



# **UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

## **CHILD LOCATION TRACKER**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer Systems) with Honours

by

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**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

**TAJUK: Child Surveillance for Helping Parents Using Arduino**

**SESI PENGAJIAN: 2016/17 Semester 1**

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## **APPROVAL**

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Computer System) with Honours. The member of the supervisory is as follow:

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Dr. Suhaila Binti Mohd Najib  
(Principal Supervisor)

## ABSTRAK

*Pada masa ini, ramai ibu bapa yang kehilangan anak mereka di pusat membeli belah, di tempat percutian dan di tempat tumpuan orang ramai. Mengikut statistik, lebih 70 peratus kanak-kanak yang hilang di Malaysia. Adalah penting bagi memastikan keselamatan kanak-kanak terjamin dan diawasi. Oleh itu, system pengesanan peranti adalah satu aplikasi yang paling penting dalam era ini untuk mencegah kadar kehilangan kanak-kanak yang meningkat setiap hari. Selain itu, tujuan utama yang menekankan projek ini adalah bagaimana untuk membangunkan sistem pengesanan peranti. Kemudian, projek ini juga membincangkan tentang Sistem Kedudukan Global (GPS) dan Sistem Global untuk Komunikasi Mudah Alih (GSM) teknologi sistem pengesanan peranti menggunakan papan Arduino melalui Telefon Pintar. Dengan menggunakan sistem ini, ibu bapa boleh mengesan lokasi anak-anak mereka bila-bila masa. Sistem ini dapat memberikan minit demi minit mengemas kini mengenai lokasi peranti jika kanak-kanak itu telah keluar dari jarak selamat dengan menghantar Khidmat Pesanan Ringkas (SMS). Dalam permohonan ini, ia terdiri daripada integrasi antara penerima GPS, Arduino mikropengawal dan modul GSM. GPS digunakan untuk menentukan lokasi yang tepat (latitud dan longitud) peranti dan untuk menjejaki kanak-kanak di kawasan geografi. Kemudian, maklumat kedudukan akan dihantar ke Telefon Pintar melalui GSM modem. Modem GSM diprogramkan untuk membolehkan dua komunikasi antara modem dan peranti untuk menentukan kedudukan terkini peranti. Selepas itu, sistem ini boleh menggambarkan data yang diterima ke dalam Peta Google. Projek ini boleh dibahagikan kepada dua bahagian besar, bahagian yang pertama, GPS, Bluetooth dan Arduino mikropengawal berpasangan. Bahagian yang kedua, GPS- Arduino mikro dan integrasi GSM.*

## **ABSTRACT**

Nowadays, many parents who lost their children while in shopping centers, at home and in places of the people crowded. According to statistics, more than 70 percent of children who disappeared in Malaysia. It is important to ensure children's safety is assured and monitored. Thus, the device tracking system is one of the most important applications in this era to prevent the loss of children are increasing every day. Moreover, the main purpose of this project is to emphasize how to develop tracking system devices. Then, the project also focuses on the Global Positioning System (GPS) and Global System for Mobile Communications (GSM) technology device tracking system uses an Arduino board via Smartphone. By using this system, parents can track the location of their children at any time. This system can provide minute-by-minute updates on the location of the device if the child is out of range from a safe distance by sending a Short Messaging Service (SMS). In this application, it consists of the integration between a GPS receiver, Arduino microcontroller and GSM module. GPS is used to pinpoint the exact location (latitude and longitude) and track the children in the geographical area. Then, the position information will be sent to a Smartphone via a GSM modem. GSM modem is programmed to allow the communication between the modem and the device to determine the current position of the device. After that, the system can reflect the received data into Google Maps. Moreover, this project can be divided into two major parts, the first part, GPS, Bluetooth and Arduino microcontroller pairs. The second part, Arduino micro GPS- and GSM integration.

## **DEDICATION**

Every challenging work needs self efforts as well as guidance of elders, especially those who were very close to my heart. My humble effort I dedicate to my sweet and loving parents, Mr. Samser Bin Mahat and Madam Habsah Binti Ujang who always pray for my success in this research study. To Dr. Suhaila Binti Mohd Najib who is my supervisor who not only guided me but also provide me the knowledge about this project, teach me how to use the software and experience that help in this research project. Next is my lecturer Mr. Aiman Zakwan Bin Jidin and Mr. Zulhasnizam Bin Hasan who always become my source of reference. Besides that, to my loving best friend forever Nur Yusma Amira Binti Mohd Yusof, Nur Azziana Afifie Binti Azman, Ruksana Binti Anwar, Sharifah Nur Faqihah Binti Habit Mohd Azid, Muhamad Zulli Khairi Bin Ghazali, Ahmad Zuhdi Bin Mohd Yusoff, Rashid Sidek Bin Azman, Intan Nurhazirah Binti Mohammad Fauzi and Chen Jia Sing who always with me, teach and guide me to complete this research project, always help me and stick together through thick and thin.



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## **LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE**

GPS	-	Global Positioning System
GSM	-	Global System for Mobile Communication
SMS	-	Short Message Service
IR	-	Infrared
RF	-	Radio Frequency
DOD	-	Department of Defence
TDMA	-	Time Division Multiple Access
CEPT	-	European Conference of Postal and Telecommunications Administrations
ETSI	-	European Telecommunications Standards Institute
MIT	-	Massachusetts Institute of Technology
SDLC	-	System Development Life Cycle
RUP	-	Rational Unified Process
USB	-	Universal Serial Bus
Rx	-	Receiver
Tx	-	Transmitter

# CHAPTER 1

## INTRODUCTION

Device tracking system based on Global Positioning System (GPS) and Global System for Mobile Communication (GSM) provides very effective results in data and reporting the information such as position (latitude and longitude), speed, and time. By using GPS and GSM module of a device tracking system, it will inform where your device is and where it has been via Smartphone. From the GPS, the device tracking system uses geographical position, speed and time information and will display on the screen of a Smartphone through Google map. This chapter mainly covers the general background of this project, the problem statement, objectives, scope, project significance and thesis outline.

### 1.1 Background

In the present day, Malaysia citizen faces with the uprising on child missing in the shopping mall, on vacation and sometimes residential area. Thus, the GPS and GSM of device tracking system using Smartphone and Arduino which integrate both GSM and GPS technologies is one of the most important systems. Device tracking systems based on GPS and GSM has brought out this technology to the day-to-day life for solving the problem regarding the increasing of cases missing children (Ramani and Valarmathy, 2013). A device tracking system based on GPS and GSM technology using Smartphone and Arduino board is electronic which will be installed on the child to track them based on their location.



Combining the use of automatic device location in child equipment or belonging with software that accumulates these fleet data for a comprehensive picture of device locations is called a device tracking system. Modern device tracking systems commonly use GPS and GSM technology for locating the device, but other types of automatic device location technology can also be used. The device information can be viewed on electronic maps via the Internet like Google map or specialized software.

In addition, the wide coverage of cellular and satellite network leads to various useful applications that increase the convenience of our daily life as the location can be tracked in a real time.

Moreover, device tracking system is also can be used in many other scenarios in growing technology including asset tracking to track valuable assets for insurance or other monitoring purposes by the civilian. Now, it can plot the real-time asset location on a map, and closely monitor the movement and operating status. On top of that, for surveillance a tracker may be placed on a device to follow the children's movements. Meanwhile, Smartphone sales professionals can access real-time locations.

Typically, they have classified the device tracking system as passive and active. Passive devices store GPS location, speed, direction and sometimes a trigger event such as key on/off, door open/closed while active devices collect the same information, but usually transmit the data in near-real-time via cellular or satellite networks to a computer or data center for evaluation.

## **1.2 Problem Statement**

Nowadays there are many children has gone missing for example in the newspaper, media social that always shows the news about the child missing. Therefore, the demands of device tracking system are increasing. The GPS and GSM technology using Smartphone have been improved for the development to be effective in determining the precise location (latitude and longitude) of a device.

The problems regarding in the device tracking system are to track the child device system anytime, a system that can connect the information to the device and the

Smartphone must be developed. The main problem that must be solved is how to make the system able to send the data when the child device is out of range that has to be set up and wants to track the device.

### **1.3 Objectives**

Objectives can be defined as the goals or target that needed to be achieved at the end of the project or study. Each project has their own objectives that keep the project on the right path and to make the project become more clearly defined. For this project of GPS and GSM device tracking system by using Smartphone and an Arduino board, the position of the device can be monitored through the Google maps; there are only two objectives that are determined and needs to be achieved at the end of this project. The objectives of this project are as below.

- i. To design a monitoring and tracking device as a child location tracker using GPS and GSM technology.
- ii. To integrate a device tracking system with an Android application for a navigation system.

The first objective of this project is to develop a subsystem that is intended to send information from the device tracking system to the Smartphone. The parent can track the location of their children anytime using GPS and GSM technology by sending an SMS from Smartphone. Besides that, it also to develop a device tracking system using GPS for positioning information while GSM for information transmission. The system is able to give minute-by-minute updates about device location by sending SMS via Smartphone.

The second objective of the project is to highlight on how to integrate the device tracking system that can virtualized the data in Google maps by sending SMS to the owner of the device via Smartphone. Then, the system can visualize the received data into Google maps.

## 1.4 Scopes

The work scope of this project is to develop the GPS and GSM device tracking system that can give an output of the information such as latitude and longitude from the GPS receiver. The users will also be able to send commands to the GPS receiver using the GSM technology.

This project is divided into two parts; the first part is for the child, which consists of the GPS, Bluetooth, GSM and the Arduino microcontroller pairing. The second part is for the parent, which consists of the Smartphone to get the location of device tracking system. Figure 1.1 shows the block diagram of the GPS and GSM of device tracking system.

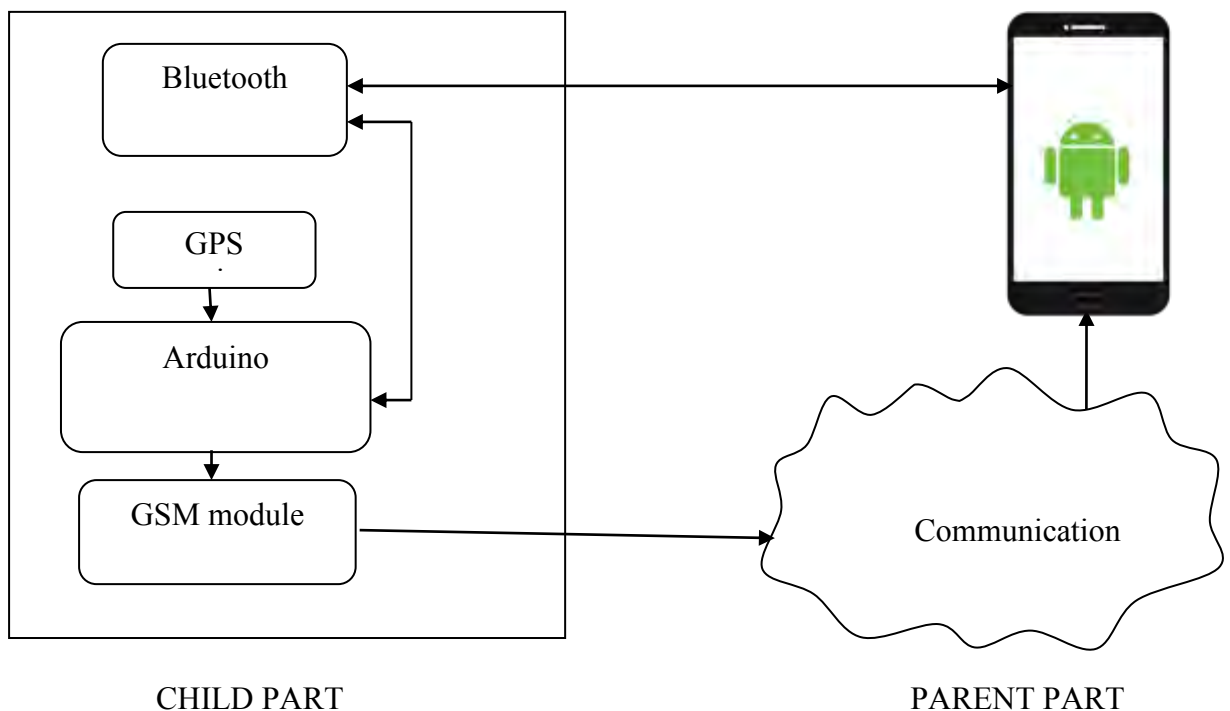


Figure 1.1: Block diagram of device tracking system

In this case, the system has the following features:

- i. Information of the device location will be sent to the smart phone only when it is out of range. Therefore, the system can receive commands from the smart phone.
- ii. The device's location will be visualized in Google Map.

## 1.5 Project Significance

The significance of this project is to provide an alternative way to track children based on GPS and GSM technology by using Smartphone and Arduino. The integration with Smartphone which is portable makes it more convenient for users in obtaining their exact location on earth via Google map. By conducting a comparative study on multiple GPS and GSM platforms, therefore the most suitable platform to be utilized for users will be identified. In order to illustrate the objectives achieved through the proposed system are:

- i) GPS based location identification.
- ii) Received location in the form of latitude and longitude.
- iii) Send position through GSM short message service.
- iv) Real time tracking using SMS.
- v) The position can be virtualized by Google Maps.

This is because each platform will have a different outcome, strengths, and limitations. In shorts, users can try to integrate their devices. Thus, integration with those devices will add another new GPS and GSM feature to their devices other than the typical functions of those devices. As far, the utilization of GPS and GSM technology enable users to identify location more accurate compared to another system.

In terms of the researcher, it is hoped that the project would be a benchmark for future work like for example, integrating the GPS with other advanced devices and the other. In another word, a future researcher can indulge more in the study pertaining to the GPS field to extemporize the current system available with different perspectives and idea. By completing this project, hoping that the device tracking system will come up to prevent the missing children.

## 1.6 Thesis Outline

This thesis is divided into five chapters to provide a clear understanding of the whole project. It also shows the logical steps involved in understanding and gaining an appreciation of the methodology used to produce the prototype of the project.

- Chapter 1: The first chapter introduces a brief idea of the project. It will cover the overview of the project. This chapter will be including the synopsis of the project, the project objective, scope of the project, the problem statement, and outcome of the project.
- Chapter 2: This part is the medium to get information in order to develop the project. The information will classify by a journal, articles, books and some related interview.
- Chapter 3: It will cover up all the methodology and a project implementation process to make the goal achieved. The hardware and software technical details are also explained in this chapter.
- Chapter 4: This is the most important chapter for this project. This chapter will contain the development and implementation of the whole project. This chapter also gives a critical analysis of the system; a determination is made on whether the project objectives have been met. This chapter will include theoretical and actual findings and circuit simulation result.
- Chapter 5: This chapter is the whole contents of this project and thesis. At the end of this chapter, some references discussions and attachment will be included for future references.

## 1.7 Summary

By completing this project, parents can be helped with the child device tracking system to prevent their children is missing or lost. This system is an affordable that upgraded the installed system to device. The parents will be notified through SMS using this system whenever an intrusion occurs. The SMS message gives an immediate alert to the Smartphone, even if the children got far so that the parents can notify the local police department immediately. This project is created and will hopefully is achieved after providing a brief description about this project. This project can make the parents and the children feel safe and comfortable when they going out, shopping and hanging together. Finally, hoping that this project using of the current device security system can help to minimize the missing children that have been increasing.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Device Tracking System**

Device tracking system can be defined as monitoring the location of children using the Global Positioning System (GPS) and Global System for Mobile Communications (GSM) system (John F. Graham, 2002). Widely deployed, device tracking ensures that the children are being safe properly and keep the children from being the victim of crime. The wireless technology standards are everywhere. Bluetooth, GSM, GPS and smart phone are the most known standard. Effectively all wireless technologies that can support some form of remote data transfer, send location and receive the data are candidates for inclusion in the device tracking system portfolio.

There are several types of the tracking system such as Infrared (IR), Radio Frequency (RF), GPS and GPS with GSM device tracking system. Each device tracking system was compared with its features and characteristics. The comparison of the important aspect of device tracking system is tabulated as shown in Table 2.1.

Table 2.1 Comparison between IR, RF, GPS and GPS with GSM tracking system  
(Catherine, 2007)

<b>Features</b>	<b>Infrared (IR)</b>	<b>Radio Frequency (RF)</b>	<b>GPS</b>	<b>GPS and GSM</b>
Function	A guide, place on the object to the tracked, continuously emits an infrared signal in all directions.	Widely used, including Bluetooth, Radios, Cell phones Satellite and extra.	Support real time tracking, it can be 24 hours tracking by using at least 3 satellites.	A very compact real time tracking device, track the far-way object conveniently by short message, internet or PDA.
Requirements	Requires line of sight, so only test in indoors.	Does not required, two devices to be in line of sight.	Does not required, two devices to be in line of sight.	Does not required, two devices to be in line of sight.
Range	Very directional within a small range.	Wide range, from a few meters to millions of kilometers.	No limitation range.	No limitation range.
Circuit	Simple circuit and low cost.	Circuit can be complicated and costly.	Simple circuit but costly since it is a new technology.	Simple circuit but high cost since it is a new technology