SMART FAMILY TRACKING SYSTEM USING GLOBAL POSITIONING SYSTEM (GPS)

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DECLARATION

I declared that this report entitled Smart Family Tracking System using Global Positioning System is predicated on my original work apart from the quotations, citations, and references. I also declared that it's not been previously submitted for the other bachelor program in UniSZA or other institutions. I understand that the plagiarism constitutes a breach of university regulations and can be addressed accordingly.

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The research conducted and the writing of this report was under my supervision

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ABSTRACT

Smart Family Tracking System using Global Positioning System (GPS), is an application that can track and monitor the child's location. Child monitoring always comes to a problem for those parents who are busy and have a lack of time to monitor their child. The parent will get a problem in knowing where their child going or leaving during their working hours. However, with the Smart Family tracking system the parent can track and monitor their child's location in just a simple application when the child is not with them. Thus, the project aims to create a system to allow the parents to keep track of their children when they are out of their view. A study of the existing systems has been made to study the existing problem of the system and through the study, there are a few limitations of the existing system that need to be enhanced to improve the user experience, for example, no limitation on the number of geofence creation.

ABSTRAK

Smart Family Tracking System Using Global Positioning System (GPS) adalah aplikasi yang boleh mengesan dan memantau lokasi kanak-kanak. Pemantauan kanak-kanak selalu menjadi masalah bagi ibu bapa yang sibuk dan tidak mempunyai masa untuk memantau anak mereka. Ibu bapa sukar untuk mengetahui di mana anak mereka pergi atau meninggalkan semasa jam kerja mereka. Walau bagaimanapun, dengan Smart Family Tracking System, ibu bapa boleh mengesan dan memantau lokasi anak mereka hanya dengan menggunakan telefon pintar apabila anak tidak bersama mereka. Oleh itu, matlamat projek ini adalah untuk mewujudkan satu sistem untuk membolehkan ibu bapa menjejaki anak mereka apabila mereka berada di luar pandangan mereka. Satu kajian mengenai sistem yang sedia ada telah dibuat untuk mengkaji masalah sistem yang sedia ada dan melalui kajian ini, terdapat beberapa batasan sistem yang sedia ada yang perlu dipertingkatkan untuk meningkatkan pengalaman pengguna, contohnya, tiada had pada nombor penciptaan geofensi.

TABLE OF CONTENTS

PAGES

CHAPTER   **PAGES**

LIST OF TABLES

LIST OF DIAGRAMS

CHAPTER 1

INTRODUCTION

1.1   Background

Parents nowadays are too busy with their smartphones which may cause them to overlook their child for a few seconds or even minute that may place their child in the risk of going missing in just a few seconds of out of sight. There is a need for a solution for the parent to keep track of their child's location when the child is not beside them and get alerted when their child reaches or leaves a certain destination. Smart Family Tracking System using Global Positioning System (GPS) is an application for tracking the family movement via smartphone in real-time. Child nowadays is easier influenced by their friends, and they might even get cheated or kidnapped by any of the strangers. On 20th August 2007 the entire nation was hit with the grim news of Nurin Jazlin's disappearance. While the police tirelessly searched for Nurin, the media was working diligently to keep the people updated with the latest developments of the case. Nevertheless, up until today, the vile person who caused unspeakable harm to the little girl has yet to be caught. The eight years old girl who studied at Sekolah Kebangsaan Setapak was reported missing after she went to a night market near her house in Section 1, Wangsa Maju to buy her favorite hair clip. She

was found dead in a sports bag after a month of the investigation by police. To minimize this tragedy from happening again, the preliminary action needs to be taken to deal with the problem. With the help of Global Positioning System (GPS) and Google Maps, we can track the movement of family members on the map with all the locations visited and the route is taken. To prevent the case of missing children, especially in Malaysia, this system will help the parent to track their family member. The existing systems offer the features in which the parents can track their child in real-time and the alarm triggering feature which will trigger the alarm when counter with a specific event. However, according to the observation, the child tracking system still hasn't got the concerns of Malaysians. The limited number of choices, price, a feature provided and the limited supported country is the main issues which cause the system is not popular in Malaysia. This system is proposed to solve the above by implementing the feature and design that will meet with the collected requirements from the parent in Malaysia.

1.2   Problem Statement

Childs missing issue has caused many concerns worldwide after the murder of Nurin Jazlin in 2007. Parents nowadays are too busy with their smartphones which may cause them to overlook their child for a few seconds or even minute that may place their child at the risk of going missing in just a few seconds of out of sight. The parent is hard to keep a watch on their child without the use of technology, especially when the child is not with them. There is a need for a solution for the parent to keep track of their child's location when the child is not beside them and get alerted when their child reaches or leaves a certain destination. The main problem involves in Family

2

Tracking System is to help the parents to keep track of their family members. It is also to prevent and reduce the child missing case in Malaysia, since, the numbers of kidnapping cases and missing teenagers in this country still in worries.

1.3   Objectives

The objective of the Family Tracking System is to design the tracking system using GPS to prevents child missing cases. Then, develop the application that has feature that able to assist the parent to monitor the child. Lastly, the system implements the application that able to help the user to track their children location more efficient and reliable using geo fencing.

1.4   Scope

1.4.1   User Scope

- Parents
    - Parents need to register account before using the system
    - Parents need to submit their child detail to setting the application
    - Add child for parents that have more than one child
    - Monitor child movement

1.4.2   System Scope

- System

    - Mobile based application (Android OS)

    - Real-time tracker

1.4.3   Device Scope

- Device

    - Only support android phone and not support Apple product

1.5   Limitation of work

The system does not operate on an IOS device. This is because there is a limited freely accessible library and creating an IOS app required the user with the IOS account which was controversial with the Android platform that was open source and is free access to the content. It also does not have a web view. This system does not include indoor positioning solutions where it uses to locate the child indoor. This system also required an active connection of internet and need to operate on an active phone.

1.6   Expected Outcome

The expected outcome of this system is it can track child and family members with a smartphone via GPS. Then, it is also can notify and trigger the alarm on the smartphone if the family members reach or leaves a certain destination.

1.7   Summary

In this chapter, the objective of this project is to design family tracking system using GPS to prevent the child missing cases. Moreover, this project will display a more significant information that wishes to see by the Malaysian parent during tracking.

CHAPTER 2

Literature Review

2.1   Introduction

Smart Family Tracking System using Global Positioning System (GPS) is an application for tracking the family movement via smartphone in real-time. The tracking system has been used worldwide in the market, either for commercial or personal usage. Waze, the world's largest community-based traffic and navigation app even announced that it reached 50 million users globally with Malaysia and Indonesia in the top 10 lists. Recently, to cope with the missing case that is happening on the kids, pets or even on the senior citizens, the personal GPS tracker has also existed in the marketplace.

2.2   Location Tracking Technologies

Location tracking technology has been used to track the location of the object since the creation of GPS. However, GPS cannot fulfill the needs of some of the countries. For example, Russia and China. Each of the countries has developed its navigation system to provide more accurate location tracking for them such as the GPS navigation system in the US, while GLONASS in Russia, Galileo navigation system in Europe, BeiDou navigation system in China and IRNSS in India. According to the European Space Agency, there is a need for them to develop its own global satellite navigation system, which is called Galileo, to provide an alternative locating technology other than GPS or GLONASS satellites in case the signal is turned off or degraded in future which is uncontrolled by them.

2.2.1   Global Positioning System (GPS)

The Global Positioning System (GPS) is a satellite-based navigation system that was developed by the U.S. Department of Defense. It made up of a network of 32 satellites that are flying 20350KM above the earth's surface which transmitting microwave signals via medium earth orbit satellite constellation, allowing GPS receiver to identify its velocity, position and time. To provide continuous, worldwide coverage, each satellite circles the planet twice a day in one of six orbits. There are two low power radio signals transmitted by the GPS satellites, designated L1 and L2 with the L1 frequency being used by the worldwide civilian users carrying the frequency of 1575.42 MHz in the UHF band. There are 3 different bits of information carried by the GPS signal,

that is pseudorandom code, ephemeris data and almanac data. The pseudorandom code is an I.D code that distinguishes which satellite is transmitting data. The ephemeris data is transmitted by each satellite constantly and is used for determining a position. The almanac data tells the location of each GPS satellite ought to be at any time throughout the day to the GPS receiver. When the GPS device receives the radio signals, the exact time of arrival will be noted and is used to calculate its distance from each satellite in view. To calculate the 2-D position (latitude and longitude), the signal of at least 3 satellites must be locked on by the GPS receiver. However, to determine the user's 3-D position, four or more satellites must be used. The figure below shows how GPS works
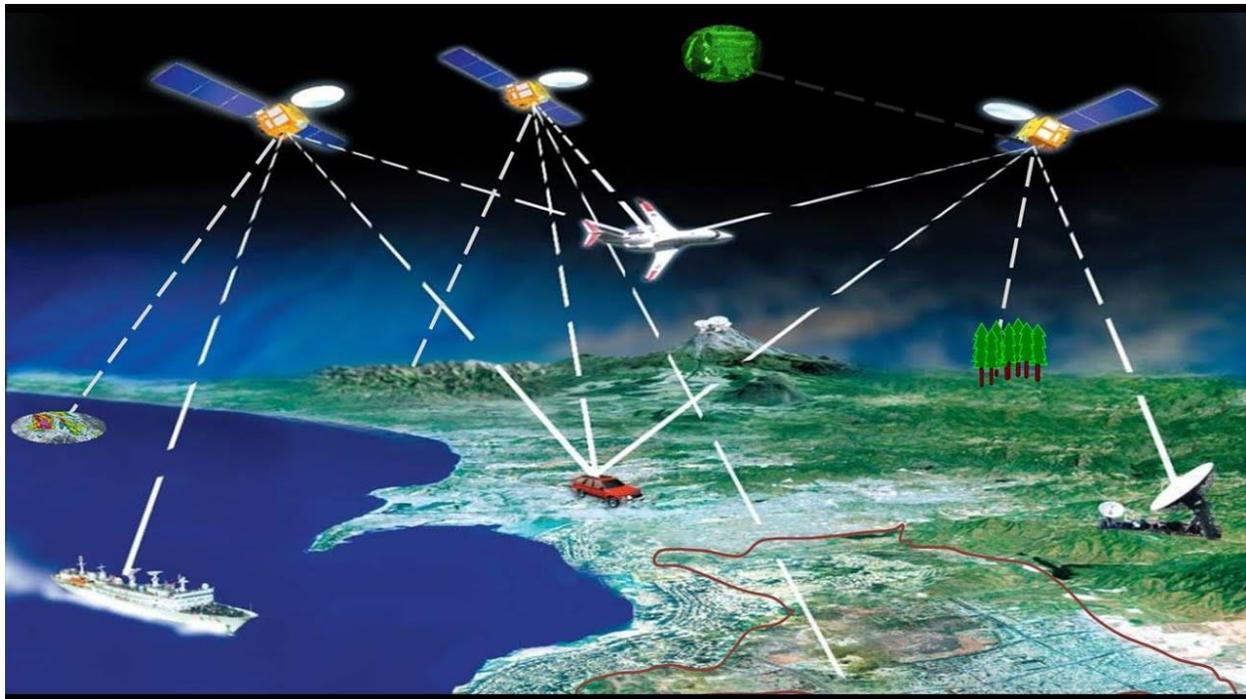
Figure 2.1 How The GPS work

However, the UHF band signals that are transmitted by GPS satellites cannot pass through the most solid object or exterior walls such as buildings and mountains, the problem or poor signal condition will occur in the urban areas. Besides, the signals can also be weakened by tree canopy or meteorological conditions. Satellite signal fracture is a problem that will be occurred when the standalone GPS navigators can't fix a position in the poor satellite conditions and must wait until a better satellite reception occurs to provide the correct location.

2.2.2   A-GPS

A-GPS, the abbreviation for Assisted-GPS is a system that is used to improve the startup performance of a GPS, called time-to-first-fix (TTFF) by acquires and stores satellites location information via the cellular network. With the U.S. Federal Communication Commission's 911 requirement to make cell phone location data available to emergency call dispatchers, A-GPS has been widely used in the GPS capable cellular phones. Besides, it also uses the cell tower data to enhance the quality and precision of the GPS when the GPS receiver is in poor satellite signal condition by using the proximity to cellular towers to calculate the position. However, it required an internet connection to an Internet Service Provider (ISP) for it to work with. Thus, the combination of GPS and A-GPS will improve the accuracy of the position by using both the GPS satellite system and the A-GPS through the cellular network to get the location. The system should have both technologies to result in satisfactory location accuracy.

2.2.3 GLONASS

Global Navigation Satellite System (GLONASS) is a satellite-based navigation system developed in Russia and started by the Soviet Union in 1976. It is the second alternative navigational system after GPS and achieved global coverage in the year 2011. The satellite is placed in a middle circular orbit, inclined with a degree of 64.8 at 19,100 kilometers altitude and a period of 11 hours and 15 minutes. GLONASS is suitable for the place where getting a GPS signal is very problematic, especially in high latitudes (north and south). GLONASS uses the FDMA (Frequency Division Multiple Access Method) channel access method to communicate with satellites. To allow compatible with GPS satellites, GLONASS has used CDMA (Code Division Multiple Access techniques) since 2008.

2.3   Geo-Fence

A geo-fence also is known as geo zone, a virtual perimeter for a real-world geographic area that uses the global positioning system (GPS). A geo-fence might be dynamically generated as during a radius around a store or point location, or a geo-fence are often a predefined set of boundaries. For geofencing to work correctly, usually an application will need to have an integrated SDK or plugin. The use of a geo-fence is named geo-fencing, and one example of usage involves a location-aware device of a location-based service (LBS) user entering or exiting a geo-fence. This info, which could contain the situation of the device, might be sent to a mobile telephone or an email account. Geo-fencing also combines awareness of the user's current location with awareness of the user's proximity to locations that may be of interest. To mark a location of

interest, we may specify its latitude and longitude. To adjust the proximity for the situation, add a radius. The latitude, longitude, and radius define a geo-fence, creating a circular area, or fence, round the location of interest. While geofencing has historically relied on cellular data, modern geo-fencing combines has moved to use GPS and Wi-fi data more. This allows users to opt-in for things like location services and can receive push notifications to keep updated. By contrast, passive geo-fencing works within the background and consumes little or no power, but it gives fewer data about the customer and gives fewer opportunities to reach out to customers and gather data. Geo-fencing used widely in daily life like in other countries such as used in applications with location firearms can allow those firearms to fire only in locations where firing is permitted and used in the human resource department to monitor employees working in special locations especially those doing field works. Using a geofencing tool, an employee is allowed to log his attendance employing a GPS-enabled device when within a delegated perimeter. Geo-fencing, during a security strategy model, provides security to wireless local area networks. The office space becomes a licensed location for designated users and wireless mobile devices

2.4   Comparison between existing system

There have been different kinds of tracking system implemented in most of the country. Table 2.3 shows the different features provided by the 3 different GPS tracker system. Each of them comes with their own feature. Nevertheless, among the 3 systems, there are few similarities in their features.

Feature Similarities			
- Location information in real time - Create geo-fences - Route history - Push notification - Emergency button			
Differences			
Application	Positioning Technique	Feature	Price
Glympse	GPS	- User profile management - ETA and predicted routes - Location sharing	Free (Android and IOS)

Life360	GPS	• Crash detection • Chatting with family members • Group monitoring • Speed alert	Free (Android and IOS)
Spyzie	GPS	• Monitor calls and contact • Blocks application in smartphone • Group monitoring	In app purchases for premium features

Table 2.1 Comparison of the existing system

2.5   Summary

From this chapter, the main function and tools needed of the project had been explained such as the Global Positioning System, A-GPS, GLONASS and Geo Fencing technique on how it can be used and enhance the application. Moreover, some of the analysis from related work also is used to develop this project thus give a clear picture of more compatible to mobile phone and suitable new application in this era to counter child missing problems.

CHAPTER 3

Methodology

3.1   Introduction

This chapter will explain the methodology used to develop this system. In this chapter, it will explain more detail about every phase in the iterative and incremental method that involves this project development. It also explains more about system functioning, the method that is used to build this system, the design of the database and the interface of the system. The method that is used to build this system are, use case diagram, class diagram, data flow diagram, and ERD diagram respectively.

3.2 Project Methodology

SDLC defines the task to be performed at each step in the software development process which will make sure our work is planned, organized and following the schedule. Figure 3.1 shows the stage involved in the SDLC. The methodology that is used to develop this system is the Iterative and Incremental model. This is because the incremental prototyping model is the best suit for the project with time and cost constraints. Besides, the functionality of the system can be subdivided into the module with each module to be developed assigned on each iteration. There are 5 phases in this methodology, planning, analysis and design, implementation, testing, and evaluation.
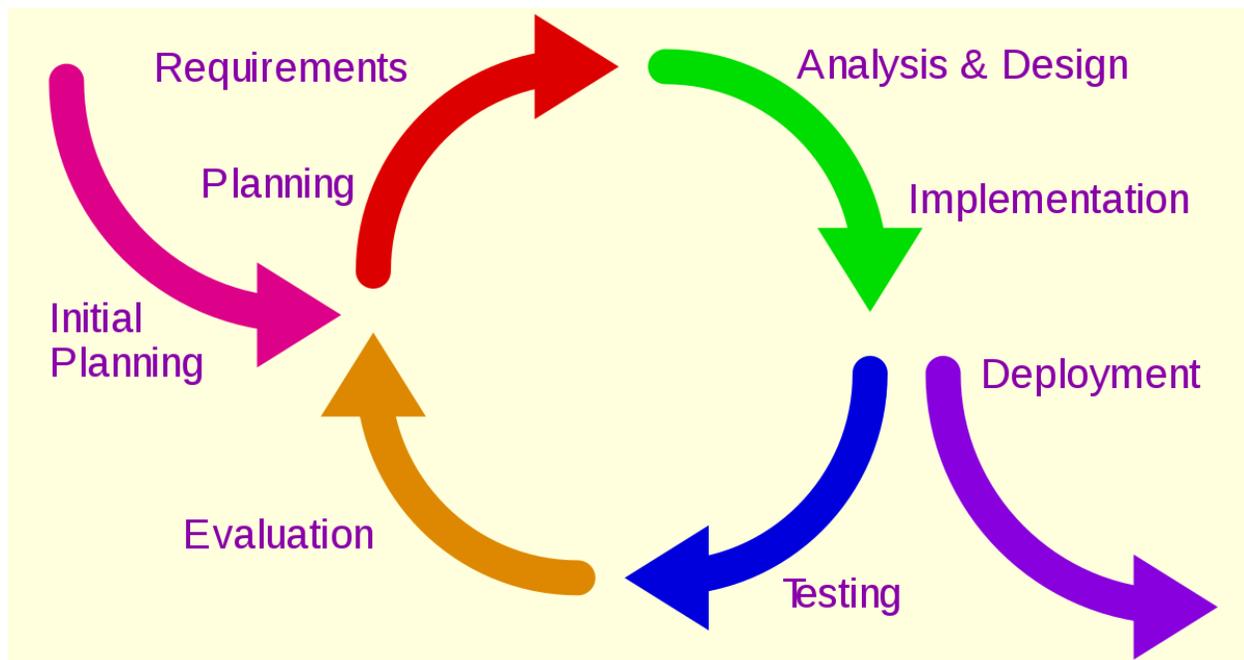
Figure 3.1 Iterative Development Model

The requirement to develop this system is identified. Planning is an essential part to make sure the success of the IT project as the tasks of the project is pre-planned and scheduled as well as planning for the strategies to implement the project. The schedule to develop the system is set into the Gantt chart below:

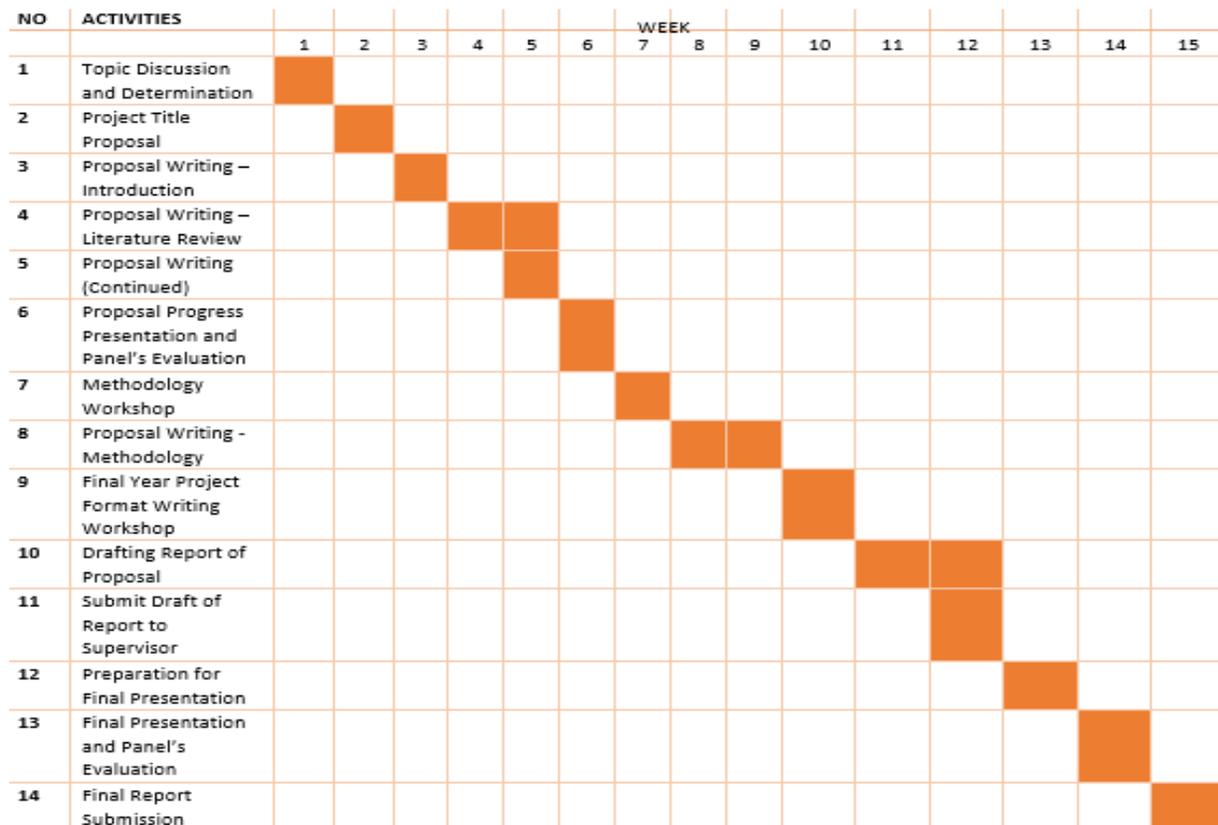| NO	ACTIVITIES	WEEK														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Topic Discussion and Determination	■														
2	Project Title Proposal		■													
3	Proposal Writing – Introduction			■												
4	Proposal Writing – Literature Review				■	■										
5	Proposal Writing (Continued)					■										
6	Proposal Progress Presentation and Panel's Evaluation						■									
7	Methodology Workshop							■								
8	Proposal Writing - Methodology								■	■						
9	Final Year Project Format Writing Workshop										■					
10	Drafting Report of Proposal											■	■			
11	Submit Draft of Report to Supervisor												■			
12	Preparation for Final Presentation													■		
13	Final Presentation and Panel's Evaluation														■	
14	Final Report Submission															■

Figure 3.2 Gantt Chart

3.2.2 Analysis and Design

In this phase, the detail study of requirement for the system such as survey from users, journals, internet and other are conducted. The requirement of software, hardware and development tools is also determined. Besides, the data design for this system is also designed and the design of Graphical User Interface (GUI) started. The design for entire module in this system will be designed in this phase. The system will move to the development phase if the GUI is fulfilled with the system requirements.

3.2.3 Implementation and Deployment

In this phase, the design is translated to coding. To develop this system, the server that has been used is Wamp server. The database is also designed in MySQL. Computer program are written using a conventional programming language or an application server. The development phase of the project will be run in iteration where each iteration will involve the creation of the new module with different features allocate to different module. During the development, the important module that is critical to the system, the module that have most demand from the parent will be seek as high priority, for example detect the user current location and create geo-fence will be developed first. After the of the module have been developed completely, the combination of the module will be carry out at the last increment to create a complete system.

3.2.4 Testing

During this phase the developed system is tested. The testing phase of each iteration involve the conduction of unit testing and user interface testing where unit testing will be conducted testing of single functionality in the module and user interface testing involve the testing for the presence of the defect in the user interface of the system. It need to be tested in order to detect errors and to make sure the function is working according to the user requirement. The system is also being demonstrated to the user.

3.2.5 Evaluation

In this phase, it will be based on the customer feedback from the testing phase. Feedback and the result from the testing phase are being evaluated. The error and bugs are detected, then the modifications are made accordingly. There might be some feature that is removed from the early planning phase.

3.3   Software and Hardware Requirement

The requirement of hardware and software are the most crucial part in order to develop a successful system. These are the details of the requirements of Smart Family Tracking System:

3.3.1   Software Requirement

In this section, the description of the software system to be developed which is the system functional and non-functional requirement is being analyzed.

I.   Functional Requirement

- The system should be able to let the user to make registration, login and edit account.

- The system should be able to detect the current location of the tracker.

- The system should be able to let the user to create multiple geo-fence to monitor another user together with monitoring period.

- The system should be able to guide the parent to child direction.

- The app should be able to provide two-ways communication for the parent to communicate with their child as needed.

- The app should be able to trigger an alert whenever the tracker is entering or

leaving the set geo-fence.

- The app should be able to trace the history of the route went through by the

  tracker

II. Non-Functional Requirements

- The location of the tracker should be retrieving in less than 10 second at

  outdoor in a stable GPS and network connection.

- The alert should be trigger with the maximum allowed delay of not more than

  5s.

- The system should be able to cope with minimum 50 user connection.

3.3.2 Development Tools

The development tools requirement to create the project is discussed in this section.

1. **Android Studio**

Android Studio is an IDE created officially by IntelliJ IDEA for Android app development. Android studio is freely available under the Apache License 2.0. It comes with the variety of features which will enhance the productivity when building an Android app such as the most astonishing one is their flexible Gradle-based build system where the Android developer can simply use the declarative Domain-Specific Language (DSL) to configure Gradle builds which was widely support on Android devices and App stores. Besides, it also come with lint tool which is a static code analysis tools to check for the potential bugs in the project as well as providing optimization improvements for performance, usability, security and some other improvement.

2. **Notepad++**

Notepad++ is a text-editor and even a source code editor for the Microsoft Windows. According to the Stack Overflow survey in 2015, it is voted as the most common used text-editor in the worldwide (Stack Overflow, 2016). It supports code folding and syntax highlighting for

many of the programming, scripting and markup languages which make it the popular source code editors in the world.

3. Git

Git is the distributed version control system for software development. It is free and open source, released under the GNU General Public License version 2.0. Unlike the other system, it comes with the branching model and the staging area where the branching model come with the ability to create multiple local branches and staging area allowed the commits to be formatted and reviewed before send to the server. It is even small and fast as compared to SVN.

4. Wamp Server MySQL

WampServer is a Windows web development environment to create the web application with Apache2, MySQL database and PHP. It allows easily manage of database via PhpMyAdmin.

3.3.3 Hardware Requirement

Hardware requirement for this project are:

i) Asus Laptop

- Processor Intel Core i5-7200U @ 3.1GHz

- Memory (RAM): 4.00 GB

- System type: 64-bit Operating System

ii) Xiaomi Pocophone F1

- Qualcomm SDM845 Snapdragon 845 (10 nm)

- Octa-core (4x2.8 GHz Kryo 385 Gold & 4x1.8 GHz Kryo 385 Silver)

- Memory 64GB 6GB RAM

3.4   Use Case

The use case diagram depicts the interaction between the child and the parent to the system is shown in the Figure 3.3. There are 9 use cases and 2 extended use cases in the diagram. The description of each of the use case is provided in the sub-section.
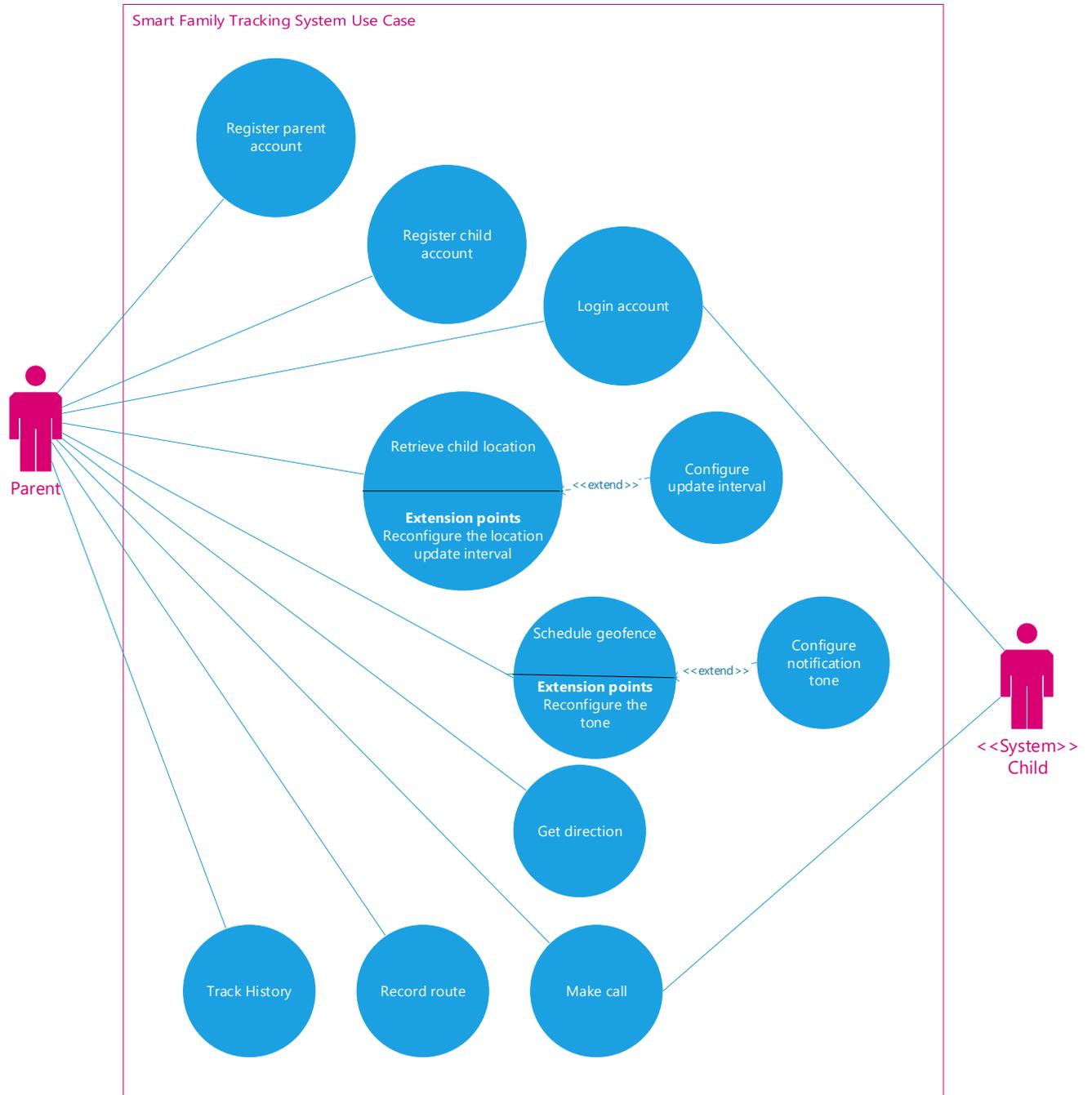
Figure 3.3 Use Case Diagram

3.4.1 Use Case Specification

In this section, the description of each of the use case is being done. The description is focusing on describing each of the use case to have a better understanding of the objective, flow and constraint of each of the use case.

Table 3.1 Register Parent Account Use Case Description

Use Case Identification and History			
Use Case ID	1		
Use Case Name	Register parent account	**Version No.**	0.1
End Objective	Enable the parent to register their own account for using the application		
User/Actor	Parent		
Trigger	Parent want to use the application for the first time		

Basic Flow		
Step	**User Actions**	**System Actions**
1	The parent enter username, email, phone number and password	The system check if the user has register in the system or not.
2	The parents will be redirect to the login activity to proceed to login	

Exception Flow		
1	The parent enters the username and email that already exist in the database records. (Basic Flow-step 1)	The system will show the invalid message and asks to retry the details. The basic flow resumes at Step 1.

Table 3.2 Login Account Use Case Description

Use Case Identification and History			
Use Case ID	2		
Use Case Name	Login account	**Version No.**	0.1
End Objective	Authenticate the user before using the application		
User/Actor	Parent & Child		
Trigger	Parent or child registered and want to login to use the application		

Preconditions
The parent or child need to have a registered login credentials before can login.

Basic Flow		
Step	**User Actions**	**System Actions**
1	The parent enters username and password	The system checks the parent's records in database to authenticate the parents.

2	The parent logs in into the system.	

Exception Flow		
1	The user enters the wrong username or password. (Basic Flow, Step1).	The system will show the invalid message and asks to retry the details. The basic flow resumes at Step 1 if login as parent.

Post conditions
The system will enter to the main activity of user's login and when it completed, most of the required task can start to perform.

Table 3.3 Register Child Account Use Case Description

Use Case Identification and History			
Use Case ID	3		
Use Case Name	Register child account	**Version No.**	0.1
End Objective	To enable the parent, register the account for the child to monitor and track the child.		
User/Actor	Parent		
Trigger	Parent want to register the account in order to be used on child's phone to track the child.		

Preconditions
The parent already registered and logon to their account.

Basic Flow		
Step	**User Actions**	**System Actions**
1	The parent key in the details of the child such as name, password, and telephone number.	The system will check for the record in the database.
2	The parent will be redirect to the main activity.	

Exception Flow		
1	The user entered the username that are existing in the database records. (Basic Flow, Step 1)	The system will show the invalid message and asks to retry the details. The basic flow resumes at Step 1.

Table 3.4 Retrieve Child Location Use Case Description

Use Case Identification and History			
Use Case ID	4		
Use Case Name	Retrieve child location	**Version No.**	0.1
End Objective	Get the latest child location		
User/Actor	Parent		

Trigger	Parent enter the map view and click the child's name listed in the map view.

Preconditions

1. Child must log on to the application and connected.

2. The parents must enter the map view

Basic Flow

Step	User Actions	System Actions
1	The parent enters the map view	The system request to the server to check whether the child is connected and the child device status
2		The system will send the location of their child along with the location info and their device status.

Exception Flow

1	The parents search for their child and their child is not connected.	The system will display an error message that their child is not connected.

Table 3.5 Schedule Geofence Use Case Description

Use Case Identification and History			
Use Case ID	5		
Use Case Name	Schedule Geofence	**Version No.**	0.1
End Objective	Monitor the certain areas and get notified when the child reaches that area		
User/Actor	Parent		
Trigger	Parent want to know the area of child has go to make sure child's safety		

Preconditions
1. Child must log on to the application and connected.

Basic Flow		
Step	**User Actions**	**System Actions**
1	The parent selects the area that they want to monitor, the radius of area, the type of area that they concern.	The system sends selected details to server
		The server will send the details to child and request the system from the child side to set the geofence.

2		When the geofence is triggered, the system will send the notification to the parents

Post conditions

1. The geofence will continue to listen to the next trigger except the duration has reached.

Extension Points

Configure Notification Tone

Step	User Actions	System Actions
1	The parent goes to application setting and set for the notification tone	The system saves the selected tone
2		The system sounds the selected tone when the geofence is reached.

Special Requirements

1. The geofence cannot be created at the same area.

Table 3.6 Get Direction Use Case Description

Use Case Identification and History			
Use Case ID	6		
Use Case Name	Get Direction	**Version No.**	0.1
End Objective	Get the direction of child's location		
User/Actor	Parent		
Trigger	Parent want to go to location of their child when something happens		

Basic Flow		
Step	**User Actions**	**System Actions**
1	The parent clicks the marker on the map of their child location	The system will show a direction icon
2	The parent clicks on the direction icon	The system will be directed to the google map direction
3		The google map get the child location and calculated the route to the child location
4		The google map display the direction to child's location

Table 3.7 Make Call Use Case Description

Use Case Identification and History			
Use Case ID	7		
Use Case Name	Make call	Version No.	0.1
End Objective	Contact each other		
User/Actor	Parent and child		
Trigger	Parent or child want to contact each other if there is emergency		

Preconditions
1. The parents need to register their contact number and their child contact number

Basic Flow		
Step	User Actions	System Actions
1	The parent clicks on the call button	The system search on the server for the contact number.
2		The system makes a connection with the received contact number and dialing to that number

Table 3.8 Record Route Use Case Description

Use Case Identification and History			
Use Case ID	8		
Use Case Name	Record Route	**Version No.**	0.1
End Objective	Record route traveled by the child		
User/Actor	Parent		
Trigger	Parent want to know the route record the child travelled during that interval		

Preconditions
1. The parents need to choose which child routes record

Basic Flow		
Step	**User Actions**	**System Actions**
1	The parent clicks on the routes record button	The system asked for the duration of the routes record.
2	The parents select the desired duration	The system sends to the server and wait for send to the system
3		When the interval reached, the system will stop recording for location and send the list of recorded routes to the server.

4	The parent will be notified about the end of location recording.	

Table 3.9 View Track History Use Case Description

Use Case Identification and History			
Use Case ID	9		
Use Case Name	View Track History	**Version No.**	0.1
End Objective	View the recorded routes travelled by child		
User/Actor	Parent		
Trigger	Parent want to view the recorded routes travelled by child		

Preconditions
1. The parents need to trigger the record routes function first in order to see recorded routes

Basic Flow		
Step	**User Actions**	**System Actions**
1	The parent clicks on the recorded routes	The system will select the routes and send to the server
2		The server search for the recorded routes to the system and display them.

3		The system will display the child start and end point of the location together with the route travelled in interval.

3.5   Class Diagram

The class diagram consists 7 classes which is User class, Parent class, Child class, LocationItem class, SettingItem class, GeofenceItem class and CircleItem class. The User class will be inherited by Parent class and Child class as they both are the user using the device. The Parent class and Child class will both using LocationItem class in which Parent depends on the LocationItem class to get the location history of their child. The Child class is using the LocationItem class to record their current location . Besides, the Parent class will also use the GeofenceItem class to set the geofence to monitor the child and the GeofenceItem class is then passing the geofence information set by the parent to the Child app by using the Child class to add that information into Geofence API called from the Child app. The CircleItem class is the composition of GeofenceItem class in which whenever the geofence is created, a circle will be draw on the map of the parent app via the CircleItem class and whenever the GeofenceItem class is removed, and so is it for CircleItem class. The SettingItem class will be the aggregation of LocationItem class and GeofenceItem class in which SettingItem class is responsible to set location update interval for the LocationItem class or set the notification tone for the GeofenceItem class whenever the value modified by the parent.

User

-id : int
-Regid : String
-name : String
-password : String
-androidid : String
-TelephoneNo : String

+User()
+login(name : String, password : String) : void

Child

-connected : int
-location list : ArrayList<Location>

+Child()
+getConnection() : int
+addNewDetectedLocationToList(location : LocationItem) : ArrayList<LocationItem>
+register(username : String,password : String,telNo : String) : void

LocationItem

-longitude : double
-latitude : double
-date : Date
-fileName : String
-setting : SettingItem

+addLocationUpdateInterval(setting : SettingItem) : void

Parent

-email : String

+Parent()
+Parent(id : int,name : String,email : String,password : String,telNo : String)
+scheduleGeofence(Geofence : GeofenceItem)
+getChildTraverseHistory(locationItem : LocationItem) : LatLng
+register(regToken : String ,username : String,password : String,email : String,telNo : String,androidid : String) : void

SettingItem

-title : String
-locationUpdateInterval : String
-notificationTone : String

-setLocationUpdateInterval(locationUpdateInterval : String)
-setNotificationTone(notificationTone : String)

GeofenceItem

-id : String
-latitude : double
-longitude : double
-expirationDuration : long
-transitionType : int
-radius : float
-child : Child
-setting : SettingItem
-circle : CircleItem

+toGeofence() : Geofence
+setGeofenceTriggered(child : Child,triggeringGeofenceId : String) : void
+addNotificationTone(setting : SettingItem) : void
+GeofenceItem(circleItem : CircleItem,expirationDuration : long)

CircleItem

-id : String
-selectedCategory : String
-radius : double
-latitude : double
-longitude : double
-fillColor : int
-strokeColor : int

+CircleItem(id : String,selectedCategory : String,latitude : double,longitude : double,radius : double,fillColor : int,strokeColor : int)

Figure 3.4 Class Diagram

3.6 ERD Diagram

The ERD diagram that consist of 3 tables, which is Parent, Child and Geofence table is shown in Figure 3.5. The relationship between parent object and child object is One to Many relationships as the parent can have more than one child. The same rule is applying to the relationship between parent object and geofence object as the parent can create more than one geofence to keep track of the child. The child object and geofence object both have the parent name as the foreign key to identify which parent created the particular tuple in that table.
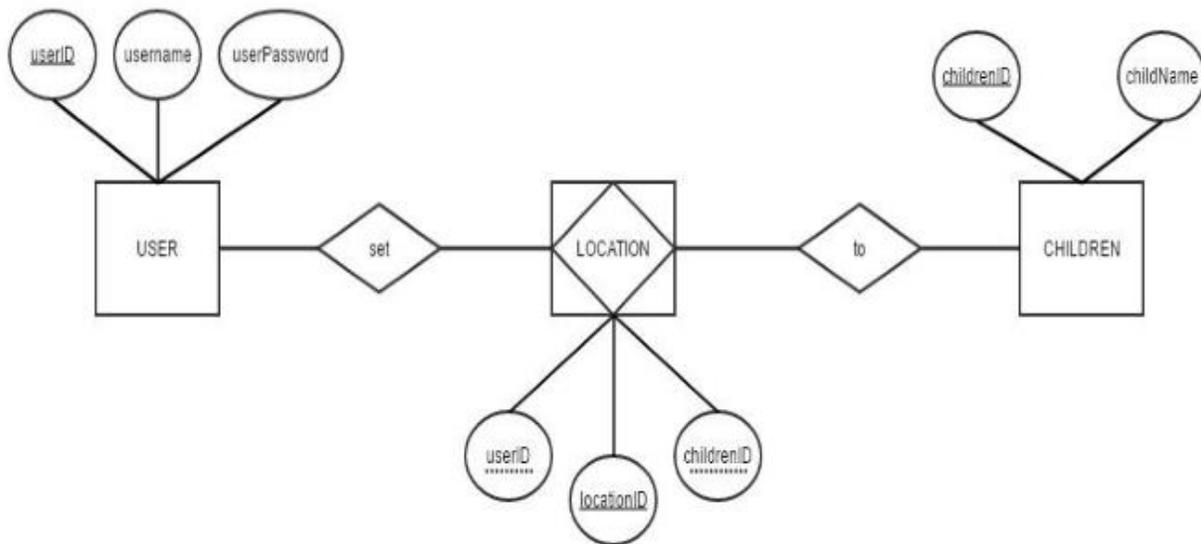
Figure 3.5 Entity relationship Diagram

3.7   Data Dictionary

This section will explain about the data dictionary for the kid tracker database. Table 3.10 will describe about the parent table; Table 3.11 will describe about the child table and Table 3.12 will describe about the geofence table.

Table 3.10 Parent Table

| Attribute	Description	Type	Remark	Size
parentID	Parent identification	Varchar	Primary Key	12
username	Parent name	Varchar	NN	50
userPassword	Parent password	Varchar	NN	10

Table 3.11 Child Table

Attribute	Description	Type	Remark	Size
childID	Children identification	Varchar	Primary Key	12
childName	Children name	Varchar	NN	50

Table 3.12 Location Table

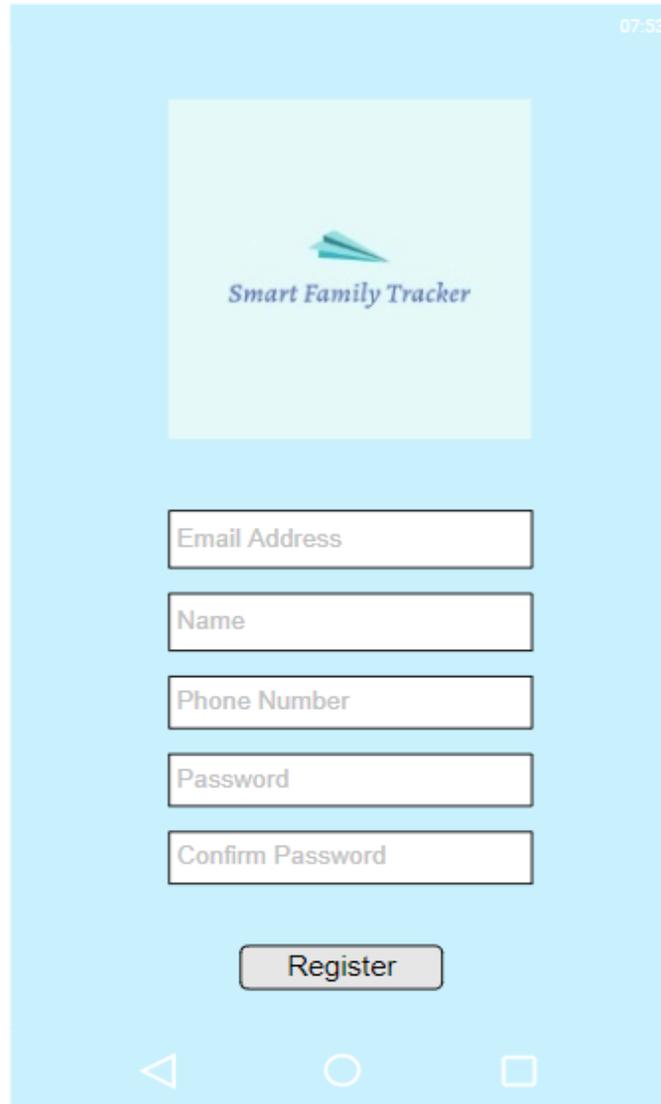| Attribute	Description	Type	Remark	Size
locationID	Location identification	Varchar	Primary Key	12
childID	Children name	Varchar	Foreign Key	50
parentID	Parent identification	Varchar	Foreign Key	12

3.8   Framework
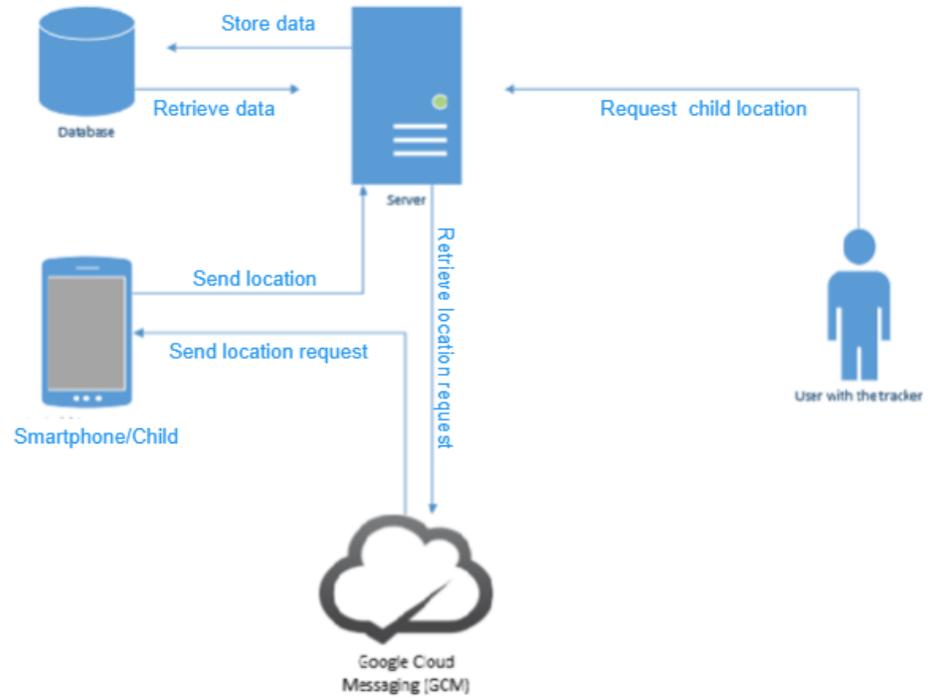
Figure 3.6 Framework of the system

3.9   Interface Design

Figure 3.7 Main View Interface

Figure 3.8 Register Activity Interface

3.9 Login Interface

3.10   Chapter Summary

This chapter is basically discussed on the methodology and tools such as hardware and software that are used in developing the proposed system. Besides the conceptual design and logical design as well as the physical design of the system has been proof by drawing the framework, class diagram, entity relationship diagram (ERD) and interface of the system. Data dictionary that related to the ERD of this system also prepared in this chapter for better understanding on the attributes used in constructing the ERD for data storing.

3.11 References

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