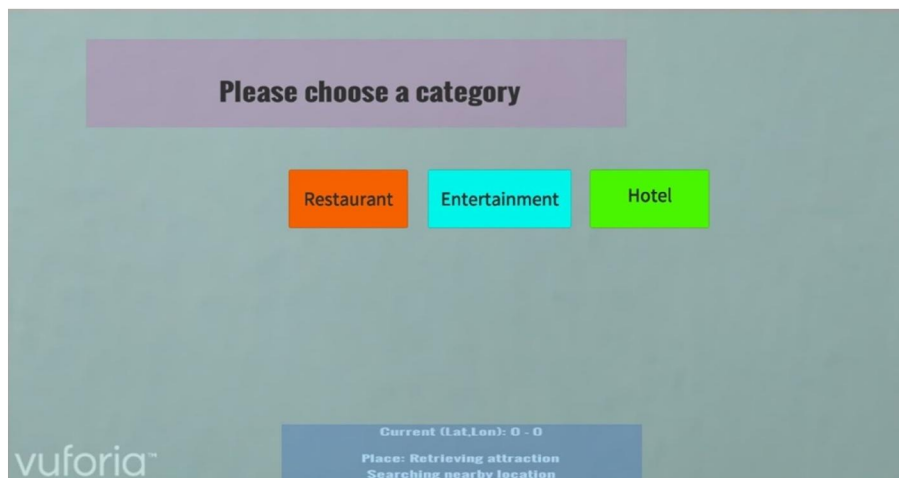


Figure 3-11 Second Scene UI

Furthermore, based on figure 3.13 shows the User interface when user's camera keep track the buildings and the system will generate some UI button to let user to select their behavior. Hence, user able to decide what kind of information they want to get from the application system. Thus, the UI buttons will be slightly different, which based on the type of shops categories and the service that provided from the buildings. Well the "Exit" button from the top of the user's view, it uses to quit the restaurant query in the system and go to the main scene of the apps. Next, when user selects the "Reservation" button option, the system will generate another part of scene to get user input as the customer information based on figure 3.14. Hence, once the user click submits on the UI, the system will store the data in MySQL database directly. Next, when user chooses for the "Promotion" UI button, the system will execute the AR effects to show the latest promotion of the shop to users. Besides that, the "Shop details" UI button use to show the shop's detail information such as operating hour, details address, contact number and so on. Lastly, the "Menu" UI button is to provide the updated version menu of the particular restaurant based on figure 3.15.



Figure 3-12 Third Scene UI



Figure 3-13 Reservation Form UI design

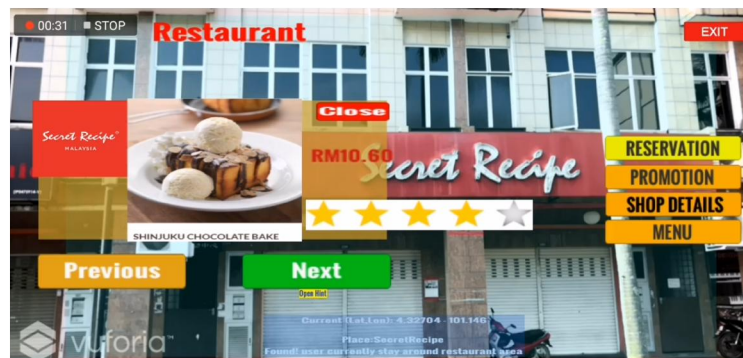


Figure 3-14 Menu UI design

Chapter 4 : Design Specification

4.1 Methodologies and General Work Procedures

SDLC methodology

For the overall of development process, the methodology that used in this project is the concept of SDLC which stand for Software Development Life Cycle. Thus, the project is much more suitable with this concept because it is a process that produces software with the highest quality and lowest cost in. Besides that, by using this methodologies it's able to manage the time in an efficient way and also make sure the whole phase of development are going with systematic in order to develop the proposed apps that expected. By referring the figure 4.1, it's showing a diagram which includes a detailed plan for how to develop, alter, maintain, and replace a software system.

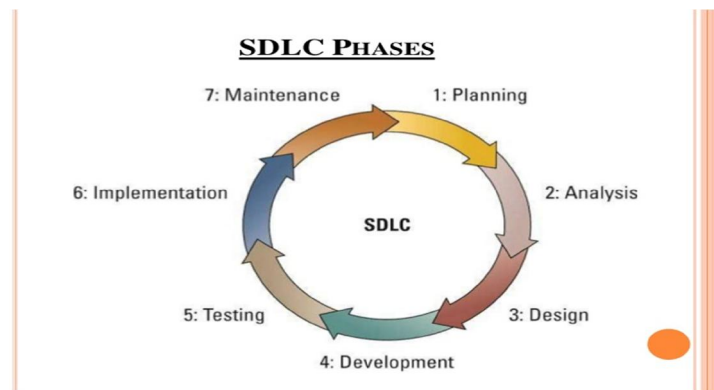


Figure 4-1 SDLC phases

Planning and Analysis stage

For the beginning of stage life cycle, requirement analysis and planning will be implemented in the beginning of the development process. The requirement analysis is basically getting some inputs from my supervisor and course mate as a respondent of survey form regarding their suggestion for improving the proposed application such as some of the survey and some domain expert in the industry about the project area which

is the augmented reality. After the process of survey, they provide some feedback or some user stories regarding the proposed application and I would like to choose the most appropriate user stories as my project user requirement as well. Besides that, for this project is about the interest locations that surrounding New Town Kampar area. Hence, it does consider needs to interview the supervisor or the manager of those shops as well.

This information is then used to plan the project approach and to conduct product feasibility study in the cost-effective, operational and technical areas. For the planning state, it's for the quality assurance requirements and identification of the risks associated with the project is also complete in the planning stage. Well, the outcome of the technical feasibility study is to define the various technical approaches that can be followed to implement the project successfully with minimum risks.

Design and development stage

Furthermore, in the design phase of the system that associate with AR features is prepared from the requirement specifications that chosen from surveys which were process in the first phase. System Design will helps to specify mobile device and system requirements and also helps in defining overall system architecture. Thus, the system design specifications or user stories will serve as input for the next phase of the model. After the design phase, it's the phase of development process. In this phase, after getting the input from the design phase, its takes time to development the whole proposed application, including some coding for the main part of the application such as the generate information of the buildings by using Augmented Reality effects and showing nearby location hints for the user in the Unity platform which mostly using C# programing which consider a longest time need to be taken in this project. After the finish of the coding for the main part, it's time to design the application features in order to beautify the whole looking for the application, such as the user interface of the whole apps appearance in order to achieve user friendly concept.

Testing, implementation and maintenance stage

Moreover, testing phase consider an important phase which it use to test against the requirements to make sure that the application is actually solving the needs addressed and gathered during the requirements phase. It will categorize in the functional and non-functional testing. Functional testing is about the basic feature or functionalities of the whole application should have and input some test case to the system and analyze the outcome whether it's under the output is under the project expectation. About the non-functional testing is about the performance of the application, whether the application will perform delay or the system will crash. Once the application are being tested, it's the right time to launch out the application for the target users such as course mate and project supervisor in order to perform the process of beta testing to get their feedback for the proposed application. The last phase of the SDLC is the maintenance phase, in order to maintain a good condition of system, it's a need to having some maintenance like once a month in order to make sure there's no bug or some errors contain in the system.

4.2 Tools, Connectivity, Hardware and Software Requirements

4.2.1 Tools Requirements for Developers

Unity



From this project, Unity is the main tools to be used for developing the whole application. Thus, Unity is type of engine which using in versatile game able to fit two kind of graphic which is 2D and 3D, convenient functionality and features and mostly using C# language. Besides that, the whole platform will contain another two kind of programming languages were supported which called: Boo was denounced with the announcement of Unity 5 and after the release of Unity 2017.1. In fact, JavaScript was started its disapproval process in August 2017 (Fine, 2017).Furthermore, The following show the targets by the engine for graphics APIs: Direct3D on Windows and Xbox One; OpenGL on Linux, macOS, and Windows; OpenGL ES on Android and iOS; WebGL on the web; and proprietary APIs on the video game consoles. Moreover, Unity also provides a special supports to the low-level APIs Metal on iOS and macOS and Vulkan on Android, Linux, and Windows, as well as Direct3D 12 on Windows and Xbox One.

In order to develop the 2D game in Unity, Unity provides the option to the users for an advanced 2D world renderer and also introduction of sprites. On the other hand, when user desire to create 3 dimensional games, it also allows requirement of texture firmness, mipmaps, and it also provides some resolution configuration for each stage that the supports from game engine and provides support for bump mapping, reflection mapping, parallax mapping, screen space ambient occlusion (SSAO), dynamic shadows using shadow maps, render-to-texture and full-screen post-processing effects. (Unity, 2013).

On the other hand, Unity also provides some offers which are services towards developers, such as: Unity Advertisement, Unity Analytics, Unity Certification, Unity Cloud Build, Unity Every play, Unity IAP, Unity Multiplayer, Unity Performance Reporting and Unity Collaborate. The main part of the platform is Unity supports the creation of custom vertex, fragment (or pixel), tessellation, compute shaders and Unity's own surface shaders using Cg, a modified version of Microsoft's High-Level Shading Language.

C Sharp programming language

For the development of the whole application, the core language of the build process is mainly using C# language to complete the system. In order to perform some coding in unity, C# is the most preferable language for developer to create the behavior of the system. C# language can be implementing for general purpose. C# language provides an advance code editor tools and it is mostly used by UI designer, integrated debugger and so on. This language is considered elegant and object oriented language which falls under type-safe to create robust mobile application that perform under .NET Framework.

Google Geolocation API

The function of GeoLocation API is to return the longitude and latitude of the nearby interest location based on the current GPS data of user or connected WIFI connection. Hence, the communications between the API with the application mostly complete with the HTTPS using POST.

Vuforia



Besides the unity is the main tools in this project, it's also assisted by the Vuforia also it is because the proposed project is mainly focusing in Augmented Reality techniques and effects, so it's a compulsory to use the functionality in Vuforia portal as well. Besides that, Vuforia platform supports AR app development for Android, iOS, and UWP devices. Thus, Unity assimilates the Vuforia Engine, making the developer life more easily in order create cutting edge augmented reality experiences for both handheld and head devices. From this tools, it will consist the portal for the developer in order to do some store the target image in the Vuforia database for the image processing purpose, it's an effective platform to update the target image in an effective way and also to make sure the time for development efficiently managed. Besides that, it's help to recognize the object in the real world and further process the effects of AR in the application.

MySQL database system

MySQL is a database that used to store some data that used in the whole apps system. For an example, the reservation information of customers will be post to MySQL database for temporally storage as well, so that if the application is being commercialize, the shop owner able to keep track the data of their customer by viewing MySQL database. Hence, the reason to choose MySQL as the application database is because it is free to use, consider an open source database system and under licenses of proprietary.

4.2.2 Connectivity Requirements for Users

Description	Compulsory
WIFI/Data connection	Yes
NFS	No
Bluetooth	No
GPS of the device	Yes

Table 4-1 Connectivity Requirement for Users

Based on table 4.2, when user installed the application in their mobile device which run under Android based, user is require to enable their GPS function in their device. It is because the application needs to retrieve the current position to run the searching module of the nearby interest location. Next, in order to improve the accuracy of the GPS data, it's a need to enable Data connection or Wi-Fi so that the system able to retrieve the longitude and latitude data from GeoLocation API.

4.2.3 Hardware Requirements for Users

Description	Requirement
Camera pixels	8 MP or higher
CPU	4.0 GHz or higher
RAM of device	2GB as minimum
Device storage	500 MB

Table 4-2 Connectivity Requirement for Users

Based on table 4.3 shows the minimal hardware requirement which to be used for the application system. For the camera pixels, the apps require 8MP as minimum so that the

program able to keep tracks the buildings in a shorter time. Next, 4.0 GHz for the CPU is needed in this application, 500MB minimum device storage and about 2GB ram of the device in order to make sure the system operate smoothly.

4.2.4 Software Requirements for Users

Description	Requirement
Android Version	4.1 jelly bean minimum or higher

Table 4-3 User's Software Requirement for Users

Based on table 4.4 shows the minimal software requirement which to be used for the application system. The minimum version of the Android environment of the user's mobile device to install the application is 4.1 jelly bean or higher version.

4.3 Survey Analysis

Firstly, the survey method that chosen for this project to retrieve user requirements of this project is face to face interview. The reason to choose this method is because interview is consider more personal form of the research compare to distributing questionnaires. Furthermore, this process able to direct interact works with the respondents and noted down all the feedback and recommendation from them effectively. It is easier to retrieve and identify their impression in the process of interview.

Throughout the process of interview, some of the suggestions or requirements are getting from 10 target users and some of the entrepreneur or shop owners in order to_further improve the innovative and creative of the whole proposed application. After getting the entire requirement from those respondents which are normally students who studying information system (IA) Engineering, they have wide of experience and professional in developing a mobile application system epically in tourism application. Thus, most of them currently are using Waze mobile application to navigate them to reach their desire destination. On the other hands, they face a lot of issues regarding function that provide by Waze due to some insufficient function that they expects. A common idea of user requirement that getting from them is, they expect that the proposed project application will able to have a functionalities which can provide more information of the places or buildings. In this proposed project, the application will have the functionalities that the user able to retrieve the information of the buildings such as “hotel rooms availability, promotion & advertisement of the shops lot, contacts and also some historical information” by showing them with Augmented Reality objects which integrating the user’s camera view with the virtual objects.

Besides that, among the respondents, some them expect that the proposed application will have the functionalities that provides hints regarding where they located and where’s the interest point surrounding them. In order to fulfill this requirement, in this proposed application will have the function which able to notify the users regarding the nearest interesting location by implementing with Augmented Reality Techniques. With this

function, if the user are lost sometimes, they also able to find the way to navigate themselves to other places by the hints given by the application. Such as an scenario, when the user feel strange towards the place, they can use this application to get some suggestions about which point they can travel to instead of using Google to search for them.

Commercial interview / Survey Experience



One of the interview sessions, the manager of EHUB entertainment category, explain about the final year projects in details, the benefits of the whole application towards the whole market of Kampar. Thus, from the feedback and physical emotion reply, he is satisfy and agree with this projects and he hope that this project able to implement and corporate with them as soon as possible. Furthermore, EHub manager also provide some requirements regarding the projects, when user use the application track the physical view of buildings, user able to make reservation in different kind of category. For an example, when user track the view, the system able to recognize the buildings contain three level, which is level 1 is for restaurant, level 2 and 3 is the entertainment floor.



Furthermore, in order to retrieve more information regarding the category of hotel, Kampar Boutique hotel is the first choice for this project. One of the managers from Kampar Boutique hotel participated the face to face interview session and provided some useful requirements for these project functionalities that relevant to hotel category. The first requirement provided, when user targets the buildings of Kampar boutique hotel, user able to observe the availability of the room directly. Secondly, when user target the buildings of hotel, user able to make reservation and the system able to provide some detail information regarding such as operation hour, promotion and so on. Thus, he feels very surprise and is looking forward for the completion of the whole application integrate with AR features and considers collaborating in the future.

User Requirements list:

Respondents	User Requirement
User 1	As a user, I need know more information about buildings in the application.
User 2	As a user, I need to know more about the special event of the shops lots in augmented reality techniques.
User 3	As a user, I need the application to show up the advertisement of a destination by Augmented Reality effects.
User 4	As a user, I need the application to use AR effects to list out the hotel's room

	availability that.
User 5	As a user, I need the application generate some suggestion about dishes from a particular restaurant.
User 6	As a user, I need the application to verify whether the place that I reach is accurate by using a snapshot of camera view.
User 7	As a user, I need the application to suggest different category attraction places, such as entertainment and restaurant option.
User 8	As a user, I need the application to generate some local attraction based on the point of GPS.
User 9	As a user, I hope the application able to show up the updated restaurant's menu.
User 10	As a user, I need the application to generate promotion of the buildings especially entertainment.

Table 4-4 User Requirement List

4.4 Verification Plan

Tutorial modules

Input	Expected Output	Actual Output
User click “Start tutorial”	System generate UI program towards the user’s view	
User click “Next” and “Previous”	System able to perform the scene changes based on the selection of users.	
User click “Start”	System will precede the users to the main program of the apps.	

Table 4-5 Tutorial module verification plan

Nearby Location Hints Generator Module

Input	Expected Output	Actual Output
User click “yes” to allow application retrieve GPS data from user’s device	The view of user will updated the current GPS data in the User interface.	
User click “no” to allow application retrieve GPS data from user’s device	The view of user will appear 0, 0 which represent the current GPS data in the User interface.	
User current location is not contains any interest nearby location.	The user view should not appear hints which represent by AR animation objects and the user interface is remaining the same.	
User current location is contains any interest nearby location.	The user view should appear hints which represent by AR animation objects and the UI of the will be updated. Example “Current location :UTAR Kampar Block N”	
User reach a specific	The user view will only appear two	

location such as “Sushi Mentai and Old Town white coffee”	location hints which mean, the AR objects will floating with 2 company logo to notify users.	
User switch off the GPS or WIFI/DATA of mobile devices	The view will contain nothing and the UI of current location will be shown as 0, 0.	

Table 4-6 Nearby Location Hints Generator Module verification plan

Building’s Information Generator Module

Input	Expected Output	Actual Output
User click “yes” to allow application enable camera function from user’s device	The view of user will able to open by the application	
User click “No” to allow application enable camera function from user’s device	The view of user will close directly the application.	
User in scan a normal view instead of any buildings	The view of user should be remaining the same which without any animation occur.	
User provide an unclear buildings or the size of the buildings in the user’s view are too small or too big.	The system will not able to recognize the buildings and remains unchanged.	
User provides an accurate position and size of the	The system should prompt up the details information in the user view such as:	

buildings view.	“historical information, promotion or so on.”	
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Table 4-7 Building’s Information Generator Module verification plan

Reservation/ booking module

Input	Expected Output	Actual Output
User click “reservation”	System generate UI text field based on the buildings requirement.	
User click “submit” with input data	System will retrieve the input from the UI text field and generate notice to user.	
User click “submit” without input data	System will generate an UI notification to require user fill up the text field.	
User click “cancel”	System will close the reservation UI.	

Table 4-8 Reservation/ Booking module verification plan

4.5 Implementation Issues and Challenges

First of all, the first challenges of this proposed project is about to learn the language and library which mainly use in the unity platform. It's basically using the C# programming to develop the whole application. Thus, it's actually needs some times to practice and learning as a beginner. Besides that, the unity tools are quite useful as it consists of a lot of features or functionality that will benefit the developer to save a lot of time to perform their job instead of start from the scratch or complicated coding. But somehow, it's complicated to use especially the modules of the 3D objects hints development for the nearby location. The AR objects need to be accurately arranging it in a specific point in order to ensure the vision of the user fall in a right position which about the settings of the (X, Y, Z) the vector position of the 3D object located with. However, it's taken a lot of times to build an AR 3D objects floating and show in the vision of the users.

Furthermore, once the project is completed and ready to build as an apk file. It is consider one of the challenging parts for this development process, the version of the Unity Editor somehow will not support our window if there is some updated version of Unity exists in the Unity portal. Hence, it force user to keep update their project to the latest version as well. One of the issues exists, the latest Unity version will somehow create some bugs or error to the projects of application system and it take some time to figure out the issues.

Besides the design for the objects, the setting of the GPS data which the longitude and latitude is consider a tedious process which mean the GPS data need to be approximately to the plot in a particular place. Therefore, it needs to configure it wisely in order to make sure following the real time longitude and latitude data of a specific location which getting from the Google Map are capable in the user device and also the application system. If the data that configured in the system are not capable with the user device, the function of the modules will not function at all. In order to prevent this issue happen, it's a need to run a lot of testing with the numbers of the locations that set in the

proposed application. Such as an scenario, if the system are consist of 10 points of the interesting location, it will need to run at least 10 testing for the accurateness of the GPS data to make sure the modules are work expectedly and perfect performance.

4.6 Timeline

Task	Assigned To	Start	End	Dur	%	2018												2019			
						Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr			
FYP Project Development		10/4/18	4/4/19	257		[Gantt bar spanning from 10/4/18 to 4/4/19]															
1 Planning/Organizing	KEE MING WEI	10/4/18	13/6/18	46		[Gantt bar from 10/4/18 to 13/6/18]															
1.1 Project Concept confirmation		10/4/18	17/4/18	5		[Gantt bar from 10/4/18 to 17/4/18]															
1.2 Discussion with supervisor		12/5/18	19/5/18	5		[Gantt bar from 12/5/18 to 19/5/18]															
1.3 Define project objective		19/5/18	2/6/18	10		[Gantt bar from 19/5/18 to 2/6/18]															
1.4 Development tools explore		2/6/18	13/6/18	7		[Gantt bar from 2/6/18 to 13/6/18]															
2 Analysis/Design	KEE MING WEI	14/6/18	26/6/18	8		[Gantt bar from 14/6/18 to 26/6/18]															
2.1 Face to face interview		14/6/18	16/6/18	2		[Gantt bar from 14/6/18 to 16/6/18]															
2.2 Gather user requirement		17/6/18	20/6/18	2		[Gantt bar from 17/6/18 to 20/6/18]															
2.3 Draft out application design		21/6/18	26/6/18	3		[Gantt bar from 21/6/18 to 26/6/18]															
3 Prototyping	KEE MING WEI	29/6/18	12/2/19	162		[Gantt bar from 29/6/18 to 12/2/19]															
3.1 Start coding development		29/6/18	20/7/18	15		[Gantt bar from 29/6/18 to 20/7/18]															
3.2 Modules development		21/7/18	28/7/18	5		[Gantt bar from 21/7/18 to 28/7/18]															
3.3 Modules refactoring		29/7/18	2/8/18	3		[Gantt bar from 29/7/18 to 2/8/18]															
3.4 Testing modules		3/8/18	9/8/18	4		[Gantt bar from 3/8/18 to 9/8/18]															
3.5 Modules addition		9/8/18	9/10/18	43		[Gantt bar from 9/8/18 to 9/10/18]															
3.6 Modules enhancement		9/10/18	4/12/18	40		[Gantt bar from 9/10/18 to 4/12/18]															
3.7 Modules integration		4/12/18	15/1/19	30		[Gantt bar from 4/12/18 to 15/1/19]															
3.8 Module verification		15/1/19	12/2/19	20		[Gantt bar from 15/1/19 to 12/2/19]															
4 System Development	KEE MING WEI	13/2/19	4/4/19	36		[Gantt bar from 13/2/19 to 4/4/19]															
4.1 Develop complete application		13/2/19	27/2/19	10		[Gantt bar from 13/2/19 to 27/2/19]															
4.2 Application verification		27/2/19	1/3/19	19		[Gantt bar from 27/2/19 to 1/3/19]															
4.3 Application testing		1/3/19	12/3/19	7		[Gantt bar from 1/3/19 to 12/3/19]															
4.4 Assemble users Feedback		12/3/19	19/3/19	5		[Gantt bar from 12/3/19 to 19/3/19]															
4.5 Application enhancement and maintenance		20/3/19	28/3/19	6		[Gantt bar from 20/3/19 to 28/3/19]															
4.6 Full application development completed		28/3/19	4/4/19	5		[Gantt bar from 28/3/19 to 4/4/19]															

Table 4-9 Gantt chart

From figure 4.2, it's basically showing the estimation of a Gantt chart for the overall development progress of the project application. Firstly, throughout the planning and organizing process, in order to clarify all the things completely and reduce the risk of failure, the overall concept of the projects need to be refreshed and identify the project scope before the development of project application. After preparing the entire project concept, it's a need to report to the supervisor and get some extra information regarding the topic of the proposed application and also getting some pieces of advice about the development process. Besides that, the main development tool is Unity and it is needed to spend some times to do some research such as "YouTube, the main page of unity,

guidelines for the beginner of Unity and so on”, since that it’s the first time using it. In the analysis and design stage, start to prepare some question for the face to face interview session. Hence, gather all the requirements or recommendation from the respondents and start to draft out a paper prototype, mind map as an initial start before the development started.

Throughout the prototype development stage, it’s time to use the features of the platform to create some demo projects by C# language. However, the first development modules will be the image recognition and also the image processing techniques, this module are considered our main features of this proposed application. Secondly, after the completion of the image recognize modules, it’s time to carry out next modules which also consider important, augmented reality objects hints which to use for generating hints towards users. Besides that, once both of the modules are totally developed, In order to make sure the modules able to work effectively instead of bugs, its need to perform refactoring process, especially the understandable of the coding by putting some extra comments in both of the modules.

Moreover, it’s good to adding more special features towards the program to increase the attractiveness of the proposed application. Besides that, in order to make sure the modules are able to process without any error, it’s a need to create some testing cases in order to examine the performance and behavior of the module. After the testing process, get the modules that already developed to demonstrate with the supervisor to ensure the effectiveness of the proposed application. After the demonstration of the prototype of the system which considers FYPI, moderator and supervisor provide some recommendation and feedback for the overall system. Hence, some of the attractive features and modules are added to the application in order to improve the user experience towards the system such as UI button interact with the AR features, booking/reservation function and user able to choose the local attraction categories.

Last but not least, once the modules or features already complete developed, it is time to integrate all the finalize modules into the final version of the mobile application. Hence, demo the final application towards the supervisor to verify the functionalities and the performance of the system. Next, in order to make sure the system able to be accepted by other users, share the final application towards them and retrieve some feedbacks from them. Lastly, the final application had already completed successfully and fulfilled all the user requirements stated in the report documentation.

Chapter 5 : System Testing

5.1 System Testing

In this semester, I have completed the main function for the final complete version of the proposed application which is the notification provided to the user by using the Augmented Reality techniques and also the buildings recognition. Furthermore, for this proposed application, there are consisting some experimental environments in the region of Kampar area new town area, which under three categories: Restaurant, Entertainment and Hotel.

5.1.1 Test Objective: Function of Track/Search interest location (No local attraction surrounds)

Situation	Expected Output	Actual output
User stays around the area which is no local attraction surround.	The system will not prompt out any information regarding local attraction.	The system will generate a “Targeting”, which mean the system did not receive any local attraction. The user’s reference UI will show as : “Searching nearby location Place: Retrieving attraction”

Table 5-1 Test Objective on track/Search interest Location 1

From figure 5.1, it’s basically showing the main scene user interface of the proposed application. Thus, the location of the user is located in Westlake housing area which consider a particular place that does not consist any shops lot or any interest location, the system will do not prompt up any changes or hints in the view of the user as well. As the user view shown, the center of the view will appear a word “Targeting” which mean the system are currently in the process to search or retrieve any place or buildings that might

user will interest with. However, the user interface in the bottom part of the user view is short description for the user’s reference, to let them know their current longitude and latitude (GPS data) which represent the point that user located with. Well, the system will not appear any place name as well, user interface of place will in the blank status.



Figure 5-1 Situation 1: No attraction point exists

5.1.2 Test Objective: Function of Track/Search interest location (local attraction surrounds)

Situation	Expected Output	Actual output
User stays around hotel area.	The system will prompt out notification and hints.	The system will generate a AR effects (UFO) and updated user reference info.

Table 5-2 Test Objective on track/Search interest Location 2

The experience environment of Figure 5.2 is under hotel category (Kampar Boutique hotel). When user’s GPS data surround with the local attraction, the system will generate the AR effects (UFO floating objects) to provide some hints regarding user are near

towards local attraction. Hence, the GPS data from user will be used as data to compare with the local attraction GPS data from GeoLocation Google API. Next, the UI of user's reference info will update to "Place: Kampar Boutique, found! User currently stays around hotel area".

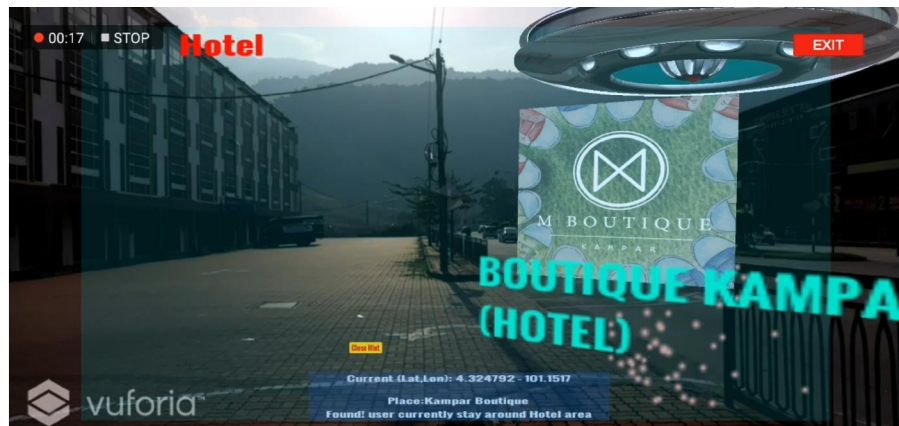


Figure 5-2 Situation 2: local attraction point exists

5.1.3 Test Objective: Function of Building Recognition (Hotel Kampar Boutique)

Situation	Expected Output	Actual output
User places the view on Kampar Boutique hotel.	The system will recognize the buildings.	The system recognized the buildings and generate UI button.

Table 5-3 Test Objective on Building Recognition

Regarding the buildings recognition module of this proposed application, when the user places their vision towards the direction of buildings Hotel (Kampar Boutique), the system will process the features of the buildings, such as the shape, the logo as well. In figure 5.3, it is basically showing the comparison with the view of reality which on the above figure and the bottom figure is basically showing the application view of user, the system will directly get response and update Augmented Reality effects in the application

user view. When user select the option of “First Floor” UI button, the system will show the availability of hotel room by AR effects and let user to make reservation. The red color represents unavailable and green color stands for available.



Figure 5-3 Situation 3: system recognition buildings of Hotel

5.1.4 Test Objective: Function of Reservation module (Hotel Kampar Boutique)

Situation	Expected Output	Actual output
User press submits without any input to the text field.	The system will prompt error notification	The system generates a notification to ask user to fill up the customer information.
User press submits with any input to the text field.	The system will store data into database successfully.	The system will show the details of reservation towards user's scene.

Table 5-4 Test Objective: Reservation module

Once the user select for the reservation option, the system will generate another UI scene towards user and ask for the user detail information. User are require to fill up the text field that prepared by the system, such as name, h/p no, room no, date and time. From figure 5.4, the user click “submit” without any input, the system will block the user and generate a pop up message to notify user. On the other hand, if user filled up all the text field of the reservation UI, the system will store data into database and show up the reservation details as a reference for user based on figure 5.5.

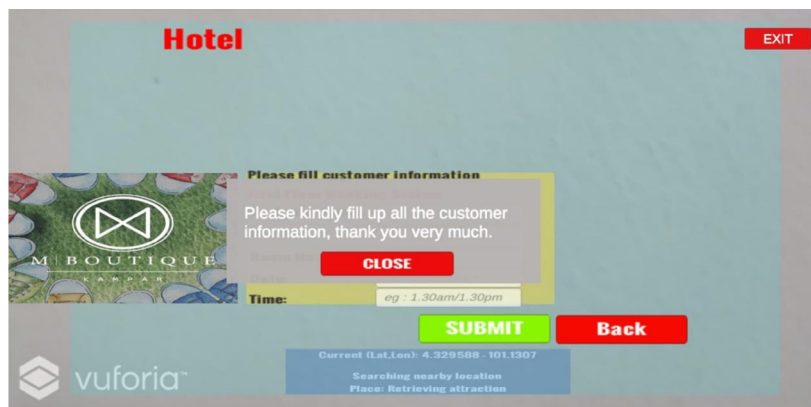


Figure 5-4 Situation 4: empty user input (reservation module)



Figure 5-5 Situation 4: user input inserted (reservation module)

5.1.5 Test Objective: Function of local attraction hints (Multiple attraction)

Situation	Expected Output	Actual output
User appears around three attractions.	The system able to generate the three location hints to user.	AR objects hints with three locations generated.

Table 5-5 Test Objective: Multiple local attractions

The test objective is to examine whether the system able to keep track multiple location surround the user and generate the different AR effects hint (UFO floating objects). The places of environment are under entertainment category which are Love bar, Vikings bar and Arena. Once the system executes the program, the system will start the GeoLocation API and retrieve the local attraction GPS data to perform comparison with user’s GPS data. From figure 5.6 shows the system able to generate the multiple hints attaches in the AR effects objects. Hence, the user able to know the area he/she surround has three local attractions exists.



Figure 5-6 Situation 5: Multiple local attraction testing

5.1.6 Test Objective: Function of promotion and details generator

Situation	Expected Output	Actual output
User places the screen view towards Family cake house and select “promotion”.	The system will generate promotion in AR effects.	The system generates latest promotion of the shop in AR features.

Table 5-6 Test Objective: AR features information generator

From figure 5.7 shows that the normal physical view of family cake house before apply in proposed application. In order to improve or enhance the business of the family cake house, this proposed application able to be a best marketing tools which in the application market nowadays does not have this kind of modules as long as the shop owner willing to cooperate with proposed application, it able to use as a marketing or advertising tools to attract more customer and increase their profits daily as well. From figure 5.8 shows the system able to recognize the family cake house buildings and the UI button form on the

user's view. Once the user select the "Promotion" UI button, the system generate AR effects component on top of the buildings.



Figure 5-7 Situation 6: Building's promotion AR effects testing 1



Figure 5-8 Situation 6: Building's promotion AR effects testing 2

5.1.7 Test Objective: Function of Restaurant's menu generator

Situation	Expected Output	Actual output
User selects Menu when system recognizes the restaurant of Sushi Mentai.	Restaurant's menu appeared.	The system generates latest Menu of the shop.

Table 5-7 Test Objective: Restaurant's menu generator

Based on figure 5.9, when user position the camera view of the mobile device, the system will directly recognized the buildings of Sushi Mentai. Hence, the system will generate UI buttons to let user to choose their desire action. Once the user select “Menu” options, the system will directly generate a UI diagram that list out the high rated dishes and the dish pricing of the restaurant.



Figure 5-9 Situation 7: Restaurant’s Menu testing

5.2 User acceptance testing / Feedbacks

According to (Rouse, 2018), in the process of software development, the phase of user acceptance testing can be defined as beta testing or end user testing. Hence, it is an important phase of software development in which the software able to test in the reality by the audience. UAT (user acceptance testing) able to done by in house testing in which the audience or user is volunteers or paid test for the application system. Thus, the user’s feedbacks or experience will be forwarded back to the developers to make the final changes in the application.

Throughout the UAT process for this project application, 10 volunteers had been invited as the user to participate the testing phase. Hence, about 5 students are from Faculty of business and another 5 students are from Faculty of Information Computer Technology. Besides that, the user acceptance testing for the project application is carrying out at UTAR campus Block N002. All the feedbacks and reaction from the users are recorded during UAT phase.

Participants details information	Summary Feedbacks/ Respondent's Emotions
Name : Oay Zhi Lin Faculty: FBF	<ul style="list-style-type: none"> • Simplicity of Interface • Easy to learn the function of apps. • She able to complete the apps functions without guidance. • AR function is interesting. • She feel amaze with the Buildings recognition features. • She comments that the apps can increase more features in the future development.
Name : Tan Hen Pin Faculty: FBF	<ul style="list-style-type: none"> • He is excited and curious when try on the apps • He able to complete the apps functions without guidance. • He like the concept of AR integration in the project apps. • He able to retrieve the information of buildings easily.

<p>Name : Anson Lim</p> <p>Faculty: FBF</p>	<ul style="list-style-type: none"> • AR function is enjoyable. • Agree with the apps concept. • Curious when using the application with the part of AR features. • He able to use the application without any tips or guidance.
<p>Name : Low Chun Kit</p> <p>Faculty: FBF</p>	<ul style="list-style-type: none"> • The application able to fulfill his needs such as the AR information prompts out from the apps. • Buildings recognition makes him feel surprise. • He thinks this app is useful and agrees with the concept of the apps.
<p>Name: Tang Chee Chuan</p> <p>Faculty: FBF</p>	<ul style="list-style-type: none"> • Feel fresh and curious with the AR features. • Feel surprise on building recognition process. • Able to complete the app function without guidance.
<p>Name: Ong Jun Kai</p> <p>Faculty: FICT</p>	<ul style="list-style-type: none"> • Agree with the concept of the apps. • Curious with the method of development in building recognition. • Useful information able to retrieve from the apps.
<p>Name: Tang Zi Cong</p> <p>Faculty: FICT</p>	<ul style="list-style-type: none"> • Well navigation in UI design • He able to complete using the apps without any guidance.

<p>Name : Chong Yee Xiang</p> <p>Faculty : FICT</p>	<ul style="list-style-type: none"> • AR features consider new to him. • He agrees with the concept of the apps. • He thinks that the application can be improve to more features. • Able to explore all the function of the apps without any guidance or help.
<p>Name : Ng Sian Siong</p> <p>Faculty: FICT</p>	<ul style="list-style-type: none"> • Impressed with AR function. • Excited when using the apps. • He comments that, the AR component object somehow less realistic, but overall is good to him.
<p>Name : Ngooi Zhuang Wuang</p> <p>Faculty: FICT</p>	<ul style="list-style-type: none"> • Able to explore all the function of the apps without any guidance or help. • He hopes that he can download from the apps store in the future. • He comments that the system is useful and benefits to user especially the buildings promotion.
<p>Name : Chew Chen Seng</p> <p>Faculty: FICT</p>	<ul style="list-style-type: none"> • He thinks the UI is simple. • He takes lesser time to explore the entire of the apps. • Looks amaze and enjoy when using the apps.

Table 5-8 Feedbacks

Chapter 6 : Discussion and Conclusion

6.1 Project Review

In the modern era, the usage of mobile application has already become a daily habit of humans. From the feedbacks gathered from the respondents, they expect something advanced and innovative features to be integrated into the current mobile application. Hence, Augmented Reality is considered one of a feature or function that still fresh and latest technology in the category of apps in the current market such as Instagram, Pokémon-GO and Snap Chat (social application). Thus, the project applications that integrate with AR will dominant higher chances to become preferable apps compare to the current local attraction searching apps. Therefore, the main reason is the current mobile application which relevant towards the project applications mostly is implemented in virtual based user interface design (Text UI/ Image graphical UI). Humans like technology, users will expect more layer of information that able to get from the application and users hope that the system will not make them feel dissatisfied and uninterested to use in their daily life. Hence, Augmented Reality is one of the features that able to increase the engagement of user and getting their attention towards the application.

From the project application, the concept of local attraction guidance that integrates with Augmented Reality feature established most of the positive feedbacks from targeted respondents through face to face interview. Thus, the main reasons that impress the respondents is because of the project application practices AR effects to illustrate the local attraction hints surround to users and also the buildings recognition function. Respondents think that the information represented by AR effects is more attractive compare the normal UI design. From the feedback from users, AR features able to improve their user experience when they observe the information from the application. Hence, the respondents also state that the application able to improve their ability of learning by using the way of representation of information which able to distract their attention especially AR effects. Besides that, the project application enables the user to

interact with the AR object or effects, the appearance of AR effects is not being constant created and it will respond depends on the user preference as well. Furthermore, the application able to enhance the life of users and solve tons of issues that they currently fronting. For example, they no need to approach the particular shops' lot and asking for information such as menu or promotions by using the project apps directly.

6.2 System Strengths and Limitation

First and foremost, the strength of the project application is the innovative integration of Augmented Reality features to generate building's information such as the promotion of the day, operation details and so on. From the particular of strength, it enables to generate motivations towards users which the application definitely makes the entire system more attractive towards users. The main reason is the AR effects are more appealing compared with text form of UI representation, as Confucius said: "I hear and I forget; I see and I remember, I do and I understand." Creativity and curiosity would definitely be fostered, and Augmented Reality effect is the perfect way to get an individual imagination flying.

Besides that, the application system is able to establish a win-win situation concept between consumers and entrepreneurs. In order to place a desire position in their customer mindsets with the company's brand or logo, the proposed application able to act as an advertising strategies to create such an experience by making the interaction personal to the consumer. The immediate and sensory-driven connection established between the brand and consumers through AR makes for an emotional interaction. As the system function, if the project application is officially commercialize, it actually able to improve the current economy of the particular city by the force of marketing and advertising. When consumers can see relevant objects in the augmented version of their own world, they develop a deep connection with the brand that resonates even when they are not using the AR platform. Hence, an entrepreneur might corporate with the application system in order to promote their shops and attract more consumers as well

since the AR building recognition function makes the application has the big potential to appeal more users to download. Moreover, consumer able to retrieve the latest and updated information's of the particular buildings from the project application.

Furthermore, everything has pros and cons; the application contains some limitation somehow. The main issue is the battery consumption of the application in the normal user's mobile device will consider high compared to other application. Hence, the main reason is that the AR feature requires the usage of camera view and needs higher consumption on processors of mobile device regarding the GPU to render process in AR component in the application system. Secondly, one of the challenges part to design a better user interface of the application is the development tool subscription cost as well. Thus, the Unity Pro version costs a onetime fee of \$1500 or \$75 dollar per month usage. In order to lower down the cost of development, the project is developed by the free version of Unity. The development tools Unity create some limitation in some of the special UI design and graphic design to the developers if he is using a free version instead of commercializing or professional version. Hence, the GUI design of the application might be less proficient.

6.3 Future work

The project application is currently able to perform searching function within the local attraction which surrounding the user, deliver useful information regarding the buildings, assist the user to perform some reservation and booking service in some shop lots. Hence, the fundamental functions of the application are integrated with Augmented Reality features. Besides that, in order to improve the user experience in the local attraction application, it considers needs to increase the functionality of navigational features towards the projects application system. In the future work, due to the time constraint and the budget limitation of the final year project, it is considered challenges to add navigational features into the project apps. Thus, the future work of the project application is enhancing the system by adding an Augmented Reality navigation path when a user desires to approach the local attraction. From these features, the navigation

path will appear in AR effects such as the concept of Gatwick airport which shows in figure 6.1. Hence, the concept is about the system will guide the airport's user to reach their desire indoor facilities by the pathway shows in the form of AR effects. Furthermore, another future work of the application is to expand the availability to other cities instead of only cover the Kampar city area's buildings.



Figure 6-1 Gatwick Airport AR path guidance

6.4 Conclusion

In conclusion, the overall of the proposed application had been completed as the requirements specified. However, the fundamental modules of the application that had been developed are tracking or searching interest location and buildings recognition function. In this project, there is consisting of some problem statement that motivates the development of the proposed application. The first problem statement of the current applications is virtual map information representation. It generates a sense towards the user of non-realistic appearance or vision towards the user by just referring the static map system instead of the real environment of the user's surrounding, it will lead the user feel the application is too bored and dissatisfied by using it since that the display is being not so attractive towards them by using an unchanged or not a two way communication between the application and users.

Moreover, the second problem statement is the complicated display of user interface design, by referring to the current application, the style to represent the nearby location, especially in the map system, somehow will create the issues regarding the difference between as the system description and the physical view of the attraction, which will create the confusion towards the user with a complicated design in static map system. Thus, the another problem is the lack of information regarding the buildings or location, with the current application in the market the information showing towards the user regarding the final location will just some basic knowledge and information such as, some few lines of text describing the location, some unrelated photos attach on the location, which considers not effective to deliver the less useful information towards the person who really doesn't have any experience or knowledge with the attraction of the particular location, especially those tourist come to our country.

Furthermore, with the current application, the technique of notifying the user some nearby location is considered not a fine way; it's hard to let the user look at the map with small icon or logo to show that the nearby location surrounds the GPS point of the user. After the overall of the problems had been listed out, the purpose of the development of this proposed application is to act as a role to overcome the problem

statements that existed in the current applications. The first idea is to change the concept of virtual static map system towards a real-world environment scene view which able to solve the problem of unrealistic of application interfaces by using the camera to assist the proposed application to capture the real environment of the user.

Reference

Reference

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Appendix A: Poster Design



 FINAL YEAR PROJECT
TOPIC

 **Augmented Reality
local attraction
guide and
Recognition**

 **AR CITY**
PRODUCED BY MEDWIN KEE

 **UTAR**
UNIVERSITI TUNKU ABDUL RAHMAN

Description

Mobile based application system which involving **Augmented Reality** effects integrate with surrounding **local attraction** information

Objectives

- To deliver innovative information and mobile based solution around the surrounding buildings.
- To integrate AR effects to guide user reach final destination.

Methodology



Software Development Life Cycle

Local Attraction hints by AR effects

What is AR?

- Interactive experience of a real-world environment where the objects that reside in the real-world are "augmented" by computer-generated perceptual information

Act as a marketing or advertising tools

"Win-win Situation" between user and entrepreneur.

Latest Promotion & Reservation

The application will update latest promotions continously and provide innovative reservation system.

Local attraction category

Commercial Participation

01 Entertainment
eg: Fyll, Ehub, Love Bar, Athena..



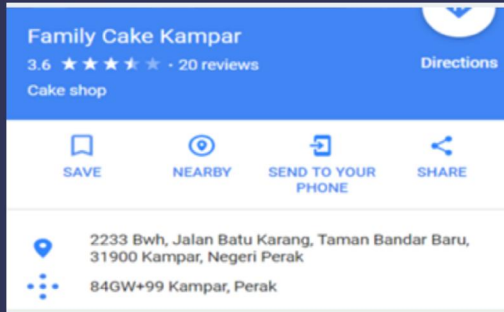
02 Restaurant
eg: Old Town, Sushi Mentai, Secret Recipe, Fancy Mee...



03 Hotel
eg: Kampar Boutique Hotel...



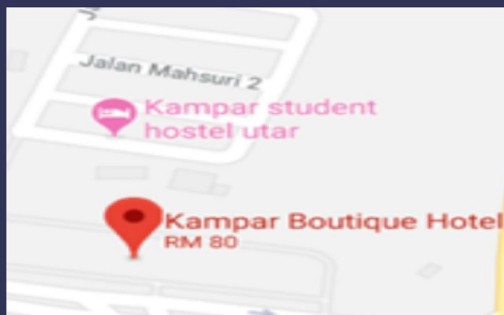
Application Concepts



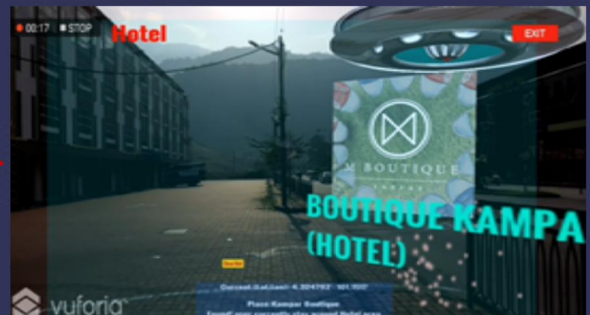
Current Buildings info representation



Proposed Buildings info supported by AR effects.



Current nearby attraction representation



Proposed Nearby attraction representation supported by AR effects



Prepared By: Kee Ming Wei
Id: 1502712

Appendix B: Turnitin

Turnitin

FYP2 full report

ORIGINALITY REPORT

11 %	11 %	2 %	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	Kee Ming Wei
ID Number(s)	15ACB02712
Programme / Course	BACHELOR OF INFORMATION SYSTEMS (HONS) INFORMATION SYSTEMS ENGINEERING
Title of Final Year Project	Augmented Reality Local Attraction Information Guide and Recognition

Similarity	Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)
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Number of individual sources listed of more than 3% similarity: _____	
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Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Signature of Co-Supervisor

Name: _____

Name: _____

Date: _____

Date: _____



UNIVERSITI TUNKU ABDUL RAHMAN
FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)
CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	15ACB02712
Student Name	Kee Ming Wei
Supervisor Name	Dr. Ng Hui Fuang

TICK (✓)	DOCUMENT ITEMS
	Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
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	Signed Report Status Declaration Form
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	List of Figures (if applicable)
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	List of Symbols (if applicable)
	List of Abbreviations (if applicable)
	Chapters / Content
	Bibliography (or References)
	All references in bibliography are cited in the thesis, especially in the chapter of literature review
	Appendices (if applicable)
	Poster
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*Include this form (checklist) in the thesis (Bind together as the last page)

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