Android Mobile Application – Expenses with Geo-Location Tracking

BY

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Date   : 1st SEPTEMBER 2015

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ABSTRACTS

This project discuss about mobile application Expenses system with geo-location tracking. It is used to track our daily expenses by the way it include the features of geo-location tracking by using GPS signal and network cellular data, and auto fill up address for user who input the new data, it tracking the position where he/she are trying to spend their budget. Base on the location the user in, it using Google Places, to check, the available store in the area, if there is no any store, user are try to use Google Map API v2 to view the map. The another useful feature is, it base on the location user in, it able to download down the menu as input more details on the spending part. This application is develop, for the reason of location tracking problem, and input method to store expenses info, for example by using voice recognition as alternative input, image to store receipt and QR code to store URLs info.

Contents

LIST OF FIGURES

FIGURE TITLE		PAGE

LIST OF TABLES

TABLE TITLE   **PAGE**

LIST OF SYMBOLS / ABBREVIATIONS

API	application programming interface
WIFI	wireless local area network
Network	Cellular network, 2G/3G/4G
GPS	Global Positioning System
HTTP	Hypertext Transfer Protocol
JSON	JavaScript object notation
SDK	Software Development Kit
UML	Unified Modeling Language
ERD	Entity-Relationship Diagram
SLDC	System Development life Cycle
SQL	Structure Query Language
XML	Extensible Markup Language
WPS	WIFI based positing system
RSSI	Received signal strength indication
FYP1	Final year project 1
FYP2	Final year project 2

CHAPTER 1 INTRODUCTION

1.1 Project background

Nowadays, many people having problem in managing their fun/income, due to attracted by new technology, trend goods and exorbitant good they to show off with. This may cause a serious problem, due to unfamiliar to manage financial fund. Example, there are new problem of teenager with bankruptcy, is because of non-propel expenses and finances problem (Ferguson, 2012). In the statistic show, teenagers having financial problem is a cause of using credit card in a not manner way. "The bankruptcy people fall under 25 years old is making grow of a portion of bankrupt" said (Smillie, 2004). Financial lesson should be taught in school, this can prevent teenagers to make mistake on their future financial area.

There is a teaching Gap, in many country, teachers may only teach them for specific professional, and neglect of teaching financial class. There is about 83% of Teens Don't Know How to Manage Money (Tuggle, 2012). Teenagers are not learning financial knowledge's, they unable to apply the tools and knowledge's when they need. Eventually, when there is problems occur, there is no sufficient time to let teenagers to make a U-turn.

Furthermore, not only teenagers are need some skill or tools to make financial free, employee, self-employee, and even financial consultancy need management tools to help them manager and manipulate their income and fund usage. For some people wanted to keep tracking their money flow, and make a net profit count, this is a useful tools to help them to manage and easily show them when they need more plan for others purposes.

Thus, there is a need of expenses and budgeting management application tools for those teenagers to make good manager to their expenses. There is also a need of this expenses application to make life easier to keep track of our budgeting and expanse. The propose system is to enhance current managing system, by include more details and more user-friendliness to the user. By nowadays, time is a very importance part of our life, longer time consuming management expenses tools is not so popular used by user, user may hate the non-usefully and hard to control application when there was so much entry of

info when expenses running in the same time. The propose application may cut down the operational time when user used the expenses application. The application must able to handle their need and easy to use, this may help them a lot on overcome over budget problem, keep budget on the track, planning their financial status, with worry less and also can prevent crisis occur. With the expenses budget system, user can plan ahead, when accident occur, it able to react well. In additional, with the financial expenses application, it able to knows user own habit on spending too much on particular categories. Example, when a smoker increases their dosage, their expenses application will also show the amount increasing in categories of cigarette spend.

1.2 Project Motivation

Demand of the expenses application is wide in range from teenager to senior user, as long as they still need using money, they are needed to have an application to store and manipulate their expenses and budgeting.

Most of the existing application is just in text form and needed user to manually enter the data, this will make user frustrated due to preciseness of information. The Geo-location tracking will try to solve their problem, with address key in automatically and also the places they have been visit.

Another issue will be current existing system without alternative input of information, this make insufficient power to manipulate the information. The user may able to input image as a record and need not to enter data at all. Another problem will be solve is the title or main for user to entry when they are in walking or driving condition, they may able to used voice recognition to input information to the expenses application.

In order to give more input method is to make user happy to use with the application, and in directly help them control over their expenses or maybe to keep track on their goal, on making more profit for business user and employee that need record to make reimbursement. Receipts are easily store in the expenses application, and retrieve the info when they need it.

PROJECT SCOPE AND OBJECTIVES

1.3 Problem Statement:

1. Currently there are many type of expenses budget application, but the current application don't have such function to record down where is the location they spend their money and used the application. Thus, there is an acute need for such system to monitor their budget expenses more details and precise.

2. Information input too complicated, need precise to what particular of spend, and user need to key in more info, therefore it cause time consuming and inconvenience. Thus, it needed transform to more simple and auto fill-up method.

3. When there is a situation that user are inconvenience to type the information, the way they needed for input is very importance. Thus, the type of input is needed to have alternative, to replace the traditional input method. Voice recognition is one of the best ways to replace typing.

4. Currently expenses application system, does not build in with menu download function. When the user need to know more details or update more details, it going to be time consuming and troublesome. Eg. Restaurant of KFC, users have the description of it but without the details, with the menu function, will able user to make selection, what he/she have purchases and get information save in just few second.

5. The traditional expenses application will limit user only input text, but for more information handling part, the application must able user to input more option of example, camera Entry, voice entry and QR-code entry.

1.4 Project Objective:

1. Develop an application that able to track the current location of user, user is able to use google autocomplete POI address, that user is current in.
2. To develop an application that able to download the menu based on Google places autocomplete search. The user in McDonald restaurant will able to download menu of McDonald for example.
3. To develop an application that simplify and precise enough to keep track of expenses and budgeting.
4. To develop an application that will have optional input method to meet wide range of requirement. Eg. While driving a car, user can used voice command.
5. User is able to save in more option of input into the application, such as picture, voice and barcode retrieve.

1.5 Project scope:

1. The application able to receive input target only on text, voice, QR-code scan and picture for information input.
2. Location will be taken by mobile phone network provider and location GPS signal if available.
3. The Menu is based on Google places auto complete address; menu may also refer to the application server update to the particular restaurant.
4. An application budgeting system with simplify input method and more option as image, voice and barcode.

CHAPTER 2 LITERATURE REVIEW

2.1 Review on existing market expenses application system

Introduction

In the back world, preparing monthly report and expenses budgeting is a difficult task to people, with the invention of application on smart phone, this make life easier. Even when there are some people with reimbursed problem, will having lost of receipt problem. Nowadays, with using smartphone apps, will have easy mind to solve this problem, the receipts can be snap by smartphone camera and store it inside expenses apps. In this literature review, will compares features and user-friendliness of expenses application from existing market.

Comparison between expenses application (Best expense tracking apps 2014)

	Expense Manager	Expensify	One Touch Expenser
Image Logo			
Geo – location tracking	No	No	No
Voice recognition	No	No	No
Auto fill-up	Yes	Yes	Yes
Time and date capture	Yes	Yes	Yes
Photo store /capture capability	No	Yes	Yes

Design	Normal	Good	Good
QR code scanning	No	No	No
Payment Reminder	Yes	No	Yes
Schedule of amount	Day,Week,Month,Year	Day,Week,Month,Year	Day,Week,Month
Price	Free	Free	Free

Table 2.1 : Comparison between expenses application

Compare also between existing systems with new expenses application system propose.

	Expenses (existing system)	Expenses Easy G-location (propose system)
Geo – location tracking	No	Yes , with build in GPS signal
Voice recognition	No	Yes, google voice
Auto fill-up	Yes	Yes
Time and date capture	Yes	Yes
Photo store /capture capability	No	Yes
Design	Good	Good

QR code scanning	No	Yes, QR code scan
Payment Reminder	Yes	-
Schedule of amount	Day,Week,Month,Year	Day,Week,Month,Year
Price	Free	Free

Table 2.2 : Compare also between existing systems with new expenses application system

Conclusion

As conclusion, there is still a space of design and features to include into current version of expenses application system. Example, there are Geo-location tracking for address purpose, voice recognition for alternative of input and QR codes scan for more input method. Therefore, new system application of expenses is propose for further enhance the application features and easy to make handle to our daily expenses needs.

2.2 Review on how Geo-Location work on smartphone device

2.2.1 Introduction

The new advanced technology mobile devices currently have the ability function like a computer, it able to work as computer and much more flexible and portability. It enable user to access to network, GPS signal, and even be a scanner. Therefore, Expenses with Geo-Location budgeting system will be a better in design and function, compare to existing mobile expenses system, there will be too depressed on traditional design, it using only text for data store, and also required manually key in data as usual. Current trend is automated trend, all talk about automated, such as auto fill-up, auto generates, and auto retrieves. No more needs to enter many data into the system to store as info, if the user wish to store the location data, smartphone will do it all for user, consuming less time to user.

2.2.2 Using GPS Signal

Geo-location using GPS signal that communicate to the satellites that send location and timing data from the satellite to smartphone. Smartphone or GPS Device while getting location, it actually communicating with the satellite. A device can be communicate with one or more satellite, if the device can receive signals from three satellites, it can show where you are on a map, and if with four or more, it can show your elevation of the earth. (Lawson.S, 2012). Nowadays, Phone manufacture build chip and processors that can use for multiple satellite constellations to get better respond on location. The satellite with closer to the device will receive the signal first and continue to receive 2 or 3 satellite. With using the time from satellite to reach the device, time of signal arrive can be estimate the distance the device from the satellite.

2.2.3 Using GPS with Cellular or WIFI Network

As above GPS take longer time to get position fix, there is another option to make it faster. GPS will start work when satellites are founds; the phone needs to download information about before it start working. The phone needs GPS information to keep tracking and communicate with the satellites. When information fully arrived the phone, GPS service starts.

The technology is keep advance, the information can now send over a cellular or Wi-Fi network, which is faster than a satellite link. Smartphone can get some information from the cell phone company, this is based on the tower that near to the cellular phone and this may improve in cutting down time of GPS start time. It approximate 5-60 seconds Time faster than using satellite link as above technology. (Lawson.S, 2012)

2.2.3   Using WIFI

Not only using GPS to detect the location of the device. WIFI based positing system (WPS), can also determine the location. Wi-Fi access points with smaller area coverage also can used to determine location. The most common, called RSSI (received signal strength indication), takes the signals from the smartphone detects from nearby access points and refers to a database of Wi-Fi networks. (Lawson.S, 2012). Device or smartphone scans for nearby wireless networks, and then sends a list of their names and signal strengths to Google's servers. Google uses their database and estimates where the device current in. The database is a uniquely identified to check the location and it Using signal strength to determine distance. RSSI determines location accurate as tens of meters to the access points. This can be convenient in indoor locations GPS, due to indoor signals can't reach.

2.2.4   Using Geo-location Google Latitude

The current location based service for mobile device is using google latitude, by using the new technology mobile devices, we can fully utilize the function to solve the manually entry of input to the system. As mention in objective, the new inventive expenses budgeting system will have a Geo-location tracking function that track the location and it for easy entry for location or address input to the system. This will bring user to a higher level of convenience. Geographical location has implement new strategies and method of location based service, with wireless mobile device that easy to get information of specific location using GPS position and cellular network. (Pande, et al., 2013) Google latitude, allow user to set his location on the Google map and share his/her location through google account service. There is another features, user can invite their friend to

join the view of location, when the person accepted to join in, he/she location will be share to the person who invite to view his/her location. Users are giving full control over his privacy of location. With the privacy option, user enables to hide his location or even specify the city or the country where his information cannot be seen.

Method of calculate current position

1. Over an IP address, the IP address contain the location, therefore from the host we can know the router status.
2. Position calculation
   - Triangulation
     The method of triangle in mathematic rule, those query out the location between the 2 position and also distance between 2 sites.
   - Lateration
     This method is used when there is more than one site is available, it calculate base on the distance of each site, and measure the distance to know the location.
   - Centroid localization
     Consist of many triangle shape, the query should be centralized, and it importance to know the signaled site.

Weaknesses of using Geo-location

Every time when we are using GPS, there is a need to get the satellites signal first before GPS can navigate us to the destination or location info required. GPS data and synchronization every time we are looking for our location. Application may fail sometimes; thus taking more time to find out the location, if we don't have wireless network or cellular network (Pande, et al., 2013). The Doppler rate of geosynchronous synthetic aperture radar (GEOSAR) is unable to get signal in some orbital positions due to high altitude (Tao Zeng, 2014). It show that the Doppler have serious effect on wrong calculation in geo-location.

Solve the weaknesses

To solve the problem of accuracy, geo-location error is derived based on the range-Doppler equations and the geometry of the squint GEO SAR. (Tao Zeng, 2014, p. p1). GPS satellites synchronization is not a big effect to mobile phone user, because most of the phone is coverage by WIFI and network service provider. Furthermore, if the location is inaccurate, user still may able to manually enter the information.

2.3 QR code Scan

Introduction

QR codes is implement to the system that propose in the objective, the reason to implement QR code is because it is quicker respond for time effectiveness purpose, and another reason is because it store more bit of info compare to conventional bar-code information. Compare to existing expenses application in market, there are still in new era, there is many application with QR code, but what is from my research, is not widely implement as information input for expenses application. In the new era, phone camera devices can be used as new input interfaces such as symbol and bar-code recognition.

Strength of QR codes

QR code is a 2D bar code that used for easily accessing phone provided network services by reading the URLs address. (Cyberworlds, 2004). Mobile phone work with digital signal processor can compute and recognize and decode in real time, it can easily replace the typing time of URLs to specific website or info from the QR code. With using QR codes, user can save a lot of time to store and search for information. QR codes is higher detection rate compare to other code.(Computer Vision and Pattern Recognition (CVPR), 2012).

Weakness of QR code

The quality performance of QR codes scan strongly depends on the accuracy of the symbol, corner position, and the threshold value between the black and the white part. If occur in1-3 pixel difference, which will be the cause of miss-recognition, because the accuracy is very importance in QR code process. Mobile security issue, currently there is no system that would only allow QR codes to go to credential or certified websites with verified certificates that what we see in normal Internet use. (Roger & Mitchum & Zhuo & Nicholas, 2013).

Method to handle weakness of QR codes

The quality of QR code can be depending on hardware of mobile phone device. QR Code Minimum Size of dot on year (2011) Therefore, it needed a higher quality of image, for lower resolution of camera used. The QR codes not scanning clear can be resolve by rescan the image of QR code. The QR code is translated to URLs, therefore in the expenses application system doesn't to key in the description of the item. In the expenses application that mentions in objective, it doesn't cause any security issue to user, it only used to descript and reference the item in the system. Website authenticates issuing; can warning by, a pop-up warning message representing the verification of the digital certificate appear to the users upon scanning a given QR code.

2.4 Reviews on Google Android API

Introduction

Application Programming Interface (API) that allows application software to make use of the functionality of other available API application through interface. API provides programming method for accessing the application resource; it is more simply in structured and way of getting function and data. Implementation of APIs to an application can result in greater flexibility, improved ability and efficiently to show and get outputs. It also consider as a re-usable code to generate more useful application. APIs are essential tools for high quality system architectures, and the concept of APIs can be applied to many advantages.
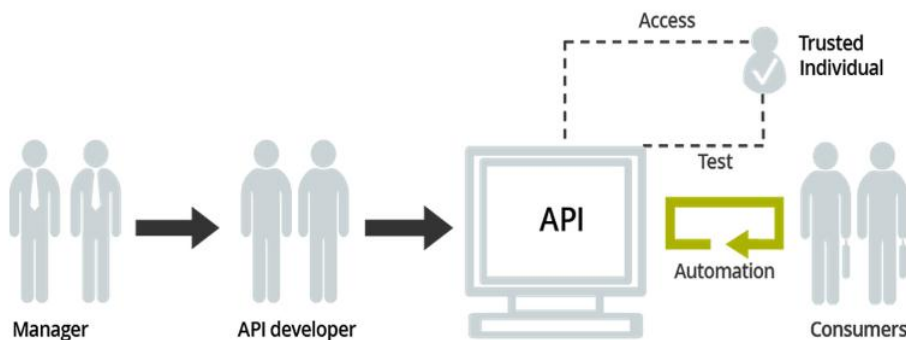
Figure 2.1 : API develop by Developers and also consumers use API

2.4.1 Android Location API

The location API is built for location aware for application, it a minimum of consumption power to use the smartphone hardware. Give user the immediate location access when it in offline situation. This location API build to understand the user doing behavior, such as still, walk, running for example. It also suitable to use as a navigation app background support, more frequent updates the location.

By using the latest Location API, the mobile devices will intelligently get the best and most recent location from GPS or network location by specifying the needs like "high accuracy" or "low power". Expenses with Geo location system need update of the

location time to time for speed up finding the place user currently in. Android location API can locate location immediately because Google Play service constantly store the best and most recent location, when user application needed the location, it retrieve more faster.

2.4.2   Google Maps Android API v2

Google Maps Android API is a feature to add maps based on Google Maps data to Expenses with Geo-Location application. The API will act as the middle to expenses application to the Google Maps servers automatically. There are some including features as well, able to use in application once it include. Eg. Data downloading, map display, and response to map gestures. The API allows making change to the graphics map;

Icons anchored to specific positions on the map (Markers).

Sets of line segments (Polylines).

Enclosed segments (Polygons).

Bitmap graphics anchored to specific positions on the map (Ground Overlays).

Sets of images which are displayed on top of the base map tiles (Tile Overlays).

Google map provide additional control over map locations, it allow user to make interaction with the map on the device. Application with Google Maps can be anchored to specific positions on the map using the API libraries provided. (Google, 2015)

2.4.3   Google Places API

Google Places API is an application interface that able another application makes request to it application system, and returns the service about the places, within the specific geographic location. The request is bases on HTTP request, for user who input their places based on user location and search. Google Places also return the details on the current location place. Depend on the situation and application used; it may able also to add in new places into Google Places database. Furthermore, Google places also have

autocomplete on place, that user input. Autocomplete also come with the query function, there are, based on same or alike word to return few or more option to let user choose their want. Google places also having two type of user, that meets their requirement, one is normal user type and second is enterprise customer from google. (Google, 2015)

2.4.4   Benefit of using API

API makes it simpler to the interface, allow programmers to build applications that can communicate with an existing application or service. (Zeb, 2012) The major benefits are;

1. Benefit by decrease the cost by eliminates the need of programmer to re-enter or rebuild the data that already have in the application.
2. Programmer have powerful tool to support their new build application. It able programmer to build more possibility work in the application build.
3. Extremely programmer friendly, can save up debug time on the sub module of application
4. Time efficient when used to develop a new application system that using API rather than build it by own.

CHAPTER 3 System Design and Overview

In system design, will show how the flow is and function of the Expenses system with Geo-Tracking application with used of , system flow, use cases diagram and activity diagrams, ERD, class diagram for the whole Expenses Geo-Tracking application will be illustrated.

3.1 System Architecture Design

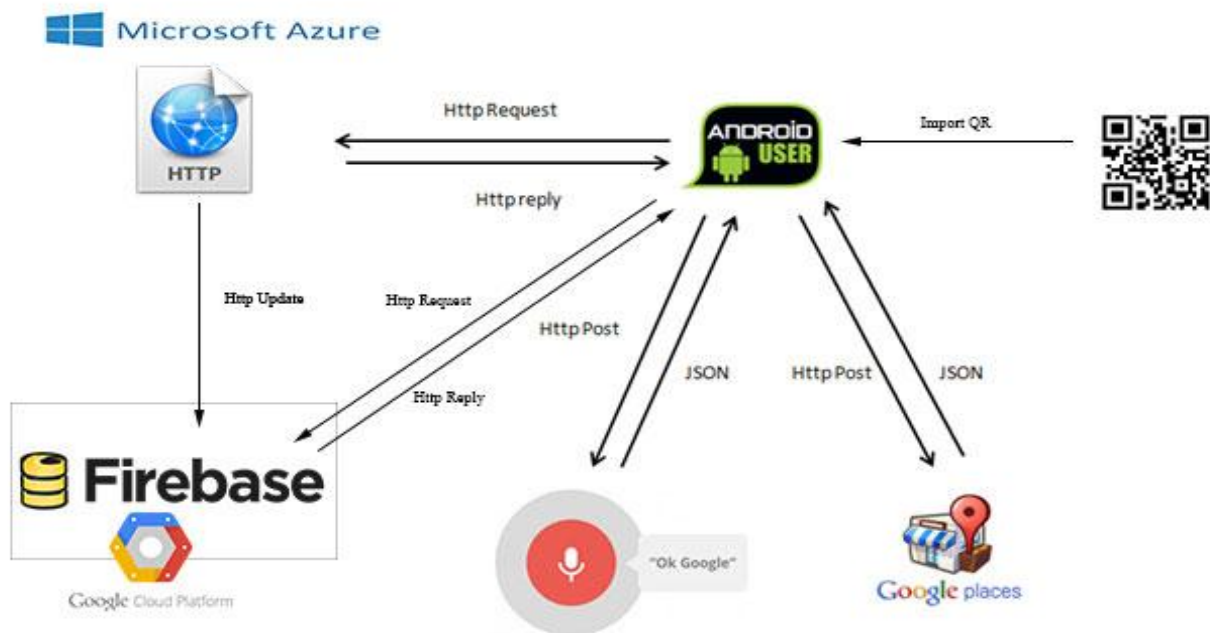
Figure 3.1: System Architecture Design

Figure 3.1 show the system architecture of Expenses with Geo-Location application, the mobile application acts as users, it interacts with two API, and they are Google voice recognition API and also Google Places API. Google Places API is used to access Google Places locations POI. However, Users is not restricting to only text input for description,

they can use the google voice recognition to translate voice to text. Therefore, google voice API is used in Expenses Geo-Location system. When users add record using Menu function, the button Menu sends an http request to specific website hosted in azure base on the google place autocomplete address bar, the expanses Geo location application will call through a browser and request HTTP Request to specific website. Then, the website will show inside the web browser, once the users complete selected which type of food he/she wanted, users can submit the request and once it submit, it automatically calculate the total amount and description and store inside the Firebase server database services. Once the user complete the submission, when users back to application by just clicking "retrieve download" button beside the description and the application will automatically key in the amount and description of order to the application edit text field. Additionally, Expenses Geo-Location comes with a QR code scanning; QR code library was included the system.
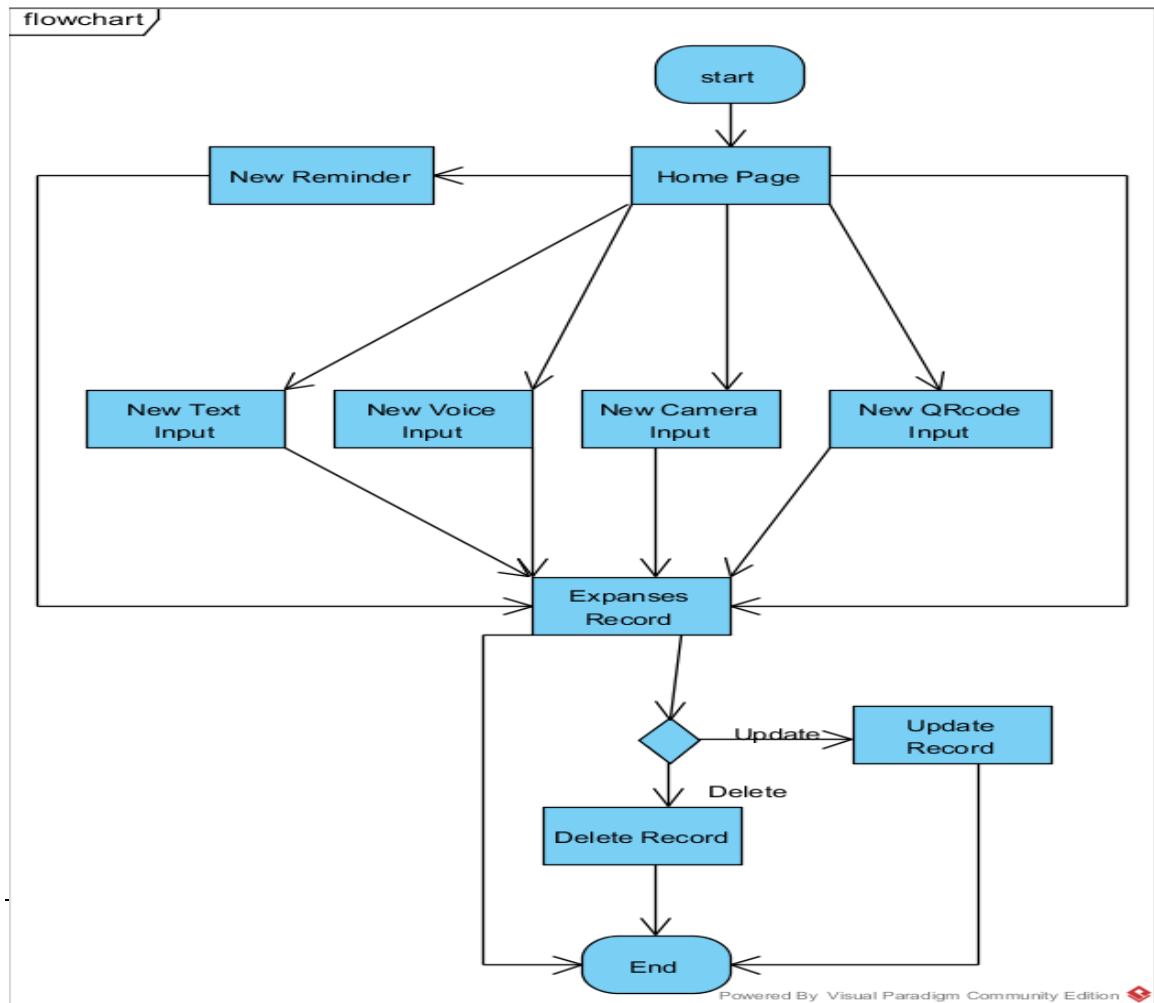
3.2 System Flow Chart

Figure 3.2 show the flow chart of the Geo-Location expenses system.
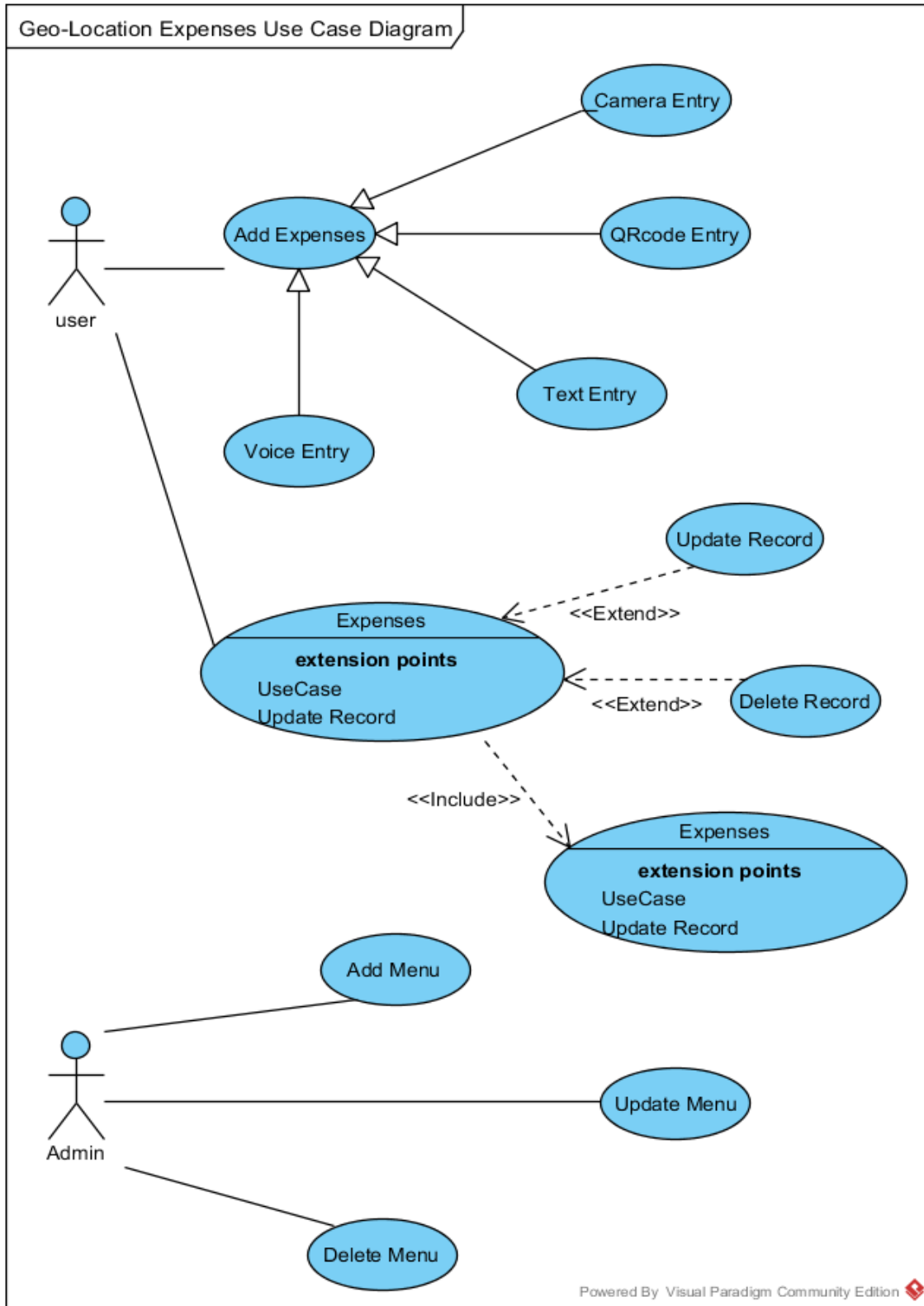
Figure 3.3 : Use case Diagram

In the use case above, there are four functions generalize to add expenses from the Expenses Geo-Location system, which includes Camera Entry Expenses, Smart Scan QR code Entry, Voice Entry and also Text Entry Expenses. The four functions is use as same purpose to record down the expenses of user, but they have different characteristic to fulfill user more convenient on their record in different situation. Text Entry is a simple entry to add expenses in a normal form, tracking while user are on multi-tasking situation, just like walking, driving and also while purchasing item. The reasons why it more convenient compares to existing system are; it able to use voice recognition as input to the description part of the expenses application. The second, Camera Entry, is more suitable for user to keep track their bill and also they need more details on theirs spending, for example restaurant bill, supermarket purchases item bill and so on. Another function of photo taking may be to keep record to what we have bought, and a collection in photo album. The third function is using QR-code scan, it more to advance technology nowadays, it scan on the QR code to get info, and keep track in their expenses application. For example, we bought goods from supermarket, we want it description as record, but mostly description are long and not easy to record therefore with this function, it able to get a long summary of description easily. QR-code scans also suitable to use on nowadays ticketing system. Phone camera act as a reader to read the details on the QR-code and save down the description on the ticket, rather than using on screen keyboard. Voice Entry is also another way to keep track record, for example, jot down some info very quickly by voice. Using this function, user is able to keep record in speedy way.

3.4 Activity diagram

3.4.1 Activity diagram for new expenses record (Text Entry)

User can add their expenses record base on Text Entry, this is the simples input for Expenses record, it using traditional way to keep tracking of record. Expenses with Geo-Location application enhance by the option to let user choose to input description either

by keyboard or voice command for the description text. Furthermore, it will automatically trace the location that user currently in by using android location, and let user autocomplete their location base on the google places API where approximate where he is. It runs with google places API to make user more convenient on selecting food for example. If there is a situation that not in the google places, the menu will not be update, feedback to the admin website for the location menu update soon.
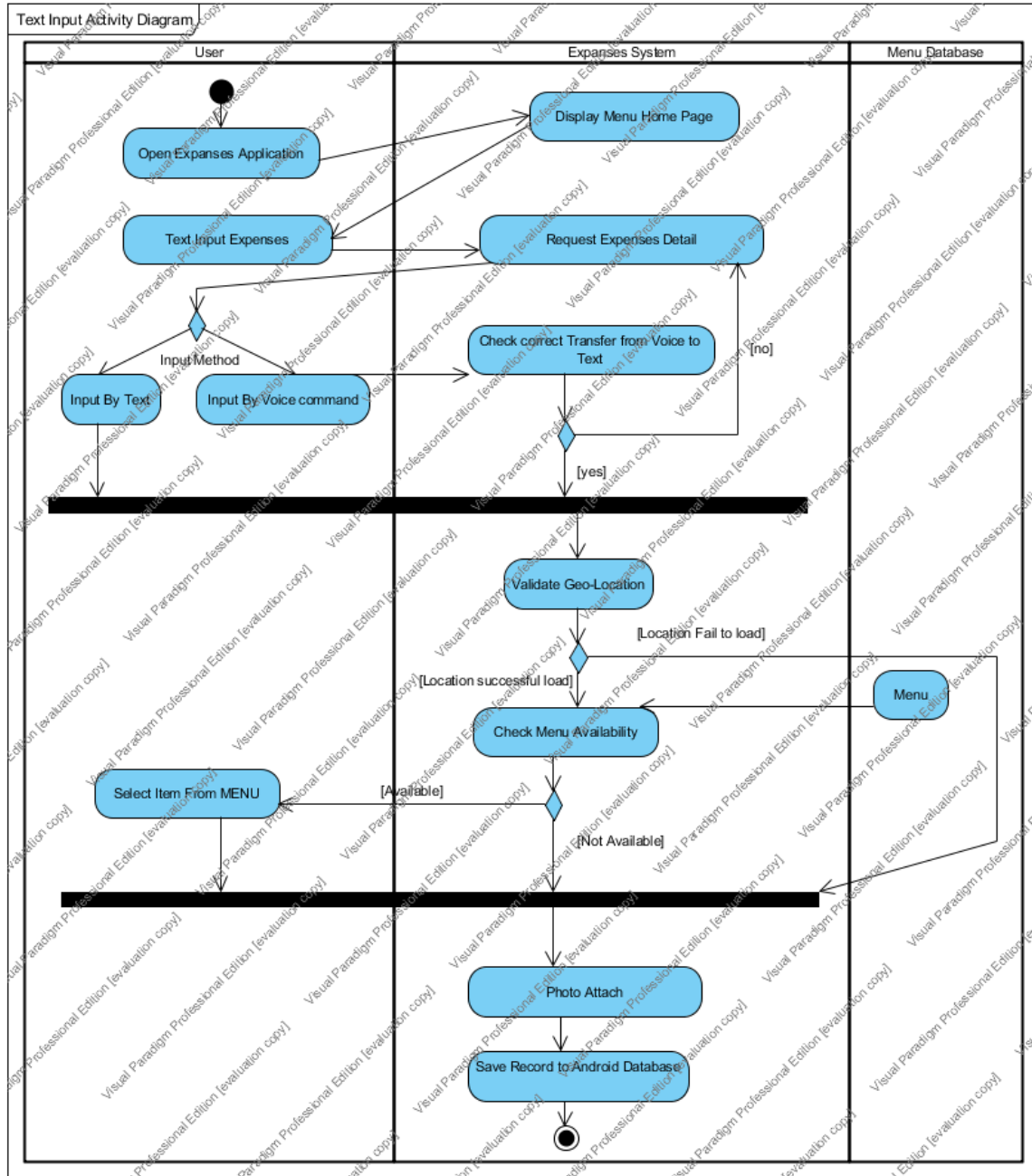
Figure 3.4: Activity Diagram for New Record by Input Text

In this Expenses application there is a function that able user to download the menu from the server, and let user keep track the item he/she have bought, for example at McDonald, user able to select which set have user purchase.

User has the choice to attach photo, if the user need it as a reference. Finally, user needs press the save button to save to the android database.

3.4.2 Activity diagram for new expenses record (Camera Entry)
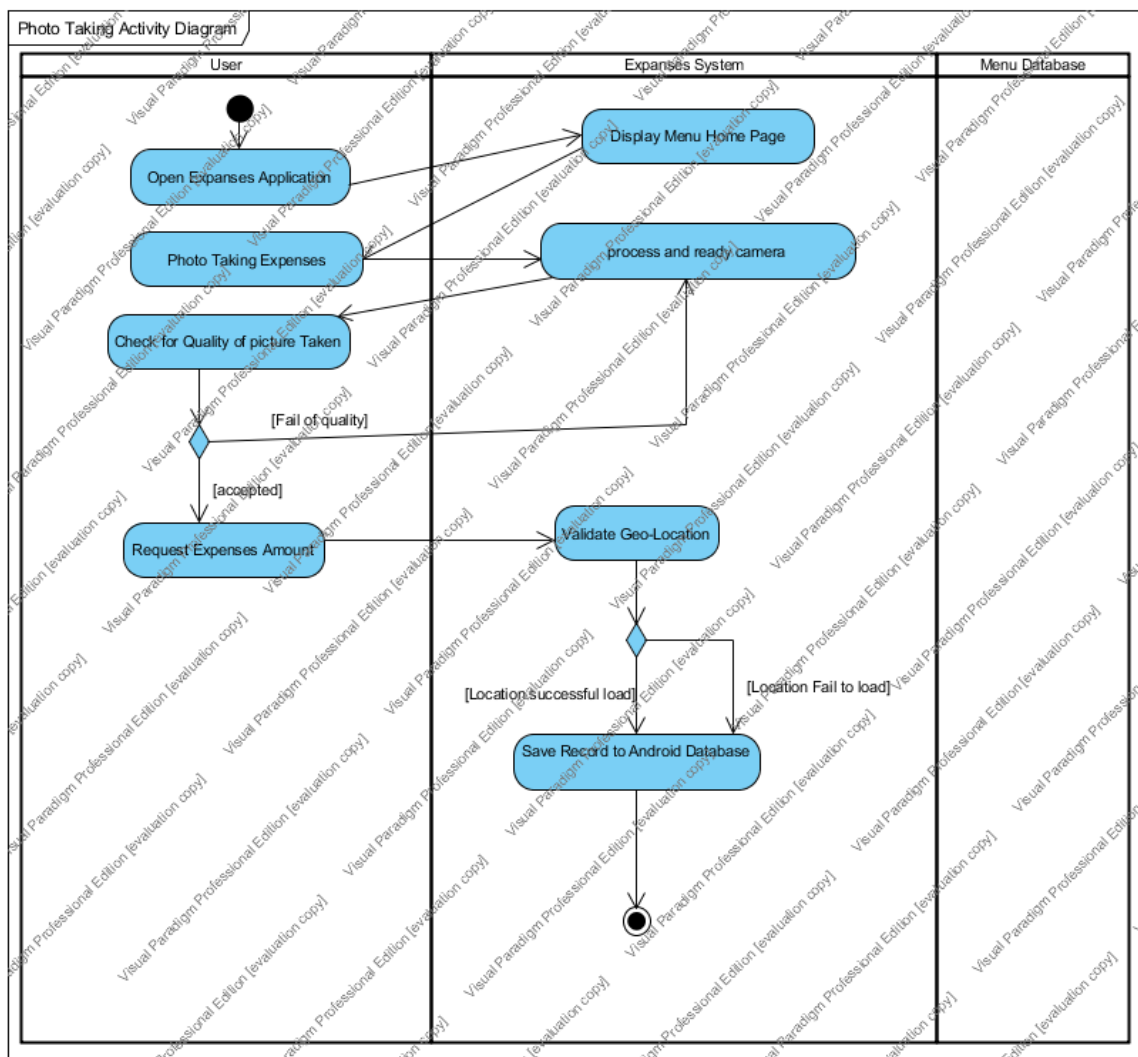
Figure 3.5: Activity Diagram for new expenses record Photo Taking

User can add their expenses record base on the photo, which mean they can take picture of the receipt as the record and store it in the system. Picture is used as a record, for this part, the activity diagram will show the step how the picture takes by phone and location tracking as well. The location is also same as the Text Entry method that stores the current location to the expenses system.

3.4.3 Activity diagram for new expenses record (Smart Scan QR-Code)
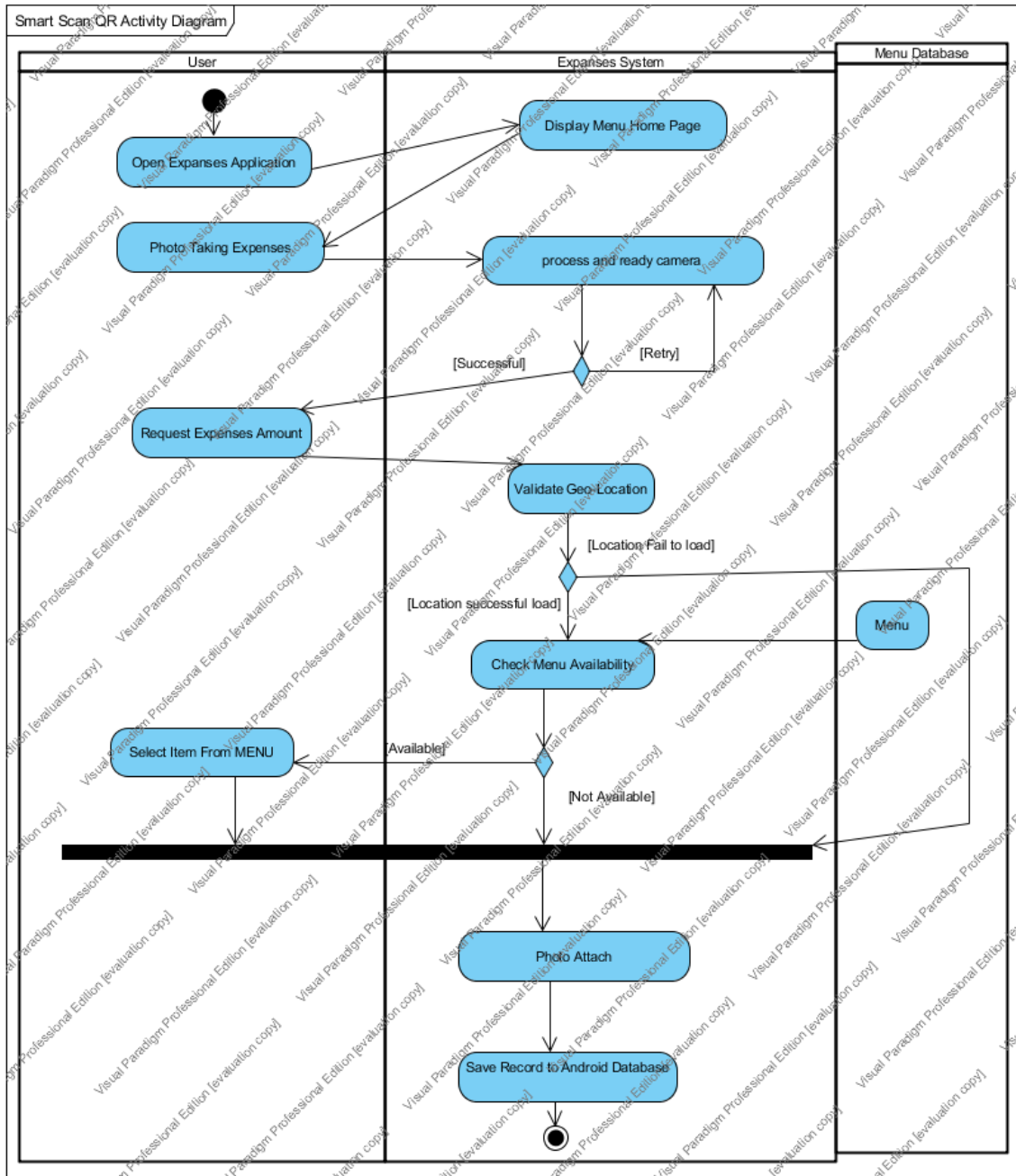
Figure 3.6 : Activity Diagram for new expenses record for Smart Scan QR-Code

3.4.4 Activity diagram for Update Record in Expenses System
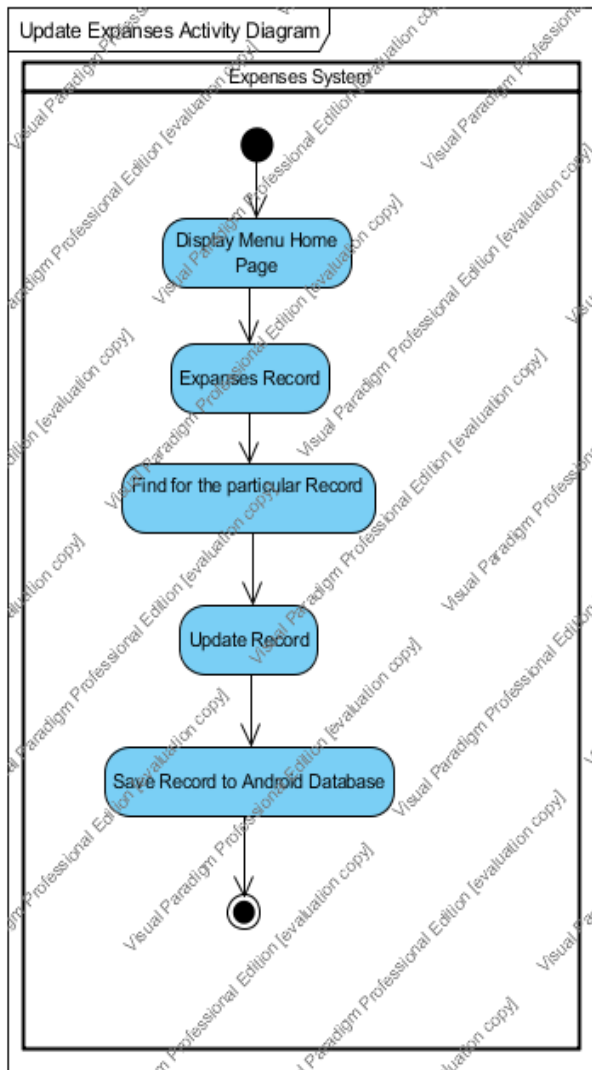
Figure 3.7: Activity Diagram for expenses update record

3.5 SEQUENCE DIAGRAM

Sequence Diagram for new expenses record (Text input)
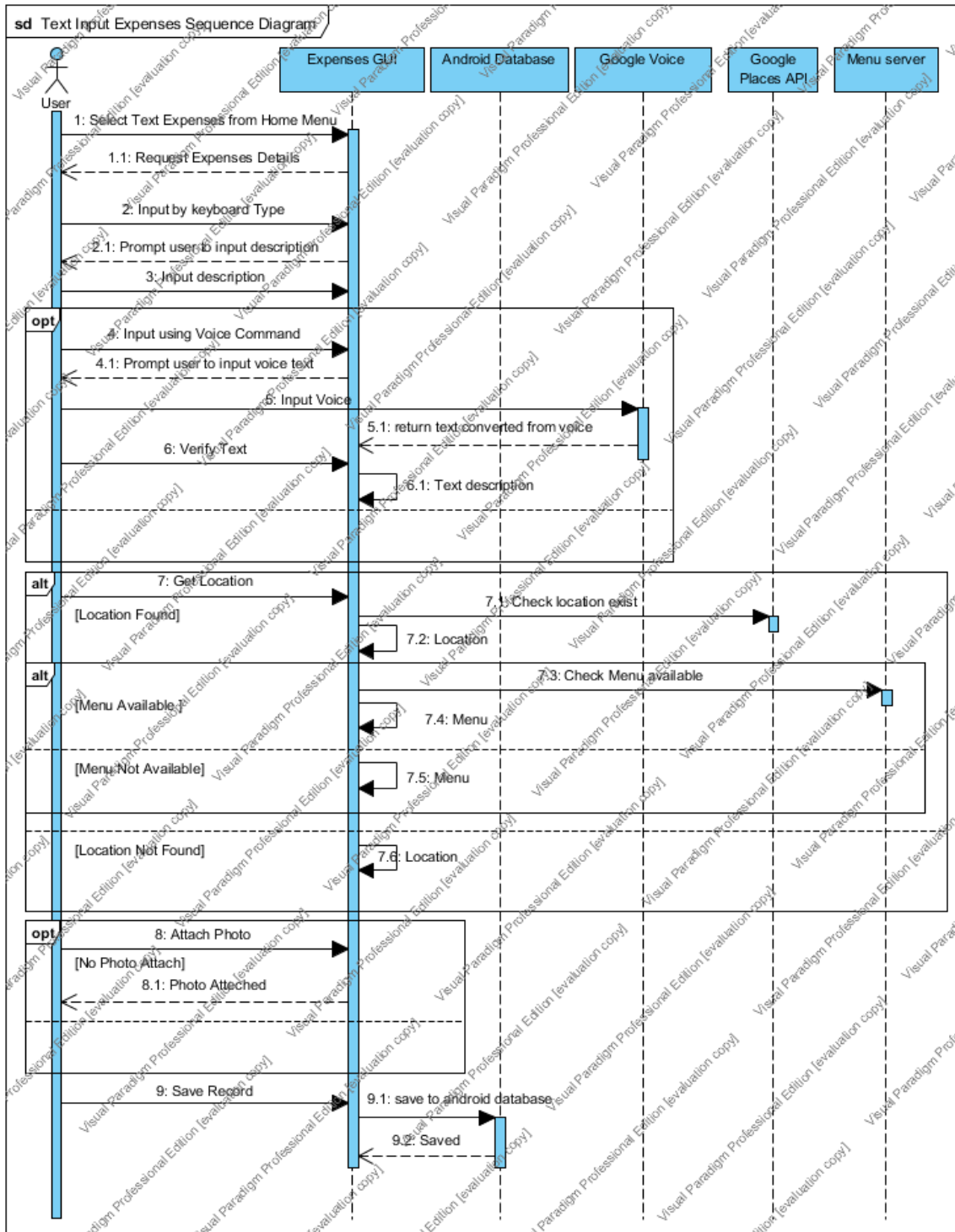
Figure 3.8 : Sequence Diagram for new expenses record (Text input)

This sequence diagram is use to illustrate, more clearly to the activity diagram.

3.6 Class Diagram Design
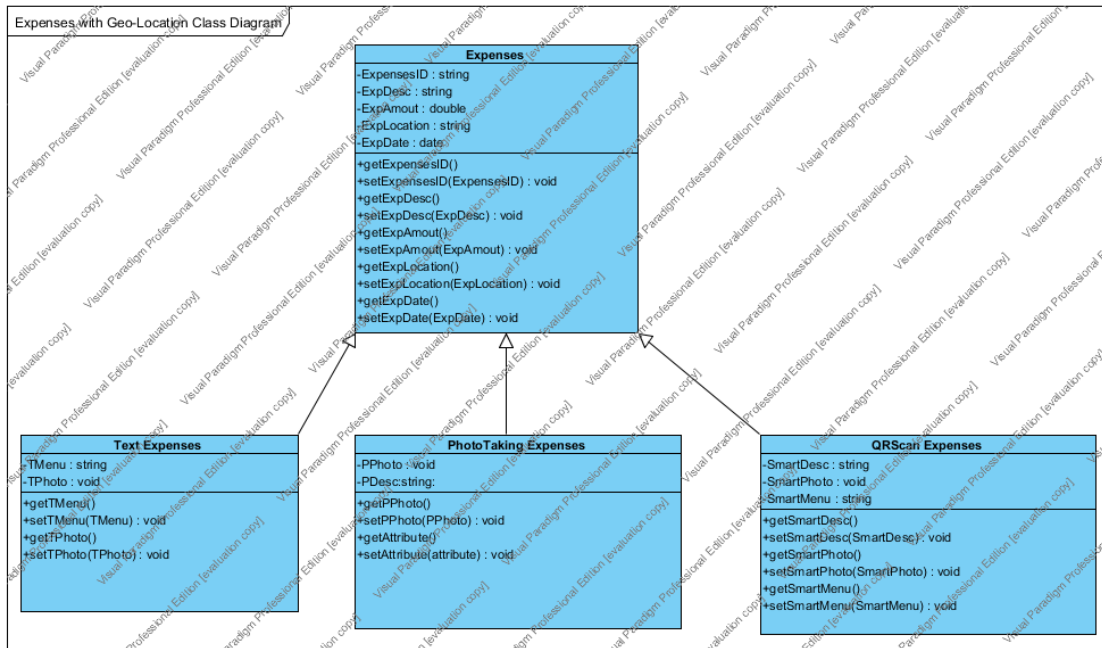
Figure 3.9 : Class Diagram Design

3.7 Entity Relationship Diagram
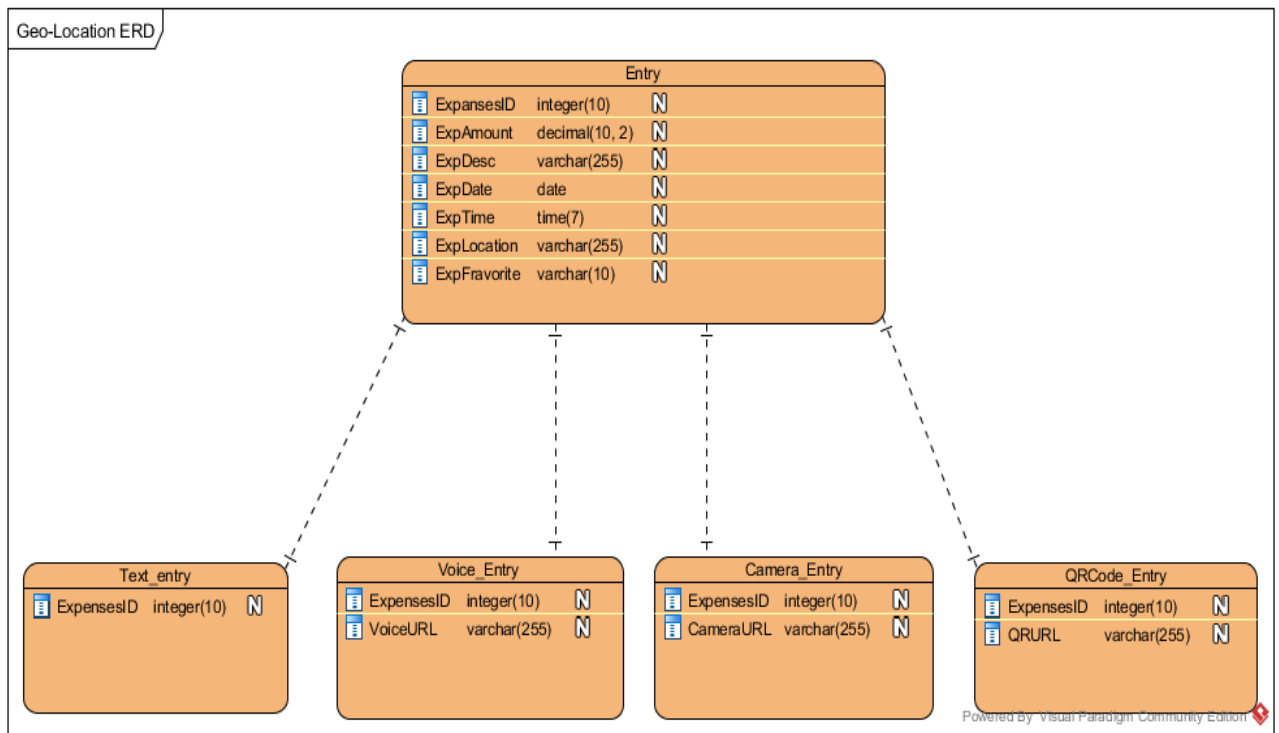
Figure 3.10 : Entity Relationship Diagram

The database design above, using higher level class design, it excellent from the view point of cohesion, all data pertaining in each elementary class, collected together as comment attribute.

3.8 System Functionality and overview

3.8.1 Security permission
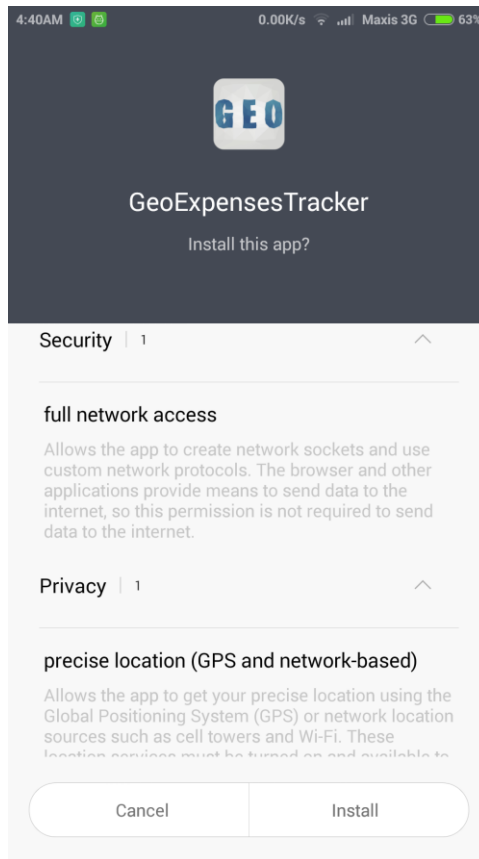
Figure 3.10: Expenses Geo-Location security permission request

This figure shows the installation android application for Expenses with Geo-Location system. It would like to make sure the permission is agree by the user, due to this Expenses Geo-Location system using Internet access, camera access, GPS location access and microphone access. The application needs user permissions to run the application successfully. The coding part belong to AndroidManifest.xml.

```
<uses-permission android:name="android.permission.RECORD_AUDIO"/>
<uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE"/>
<uses-permission android:name="android.permission.INTERNET"/>
<uses-permission android:name="android.permission.ACCESS_FINE_LOCATION"/>
<uses-permission android:name="android.permission.CAMERA"/>
<uses-permission android:name="android.permission.ACCESS_NETWORK_STATE"/>
```

3.8.2 Geo-Location Expenses Homepage
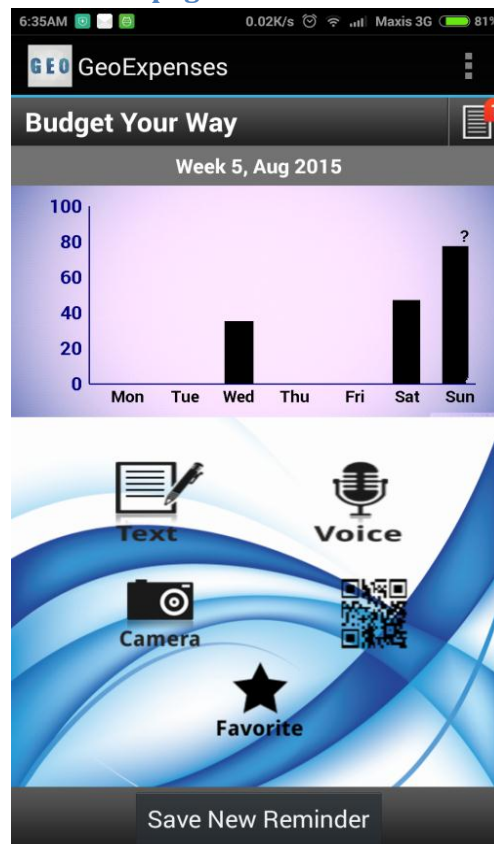
Figure3.11: Show the home page of Geo-Location Expenses system.

The home page of Geo-Location Expenses system is showing by a beautiful graphical interface. The home page is divided by two parts; there are upper part and lower part of the home page. Upper part is showing by geographical bar graph illustrate

the total amount spend in this week by Monday to Sunday. The Y-axis is dynamically change when amount of spending increase. The lower part is the button for user to input different type of Expenses record. There are Text, Voice, Camera and QR code input.

Nested layout is using to show this complicated output, it store inside folder name layout in resource and file type is .xml

```xml
<!-- ScrollView for body-->
<ScrollView
    android:layout_height="fill_parent"
    android:layout_width="fill_parent"
    android:fillViewport="true"
    android:layout_above="@+id/home_footer"
    android:layout_below="@id/home_header_include"
    >

    <LinearLayout
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:orientation="vertical"
        android:gravity="center_horizontal"
        >

        <RelativeLayout
            android:layout_width="fill_parent"
            android:layout_height="wrap_content"
            android:background="@drawable/graph_header"
            android:padding="5dp"
            >
```

3.8.3 Add Text Entry Record
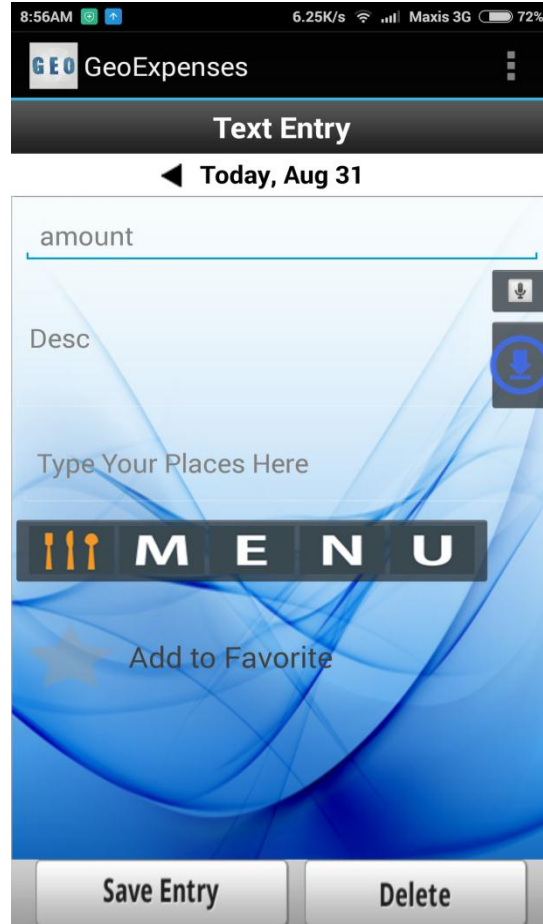
Figure3.12: The Text Entry for Geo-Location Expenses

Inside "Text Entry", user is required to enter 'Amount' and 'Description' for the basic entry. However for the location the device GPS will start to get the current location for the user, date is today date follow the smartphone date, time is current time. If the user wish to reset the today date; it possible to set previous day and not future day.

3.8.4 Google voice recognition

Google voice recognition is one of the ways to replace text input by converting voice command to text. Nowadays is a trend using voice to instruct a phone, it use our

voice as command to a smartphone; tell the smartphone what to do. It also acts as a very importance tools while user are in multitasking mode. Driving or walking for example.
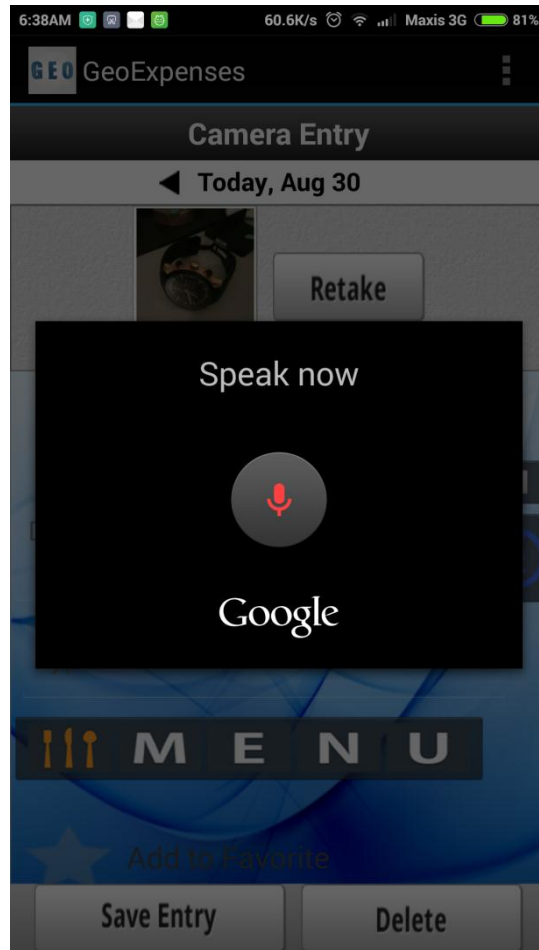
Figure 3.13: Expenses with Geo-Location application is activated with voice command.

Google voice recognition is included to easier the description of the expenses record. It able to translates the voice to text and store in the edit text entry. It will be a very useful alternative input while user is in driving or walking or in an unstable situation like inside the bus.

3.8.5 Automatic Location

The coding shows how the Geo-Location Expenses system gets the locations automatic. The location name, type of application, latitude and longitude will stored in Shared Preference using an array list created in order to retrieve little location information faster.

Figure 3.14: The location is automatic traces by GPS and gets the specific address from google.

This is done by using android location helper, it will update once network is available and also GPS signal is available. This will automate the input for user and help user to keep track their expenses record base on the location she made this expenses record.

3.8.6 Update Record / Unfinished Text Entry

After user enter the most basic information, 'Amount' and 'Description' user is allow to save as a complete record in android database. If the user missing either amount or description, the record is save with a string text "Unfinished Text Entry" but later on, if the user wish to update back the information, Geo-Location Expenses system is allow updating or deleting the record.
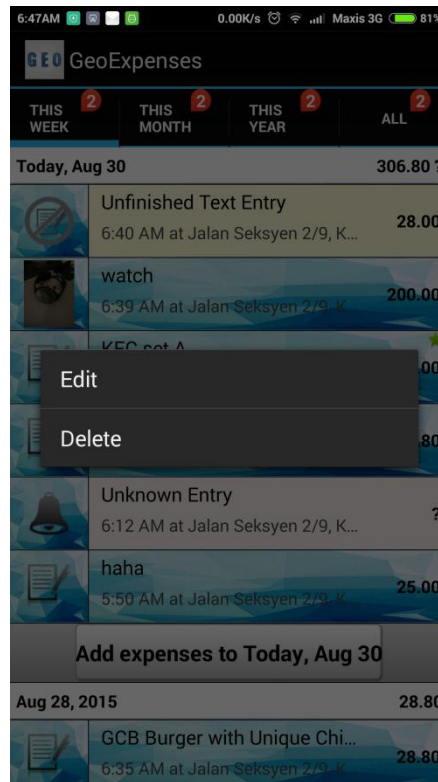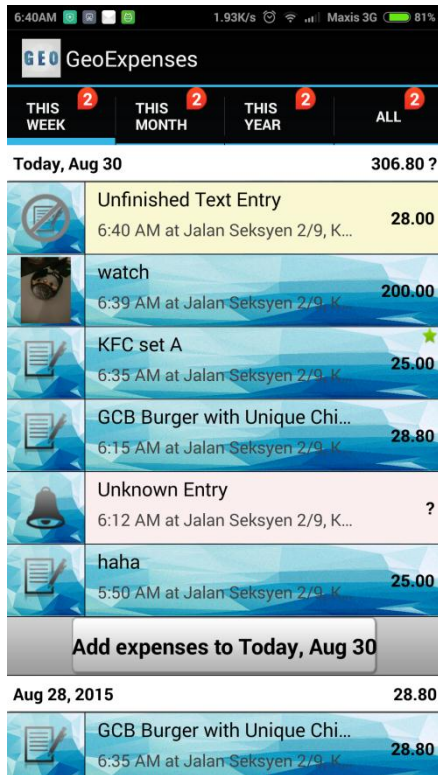
Figure 3.15: The unfinished record stored and updates the record in later.

Geo-Location Expanses system able user to makes an unfinished entry record due to it giving a convenient way for user easier to update the record later on. For example user some time may be in rush situation, therefore it just need to open up the application and save down a record, and update the record later on when he/she is free. It gift convenience to busy people nowadays. It also set down a notification for user easy trace back the unfinished record update.

Figure 3.16: Notification
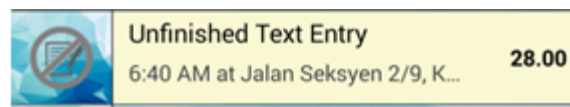
Figure 3.17: Unfinished Text Entry

3.8.7 Google Places Autocomplete API
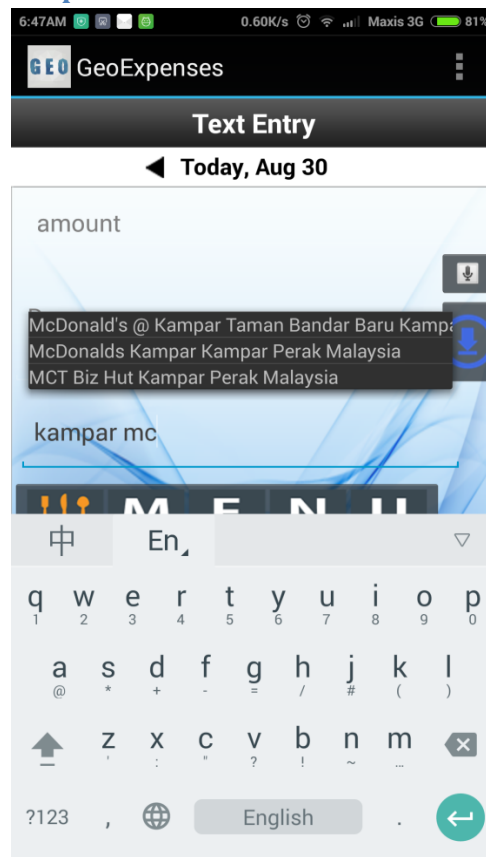
Figure 3.18: Show the Google Places Autocomplete POI address in list view.

Google Places API key is required to perform data retrieve for the from google server. Google places is filtered by country, therefore must be apply a key from country "Malaysia" to perform POI query from google server base on device location. In order to get the API key, we need to need to register a developer account from google and login to the console and request for the google autocomplete API key. Before getting the key, google need get retrieve SHA1 fingerprint and verify the key to allow user used that in the application. After the key requested, the key is needed in the Expenses Geo-Location application system. It also allows admin to monitor application API request.

Figure 3.19: Show the key requested for android

The key is used in the application declare as API_KEY in the java class. API send request from JSON format include with string input to google autocomplete server, and server reply with HTTPS.

Figure 3.20: API key declare
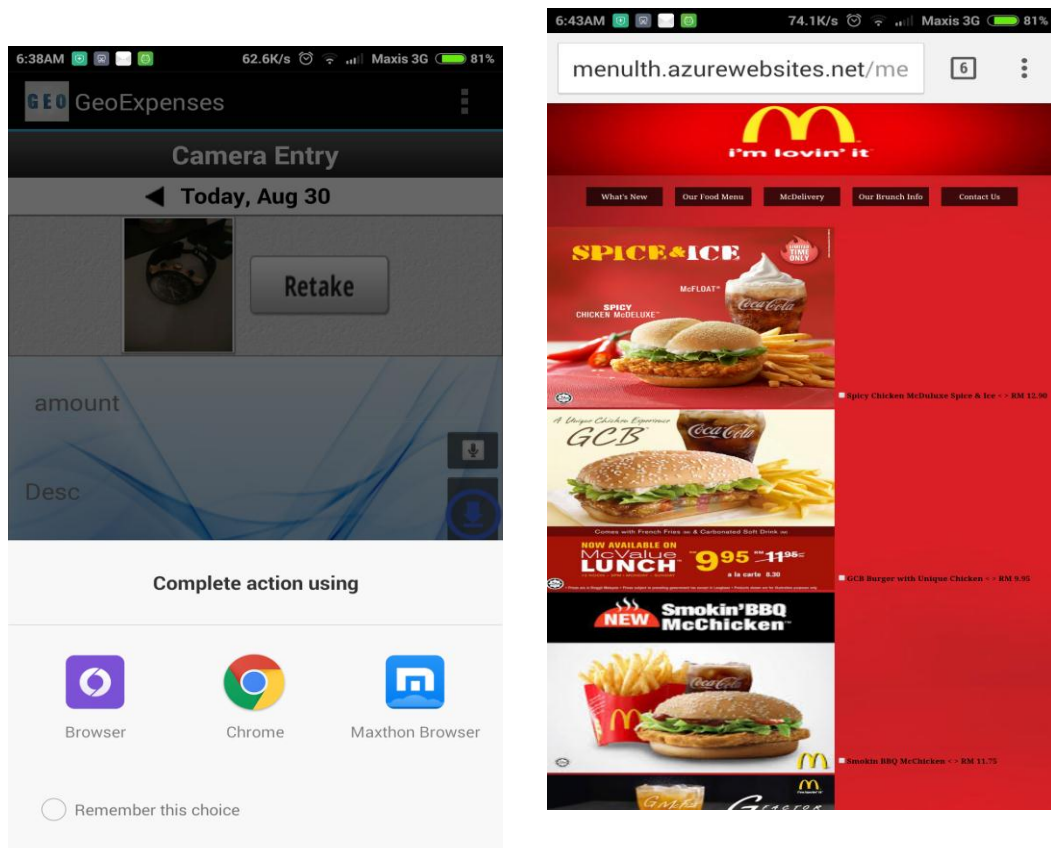
Figure 3.21: Geo-Location Expenses Menu display

This is the Entry for Expenses Geo-Location system that able user to use autocomplete for places they search for menu. After the location search, the menu button will be enabled if location menu found. The menu button will execute in URL store in database; the Menu will be show by using smartphone browser.
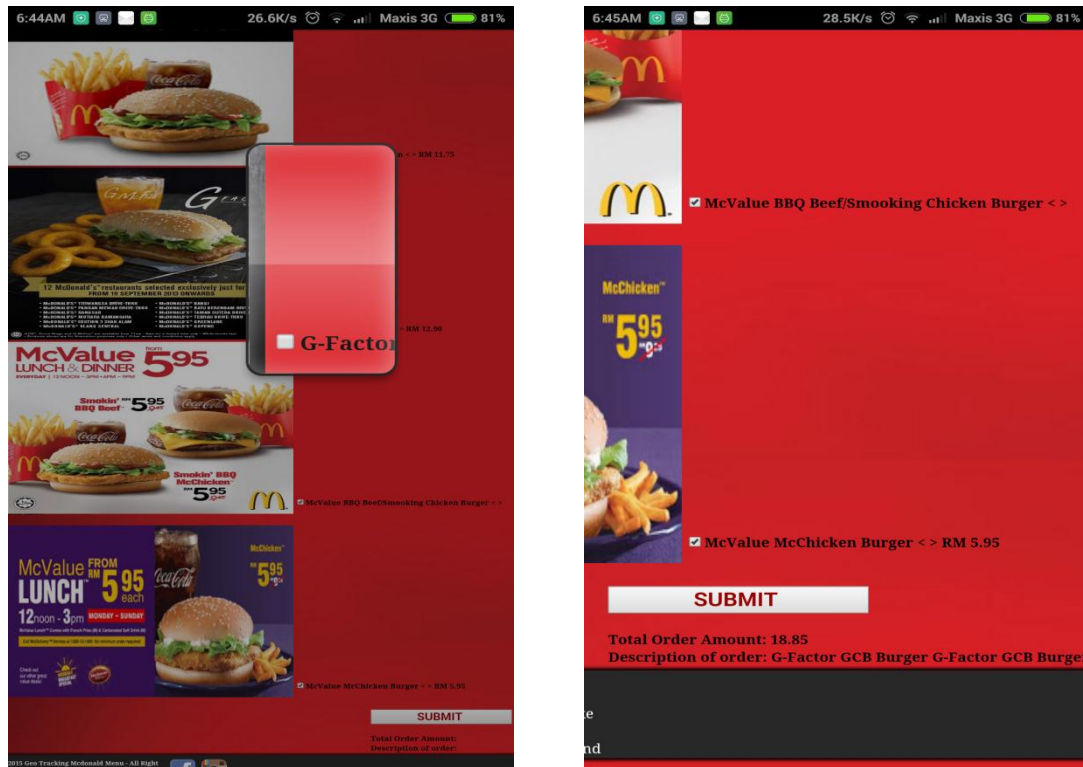
Figure 3.22: The web server calculates the total amount and displays the selected set

The browser shows the webpage produce by admin and able user to make selection from the website. The user is able to select the "menu" inside the webpage. The server from the webpage will then calculate the total amount that user selected and description. The total amount and description will then store to firebase server database.

3.8.9 Firebase Server database record

Figure 3.23: Database store the record of data selected from the menu McDonald.

```
////Get Data from Server Database
Firebase.setAndroidContext(this);
Firebase myFirebaseRef = new Firebase("https://torrid-heat-3383.firebaseio.com/");
```

Figure 3.24: Firebase data directories
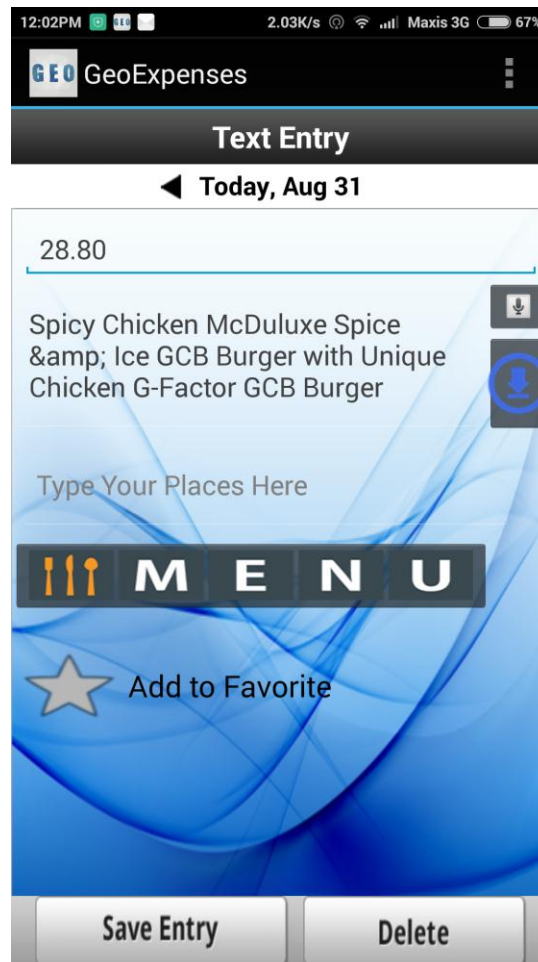
Figure 3.25: Successfully retrieve data from firebase server database.

The data store in the firebase server database is what the user selected and submits from the webpage. The firebase server database only stores the current updated menu

data for each menu. For example, McDonald, it will create a location to store data for McDonald set selected, and the latest data replay the last data.

3.8.10 Camera Entry

Camera Entry is very useful function to take down a photo such as receipt, or an object that easy to get view back when needed. Therefore, this function is implement into Geo-Location Expenses system.
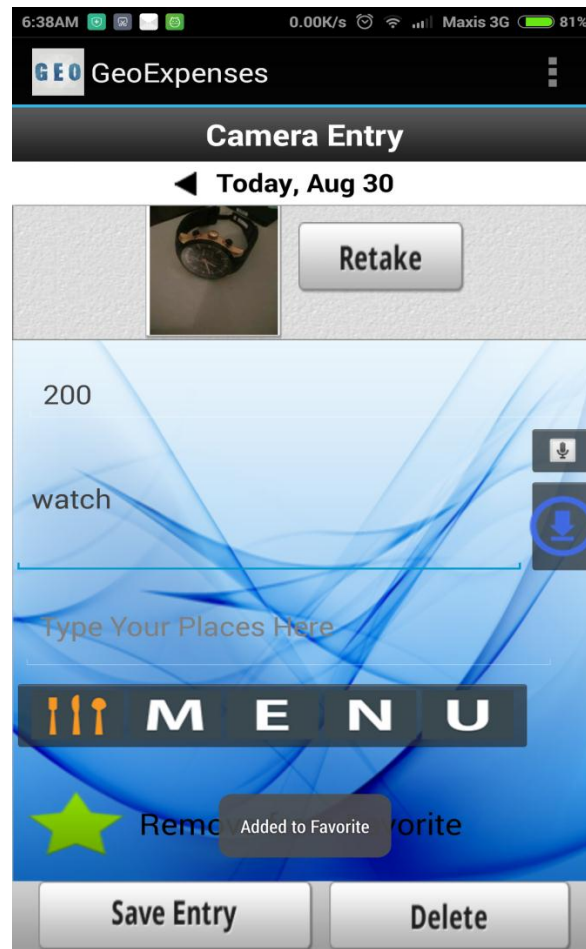
Figure 3.26: show the Camera Entry of Geo-Location Expenses system.

The camera entry is using camera library to turn on the camera and capture the picture though the camera lens on the smartphone. The picture captured by camera is

stores into specific android data storages for easy retrieves by Geo-Location Expenses system.

3.8.11 Voice Entry
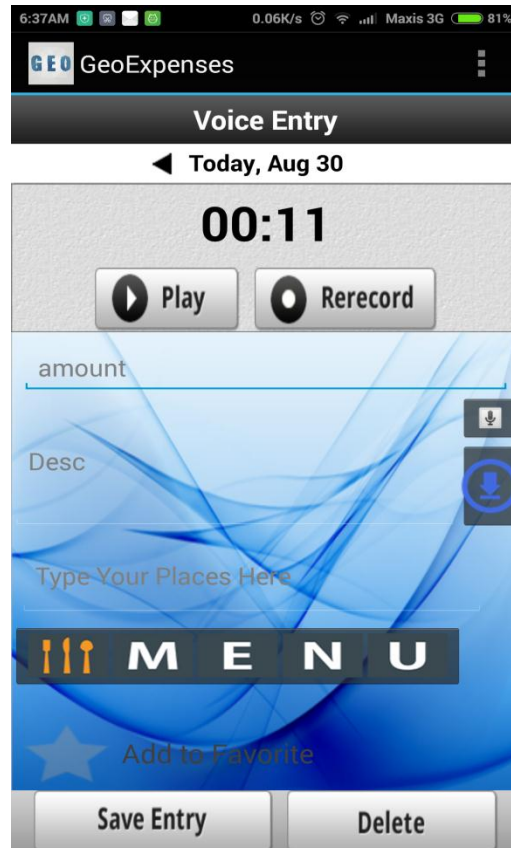
Figure 3.27: The Voice Entry for Geo-Location Expenses system

The Reason include voice is because; voice can store a lot of info when needed in speed and inconvenient moment, keep record instruction from other for example.
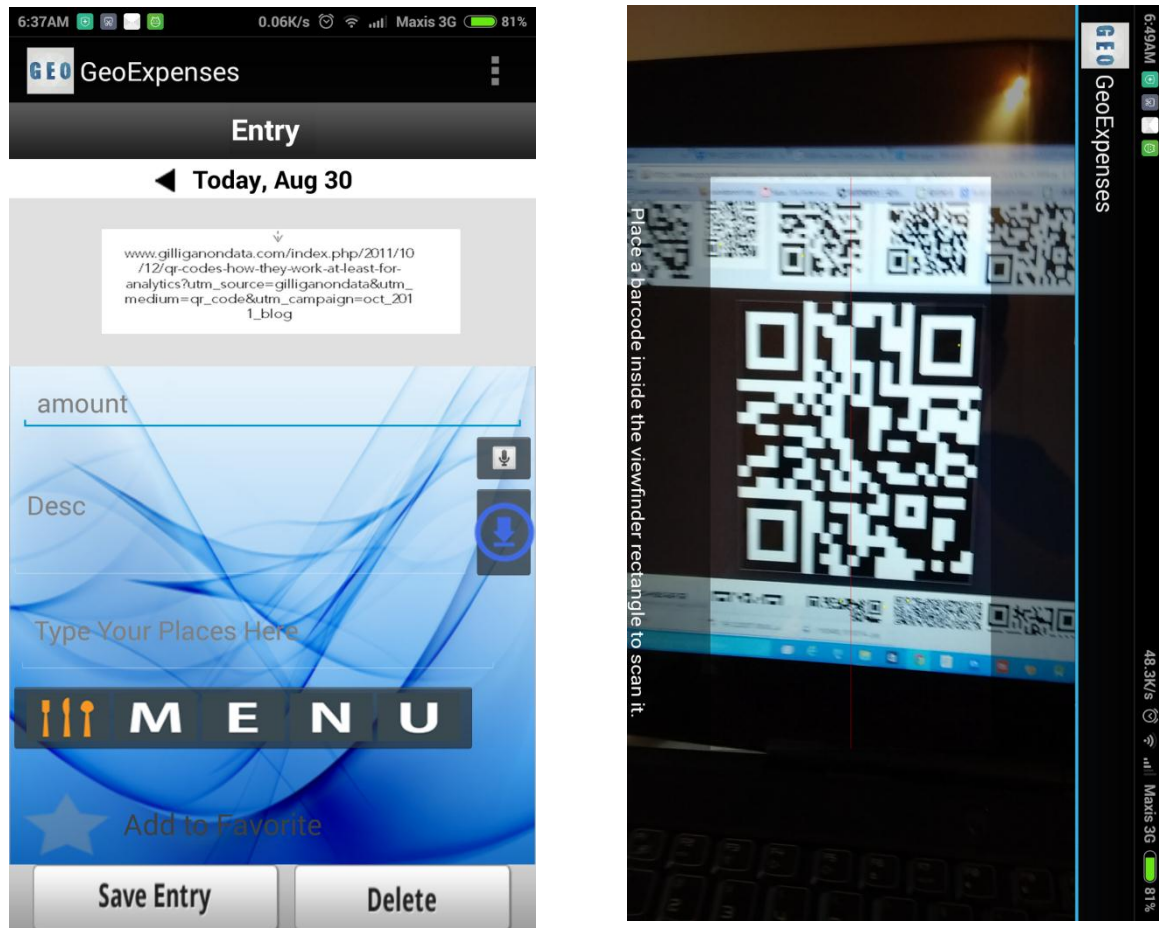
Figure 3.28: The QR-code Entry for Geo-Location Expenses system.

QR-code scan is a more advance technology nowadays; it scans on the QR code to get info. For example, we bought goods from supermarket, we want it description as record, but mostly description are long and not easy to record therefore with this function, it able to get a long summary of description easily.

3.8.13 Display Expenses Record

The Geo-Location Expenses record is store under flurry, therefore is able to list view of record base on week, month, and year. The flurryAgent.jar file is must be included in the library, with Agent key to start insert the record.

Must start a flurry before record retrieve or add, the flurry key must include

```
protected void onStart() {
    super.onStart();
    FlurryAgent.onStartSession(this, "TWN1Q86PGWA7WWEPDWXA");
}
```
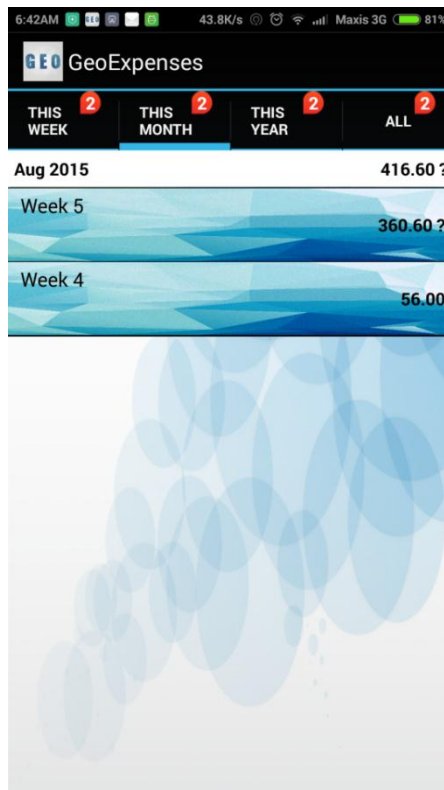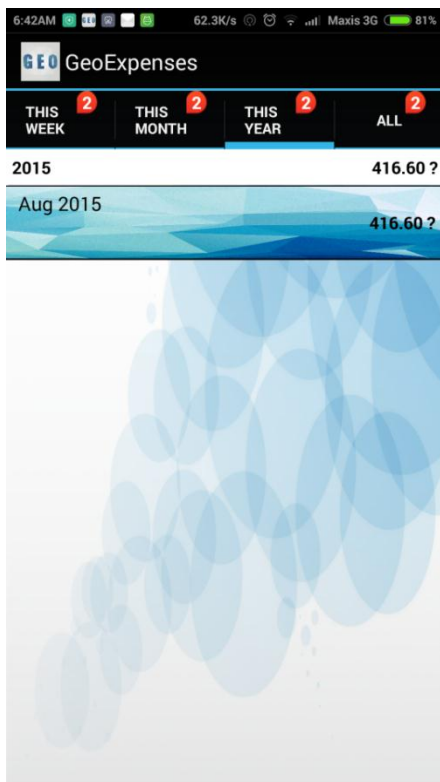

Figure 3.29: The different Record view filter by week, month, and year.

3.8.14 Edit and Delete viewer
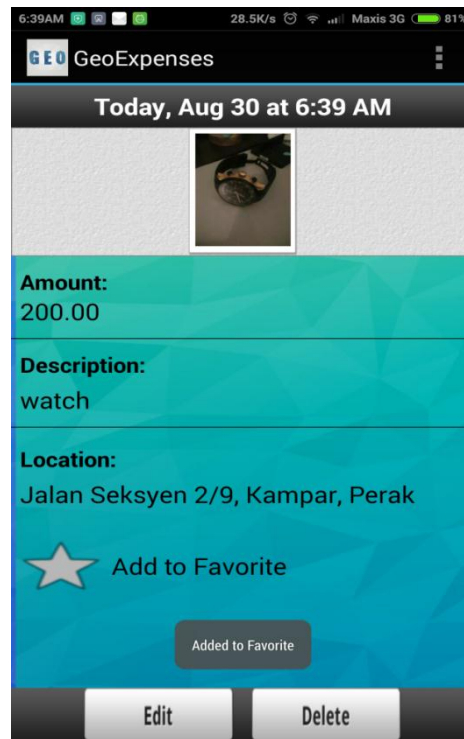
Figure 3.30: The full detail view of record in Geo-Location Expenses.

3.8.15 Camera photo viewer
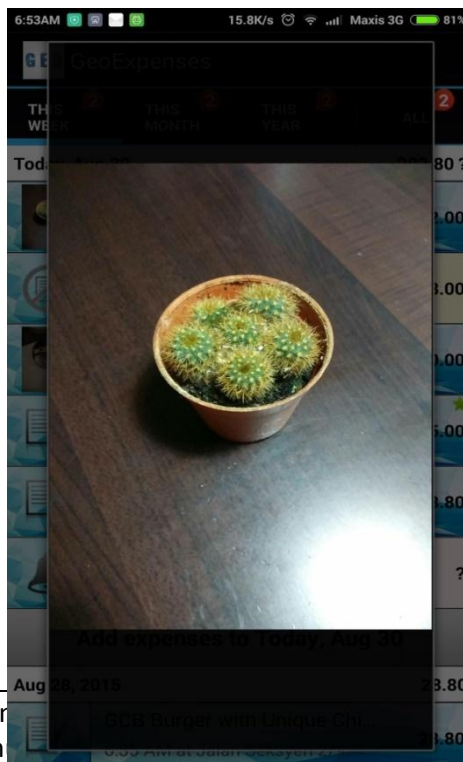
Figure 3.31 show the camera viewer of Geo-Location Expenses.

3.8.16 Generate Report

Another feature of using flurry makes Geo-Location to be more flexible in doing some backup or keep record or generate monthly, quarterly, yearly report.
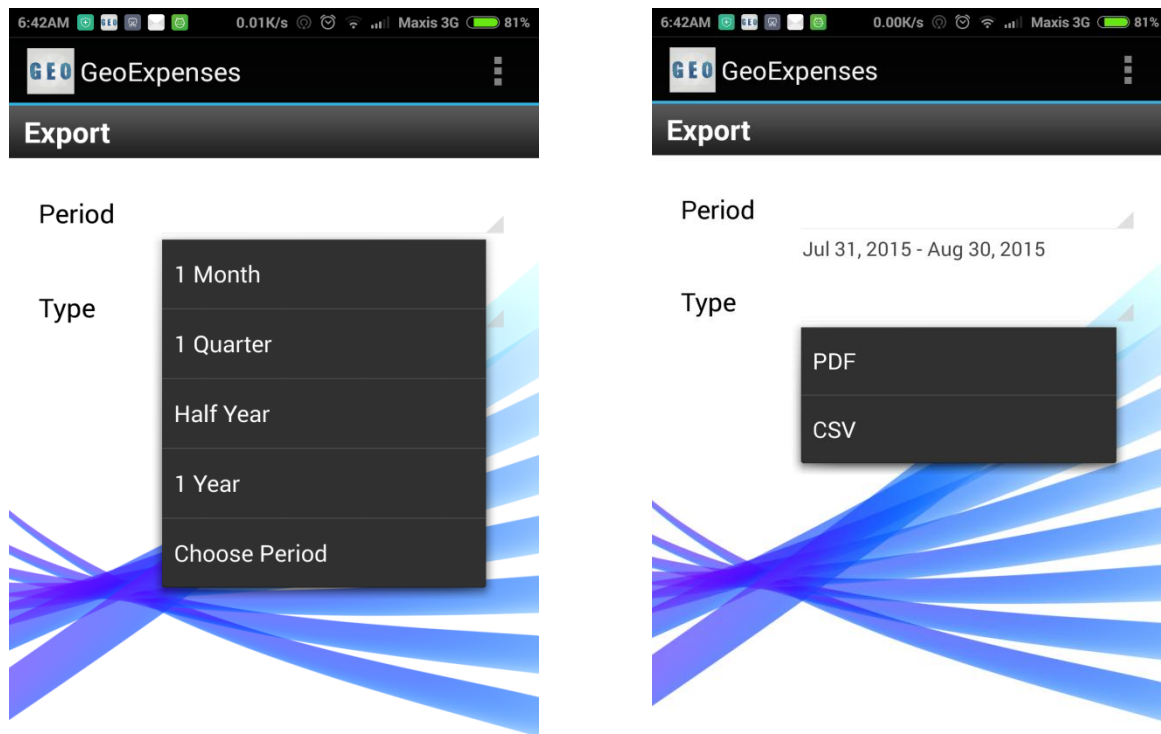
Figure 3.32: Show the type of report can be generated by Geo-Location Expenses system.

CHAPTER 4   METHODOLOGY AND TOOLS

4.1 Introduction

The Method and tools using in methodology is very importance, it take the role to develop the whole project in successful or not. The design and used of development methodology for the project Expenses with Geo-Location Tracking will be described in this chapter. This chapter will show which software are used in every stage of development, technology used and tools used in this project.

4.2 Software Development Methodology used

There have so many methodologies as the system development life cycle (SDLC), the methodology choose to develop Geo-Location Expenses system is throwaway prototyping. The reason used throwaway prototype is because the final throwaway prototype is cost effective and also suitable for unfamiliar of technology such as programming code for voice recognition, QR code scanner and also Geo-location and also server database. Additionally, throwaway prototyping developments able to help this project to test out every function are working fine and fast implementation when it reached to final implementation of the system.

Figure 4.1: Throwaway-Prototype

Throwaway prototyping development is using due to needed to explore new idea of technology such as flurry for analysis data. While Develop Geo-Location Expenses system, final solution will not be develop from beginning, development done part by part to ensure each function running well. When coming to implementation state, failure can be easily solve due to design and develop part by part in the beginning. SDLC will include planning, analysis, design, and implementation as the traditional waterfall development, but it have additional step as shown on figure 4.1 Structure of Throwaway Prototyping Development. The step of throwaway prototyping development work is starting at planning stage, then continues by analysis state, in analysis state analysis need to break the project to sub function in order to design prototype separately and test. Every sub function needs to repeat the same step as all the function do. After complete all of the sub function, developer need make a construct and testing, if there is no problem, and then will start to implement the system. If there is no any problem occur in implementation, the final system is done to be use.

Throwaway-prototype

Planning Phase

> First, based study on the existing system and literature review to find the idea of application that develop, and also find out the problem that current existing application.

- Define problem, and objective.
- How to make a better system from the existing one.

Analysis Phase

> In the analysis phase, project needs to find out how the system to can detect the voice to make voice recognition, and how the mobile phone camera detect the QR code. Furthermore, the Geo-location must me

recognize by the user current location, how the application can communicate with those API include, such as and also Google Places API , connection of firebase server database used in the application system. After that, the Gantt chart and UML diagram is developed based the project requirement.

Design Prototype Phase

Design prototype phase, based on the analysis phase; translate the requirement to a logical structure. Such as, UML diagram using Visual Paradigm. Design the interface on how each function can communicate better and giving better output while develop.

Construction and testing

This is the phases before implement phases; it changes from logical design to the actual system and testing the module of prototype. This is also the longest journey of the software development life cycle. Testing phase includes unit testing, integration testing, system testing, acceptance testing.

Implementation Phase

This phase converting the new system design into operation, in addition, this system needs to be tested whether it is work probably after integrated.

If there are bug or problem in integration phase, will try to fix it as soon as possible.

4.3 Project Description and tools used

This project aims to provide a great Expenses Geo-Location system on a mobile application. The Expenses system will associate with the location base on the item that user record or spend. The keep tracking expenses system uses the feature on the mobile devices, such as GPS location signal and also network to determine the location of the

user to keep track the item have bought by the user. When user starts up the mobile application, user location will be determined by the GPS signal and query the restaurant or famous places from the database requested by the Google Places API.

The very special features of Geo-Location Expenses system is let user view on the location restaurant menu, based on the location search by Google places autocomplete. When there is menu available for the specific restaurant, menu is enable, the Expenses application will pass the URL to smartphone browser and user are able to show all the food inside the website. User allows choosing from the menu and making a submission thought the website. Once it's submitted, user is able to show the total of order and the details of order. When back to Geo-Location Expenses system, user can retrieve back the data that he/she submitted and store to the local android database.

These features can increase user's engagement, due to able to select the item that have bought in more details, and this feature will automatic update time by time through Geo-Location admin, this function implement is to shorten the time for user to input the details of item bought or taken from the restaurant.

4.4.1 Development Technologies and Tools

I. Android SDK

The Android SDK which is freely downloadable via Android's main website provides developers the API libraries and tools necessary to build, test and debug apps for Android. Plus, the Android library includes specifications for the use of multitasking, drag and drop and swiping between screens. Thus, if the Android application for this project is to be developed, this Android SDK is vital to be used. Since different computer platforms require different type of SDK, a proper checking in terms of compatibility and system requirements should be performed before downloading and installing a SDK. The Android Studio, is a platform which allows programmers to code in Java for develop an android application system. Eg. Geo-Location Expenses system.

II. *Java Programming Language*

Most of the important features and interfaces in the Expenses with Geo-Location project develop using Java language. The reasons using Java programming language because most Android devices nowadays running in java platforms. Since Android implements the open source platform, available code samples and supports from fellow developers or forum, can be easily accessed thus, finding, sharing and the enhancement of solutions for problems can be easily performed.

III. *Firebase For Android*

Firebase is a new method for server database that work user friendly with android application. Firebase purposely develops for Android, iOS, and Web Service. Therefore, firebase is easy to communicate within these three platforms of data. Firebase also combines the power of server and database, this make developer life easier to develop an application that need server and database. Firebase is authentication by Google, firebase language is powerful enough to handle different situation compare to other server database. Firebase also provided some features of drag and drop for easier control to firebase. Firebase can power your app's backend, including data storage, user authentication, static hosting, and more. (Firebase, 2015)

IV. **PHP For Firebase**

PHP is a widely used and it is open-source server-side scripting. PHP syntax based on Perl, Java and C. PHP is familiar in used in server-side scripting language because it powerful tool to script the server and it able to provides many advanced features as needed in Expenses with Geo-location project, as example database. Besides that, PHP compatible with Windows, Linux, and Mac OS. PHP open source have a large community support. PHP tutorials and examples can be easily found on the Internet forum or developer site. The main purpose choosing to use in Expenses with Geo-location development is to communicate with the database.

V. Google Maps Android API v2

Google Maps Android API v2 provides the API libraries to create interactive and feature rich maps in Mobile application. For example user used Expenses application at the eating restaurant within an area can be anchored to specific positions on the map using the API libraries provided. Google Maps Android API v2 is used to show the map of the restaurant in the mobile application. Besides showing, user also can zoom and pan the map.

VI. Google Places Android API

The Google Places API is a service that if users include the API into their application, information will returns about Places that user at current. The API establishes geographic locations, or prominent points of interest — using HTTP requests. Google have launched Place Pages last September on 2010 for more than 50 million places around the world (John, 2010), the main idea is to to help people make more informed decisions about where to go, there are restaurants, hotels, dry cleaners and bike shops, as well as places like museums, schools and parks.

4.5 Devices for Technologies Involved

Server, Notebook/Desktop computer (Windows) with java installed.

Mobile Phones (Android 4.2 and above)

- Mobile phone with camera input

- Mobile phone with GPS signal

Router (Wi-Fi, Internet)

4.6 Language used to develop application

A. *Android Java programming language:*

Development of Android applications required knowledge and skills in using Java as basic language is the main programming language supported by Android. Thus, Java concepts such as inheritance, usage of superclass and subclass and abstract and Java syntaxes are applied throughout the development of Expenses with Geo-Location (using the Eclipse software).

B. Extensible Markup Language (XML)

XML is generally used to manipulate the layout for each screen of design in Expenses with Geo-Location application. The XML affect the Android layouts applied on each screen such as Relative Layout, Absolute Layout or Scrollable Layout and Android specified terms and standards.

C. Hypertext Preprocessor (PHP)

Expenses with Geo-Location include a function that able to get the menu from the application server, therefore it requires a web server to retrieve, update, delete and perform by application administration to maintain it functionality. PHP is open-source, supports SQL and is easy to be learned especially its coding standards; the codes can be written as simple in a simple Notepad.

4.7 Software Used

Software used for the development, implementation and deployment for Expenses with Geo-Location application.

A. Android Studio Version 1.0.1 – Main development for android.

Android SDK is included when being installed for Android application development.

B. Firebase Online Server – Used to handle the server database and data storage for the application menu data.

C. Visual Studio 2013 – Visual studio use to develop application Menu, for Geo-Location Expenses system.

D. Window Azure - Used to host the website created by visual studio and retrieve the URL by Geo-Location Expenses using smartphone browser.

E. Adobe Photoshop – Used for photo editing for the interface design for Geo-Location Expenses application system.

F. Google Chrome – Used for webpage testing and debugging for android application.

4.8 IMPLEMENTATION ISSUES AND CHALLENGES

The issue and challenges of developing this application are;

1. Integrating application with few API. Eg. Google voice recognition, google places API

2. Deal with server menu, that able to base on google places location detected and select, download menu to show with browser in the application.

3. Not familiar with Android database, and it require to implement higher level of ERD.

4. Expenses system due with different input and need to calculate accurate summary. Eg, using flurry to generate summary data and report.

5. Application includes the use of hardware, such as GPS signal, internet, and camera for QR-code scan and camera photo capture. Develop may needed compromise both hardware and software.

4.9 Timeline

Project 1 will take seven weeks to complete and hand it to supervisor on week 8. After submitting the report, prototyping process will begin to develop a partially function, prototype system will demonstrate to supervisor at the end of semester. There are two things to handle in FYP 1, one will be the submission of project 1 report and the second is to come out with and demonstrate prototype. At the end of this semester will be the partially function prototype system. For the coming next semester onwards will be focusing on implementing the fully functional system by following methodology and Gantt chart to develop the application system. Four design and develop prototypes will be built, tested and debugged and find out any problems not fulfil the system and need to correct them as many as possible. The completed Expenses with Geo-location application system will be presented and submitted at the end of semester for FYP2.

Project Planning

This project is planned and carried out the task according to schedule in Figure 4.2.
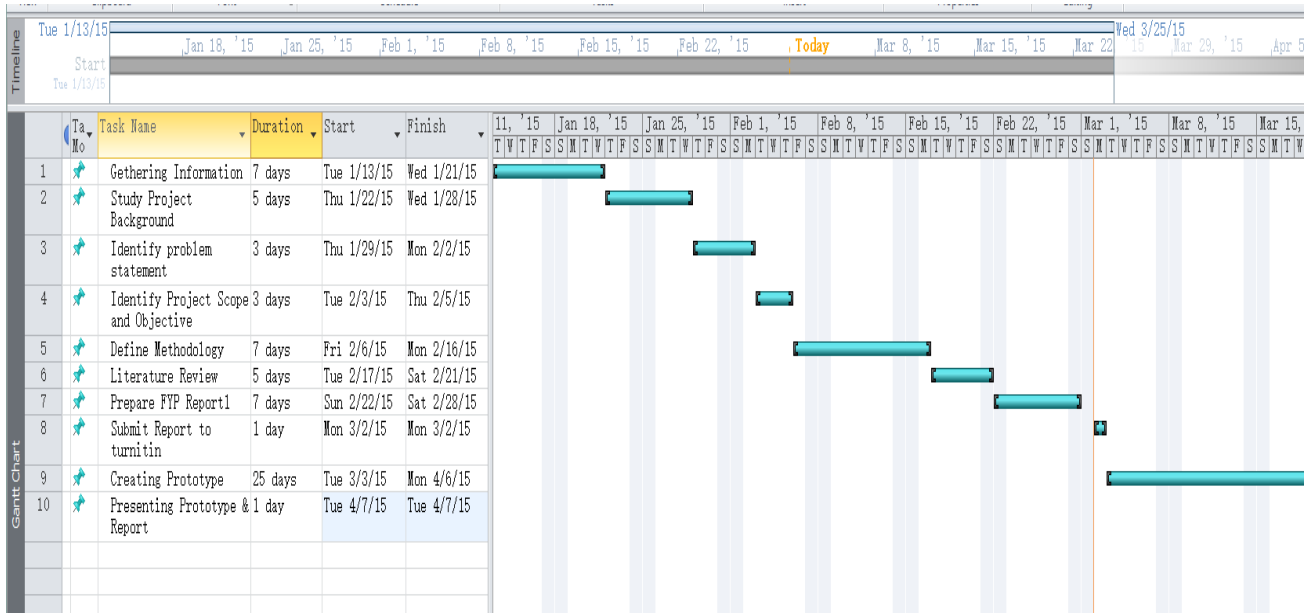
Figure 4.2: Gantt chart for FYP1
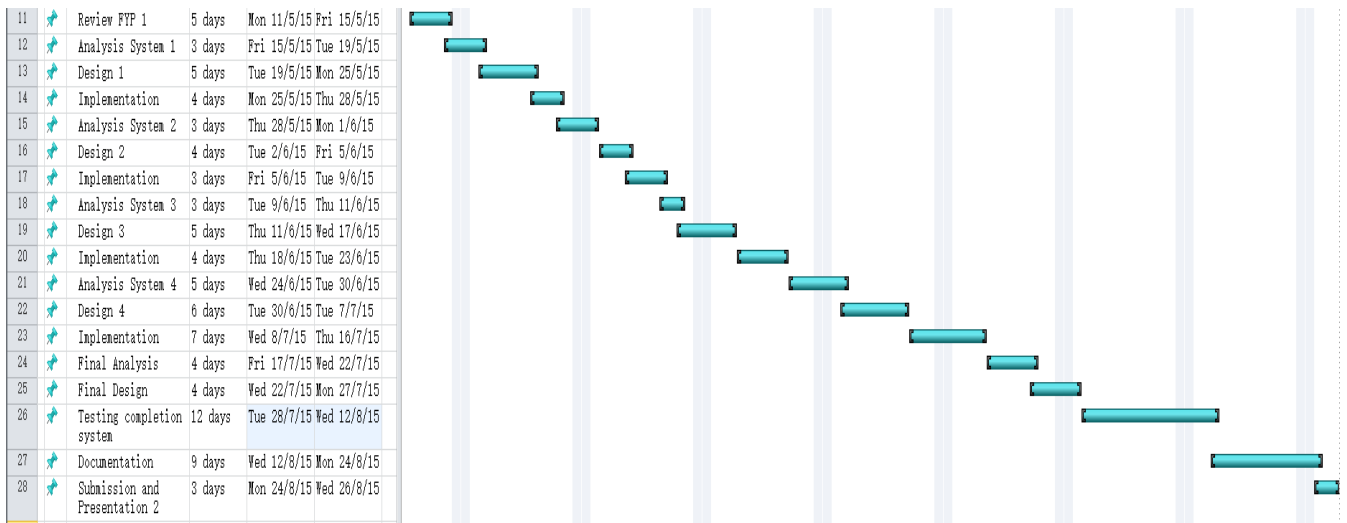
Figure 4.3: Gantt chart for FYP2

As shown in Figure 4.2 and figure 4.3, project is categorized into the following phases:

i) Planning

Planning is the phase, to determent the problem statement, objectives and project scope of these Expenses with Geo-Location application. Functional requirements of the application also consider in this phase.

ii) Literature review

Journals, websites and book about related work were collected and put into a literature. The findings of the literatures help to gain more details about the technology and choose which suitable to use in the development.

iii) Methodologies and tools

Several software development methodologies were compared and choose the most suitable methodology for this project. The development tools such as the java platform eclipse SDK, MySQL, and PHP language were also determined in this phase.

iv) Design development and testing

Design development is the process that defines how the system should be look like, design part is harder than part to actually visualize, and what to put in the system to make more interaction and interesting to user. System architecture design is carried out in the beginning, design, development and testing of each module respectively. A useful and interesting application build with the design of Database, user interface design, functional design and user-friendly design. In this phase, mobile applications are also developed module by module during this phase. Test will be taken during each module is complete. After one module has been designed and complete, next module will be continued to develop and test. The module make changes will also affect the design of other connected module, therefore planning in design is very importance. The test plan will be generated in the unit testing together with user testing. Overall modular code is reviewed and tested; application is distributed to users for testing, and collecting feedback info.

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Verification testing Plan

Feature and function of Expenses Geo-Location Tracking System will be listed below for testing purpose. The actual output will be update during the system testing.

5.1.1 Add Text Entry Record

Input	Expected Output	Actual Output
Expenses detail -Input amount	-Focus on first column "Amount"	
-Input Description	-If input amount and description is not inserted, record will be store as "Unsuccessful Record".	
-Get current time		
-Get current date	-Let user to choose date if they wish to change date.	
-Get current location		

| | -System must be successfully insert record get from input amount and input description. | |

Input	Expected Output	Actual Output
- Open camera in application "Clicking" -Capture button function -Recapture button function -Cancel function Expenses detail -Insert amount -Insert description	-Camera should be able to open and capture picture. If user wants to recapture image, there is a button to let he/she recapture. -If user suddenly press back button, it should be cancel the camera function. -Prompt user insert; Expenses detail -Image capture and Expenses detail saved in android storage	

Input	Expected Output	Actual Output
-Input voice Expenses detail -Insert amount	-Microphone successfully on and able to record voice. -Stop Button must able to Stop	

Input	Expected Output	Actual Output
-Insert description	recording.	
	-Rerecord button must able to restart record.	
	-Prompt user insert; Expenses detail	
	-Voice clip and Expenses detail save in storage.	

5.1.4 QR-code Entry

Input	Expected Output	Actual Output
-QR-code Scan Expenses detail -Insert amount -Insert description	-Able to get QR-code URL for information and display the URL -Prompt user insert; Expenses detail -URL address and Expenses detail save in storage.	

5.1.5 Voice Recognition For Alternative Data Insert

Input	Expected Output	Actual Output
-Press the button of translate	-Translate button press, voice should be receive and translate to text. -The text is than save in description area.	

5.1.6 Google Places Autocomplete Insert		
Input	Expected Output	Actual Output
-Insert a one or more POI related word.	-Google places able to autocomplete POI address.	

5.1.7 Menu Button for URL		
Input	Expected Output	Actual Output
-Click on menu button when it enable.	-Menu button will only function when Google places autocomplete address inserted and there is menu available -Menu Button will change in color if menu is available on page. -Menu button able to call the browser to browser for specific URL without typing the URL.	

5.1.8 Bar Graph		
Input	Expected Output	Actual Output

Input	Expected Output	Actual Output
-No input required (Auto update)	-Bar chart graph show in main page to illustrate spending amount. -Bar graph should be show dynamically when data change.	

5.1.9 Show List of Record

Input	Expected Output	Actual Output
Retrieve data : -No input required	- Display all record of Expenses - Two choice for action *Delete *Edit	

5.2 Implementation Testing and Debugging

When the final stage of Geo-Location Expenses Tracking system deploy, the application is running a system testing in order to find out bugs and errors inside the system. The testing will be go through by verification testing plan as design before the system fully develop. The Testing results will be show below;

5.2.1 Add Text Entry Record

Input	Expected Output	Actual Output
<u>Expenses detail</u> -Input amount -Input Description -Get current time -Get current date -Get current location	-Focus on first column "Amount" -If input amount and description is not inserted, record will be store as "Unsuccessful Record". -Let user to choose date if they wish to change date. -System must be successfully insert record get from input amount and input description.	-On focus Amount. -Record is able to save with "Unsuccessful Record" if user not inserted value on amount or description. Remark: The application date is set to today's date, user are able to change date by clicking "Date". Problem: Location data not set, if there is no network or GPS signal.

5.2.2 Add Camera Entry

Input	Expected Output	Actual Output
- Open camera in application "Clicking" -Capture button function -Recapture button function -Cancel function <u>Expenses detail</u> -Insert amount -Insert description	-Camera should be able to open and capture picture. If user wants to recapture image, there is a button to let he/she recapture. -If user suddenly press back button, it should be cancel the camera function. -Prompt user insert;	-Able to capture the photo by camera lens and waiting input of amount and description of Expenses by user. -user can either fill up info or not. If fill up amount and description, the record is successful record. Problem: If camera not function well, it

	Expenses detail	fail to insert record.
	-Image capture and Expenses detail saved in android storage	

5.2.3 Add Audio Entry

Input	Expected Output	Actual Output
-Input voice Expenses detail -Insert amount -Insert description	-Microphone successfully on and able to record voice. -Stop Button must able to Stop recording. -Rerecord button must able to restart record. -Prompt user insert; Expenses detail -Voice clip and Expenses detail save in storage.	-Able to record voice using microphone. Able to start, stop the record. Successfully insert the record to database and storage.

5.2.4 QR-code Entry

Input	Expected Output	Actual Output
-QR-code Scan Expenses detail -Insert amount -Insert description	-Able to get QR-code URL for information and display the URL -Prompt user insert; Expenses detail	Able camera to get QR-code info and Save URL to record. Successfully insert record to database and storage.

	-URL address and Expenses detail save in storage.	

5.2.5 Voice Recognition For Alternative Data Insert

Input	Expected Output	Actual Output
-Press the button of translate	-Translate button press, voice should be receive and translate to text. -The text is than save in description area.	Successfully translate to text input from voice. Problem: When there is no connection to internet, function lost.

5.2.6 Google Places Autocomplete Insert

Input	Expected Output	Actual Output
-Insert a one or more POI related word.	-Google places able to autocomplete POI address.	Successful insert Google places autocomplete, it able to complete the full address from one or more word to search for POI address.

5.2.7 Menu Button for URL

Input	Expected Output	Actual Output
-Click on menu button when it enable.	-Menu button will only function when Google places autocomplete address inserted and there is menu available -Menu Button will change in color if menu is available on	Successful insert the menu button with function calling browser to specific URL. Problem: Menu need to create by admin, before it can use.

	page.	
	-Menu button able to call the browser to browser for specific URL without typing the URL.	Need *Provide URL when google places inserted.

5.2.8 Bar Graph

Input	Expected Output	Actual Output
-No input required (Auto update)	-Bar chart graph show in main page to illustrate spending amount. -Bar graph should be show dynamically when data change.	Successful inserted bar graph. Problem: Not showing total amount when there is "Uncompleted Entry".

5.2.9 Show List of Record

Input	Expected Output	Actual Output
Retrieve data : -No input required	- Display all record of Expenses - Two choice for action *Delete *Edit	-User either long press the record to update or delete record. -Click to view and update or delete record.

6.0 CONCLUSION

6.1 Project overview

In conclusion, the project of "Expenses with Geo-Location Tracking" will be one of the useful applications that manage to help user to save time by tracking their income and expenses go around. With this application, user can create more wealth compare to not a user using this kind of application product. It work just perfect in sense of input, have multi type of input, and therefore won't affect longer time using on this application. Besides that, user able to allocates their money to useful interesting places, rather than unconsciously over spend their money.

This project is categorized into two parts which are a client side application and admin as a server backup to maintain powerful menu update. Android native application acts as the client side and PHP are used to develop the backend server. Google Places API plays an importance rule to access the wealth information.

6.2 Objective Achieved

The Geo-Location Expenses application had achieved the 5 main objectives that stated earlier, which is allow user to keep track current location address when user store a Expenses record to the application. The second objective archive is allowing user to get the view to the menu and make selection inside the menu. After making selection, user is able to retrieve back what he/she has submitted previously. The Geo location is archive also the

simplification of data collection in Expenses by using autocomplete data generated by the application, for example time, date and location of user. The fourth is, meeting the wide range of requirement, while user are in walking or driving, they can replay text with voice command, or voice input. The last object archive is able multiple input for the expenses system.

6.3 Future Improvements

In the future, there are few ideas for this project, can be enhanced;

1. The camera input can include in image processing method, therefore the receipt that take by the camera can be converted into text and auto generate total amount and description for the expanses record.
2. Able to include a payment method to this existing expenses system. For example, once a PayPal payment made, the record will automatically inserted to Geo-Location Expanses application.
3. The expanses application may also adding in new notification for promotion purpose, this will be filter by user location expanses spend, his/her favorite restaurant having promotion, the application can have a new feed prompt.
4. The Geo-Location Expenses may also come with storage backup plan. For example, user data can be hosted to cloud storage/drive to avoid data lost.
5. In term of security design for future, Geo-Location Expenses system may implement a login authentication such as Facebook login; this function may bring more security confidence to user.

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Appendix A: POSTER