

# DEVELOPMENT OF CHILD LOCATION SYSTEM IN A SHOPPING COMPLEX USING RFID



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

**TAJUK: DEVELOPMENT OF CHILD LOCATION SYSTEM IN A  
SHOPPING COMPLEX USING RFID**

Sesi Pengajian: 2021



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TERHAD

Yang benar,

Disahkan oleh penyelia:



Norhasniza binti Zaini

Alamat Tetap:

Lot 5737, Kampung

Jalan Badak, Jeliang,

33800 Manong, Perak



Izadora Binti Mustaffa

Cop Rasmi Penyelia


Tarikh:

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Signature:	.....
Name:	Norhasniza binti Zaini
Date:	14/2/2021



## APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours. The member of the supervisory is as follow:

Signature:	.....
Supervisor Name:	.....
Date:	.....

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## **ABSTRAK**

*Pusat membeli-belah lebih kerap mempunyai pengunjung terutamanya pada hujung minggu atau cuti tidak kira hari kerja atau hujung minggu. Memang, pusat membeli-belah adalah tempat yang sesuai untuk keluarga. Oleh kerana ia terdiri dari kedai runcit dan pasar raya, restoran, dan kemudahan hiburan. Ini adalah tempat yang bagus untuk meluangkan masa bersama keluarga sambil melakukan tugas yang diperlukan. Walaupun begitu, dengan semua kegembiraan dan persekitaran yang sibuk, anak-anak berisiko kehilangan ibu bapa mereka dan sebaliknya. Projek ini menerangkan kaedah untuk mencari lokasi anak-anak dalam persekitaran tertutup atau tertutup. Projek ini menggunakan teknologi RFID yang memetakan lokasi anak sebaik sahaja memasuki kompleks tersebut. Projek ini merangkumi kedua-dua perkakasan dan perisian. Tag RFID dipakai oleh anak dan pembaca RFID diletakkan di setiap pintu masuk ke kedai, lif, bilik cuci, dll. Setiap kali pembaca mengesan RFID, isyarat dihantar ke modul GSM untuk memetakan lokasi anak. Sekiranya seorang kanak-kanak dilaporkan hilang, pemetaan akan menunjukkan lokasi di mana anak itu berada dan termasuk lokasi terakhir tag tersebut dikesan. Dengan cara ini, proses mencari anak yang hilang hampir mudah. Dengan mengetahui di mana anak itu, hanya rakaman CCTV yang relevan yang perlu diperiksa yang dapat menjimatkan banyak masa untuk mencari anak yang hilang.*

## ABSTRACT

Shopping malls more than often have throngs of visitors especially during the weekends or holidays no matter the workday or the weekend. Indeed, shopping malls is a family-friendly spot. Since it consists of grocery and department stores, restaurants, and entertainment facilities. It is a great place to spend time with the family while carrying out necessary errands. Nonetheless, with all the excitement and bustling environment, children are at risk of losing their parents and vice versa. This project describes of a method to locate the whereabouts of children in an enclosed or indoor setting. The project utilizes RFID technology which maps the location of the child as soon as they enter the complex. The project includes both hardware and software. RFID tags are worn by the child and RFID readers are placed at each entry to a shop, elevator, washroom, etc. Every time the reader detects the RFID, a signal is sent to a GSM module to map out the whereabouts of the child. If a child is reported missing, the mapping will show the locations of where the child had been and including the last location the tag was detected. This way, the process of finding the missing child is almost straightforward. By knowing where the child was, only relevant CCTVs recordings need to be checked which saves a lot of time in finding the missing child.

## ACKNOWLEDGEMENTS

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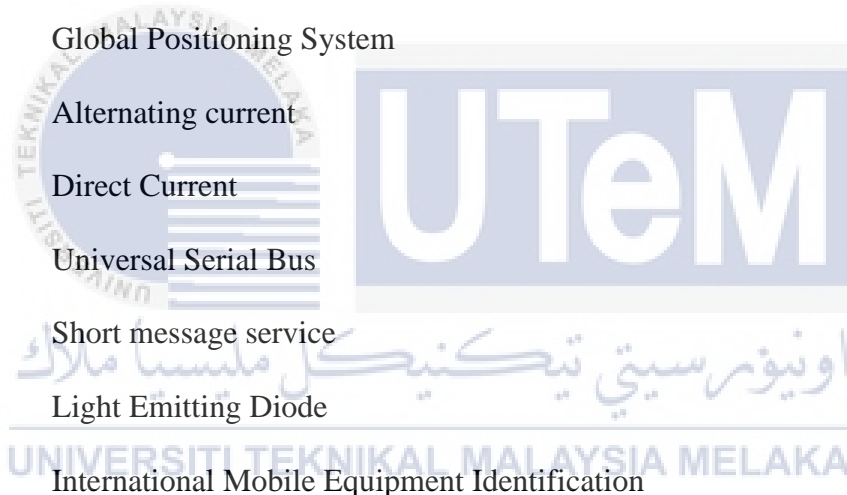
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## LIST OF ABBREVIATIONS

RFID	Radio Frequency Identification
GSM	Global system for mobile communication
IoT	Internet of Things
LCD	Liquid Crystal Display
CCTV	Closed Circuit Television
MQTT	Message Queuing Telemetry Transport
RF	Radio Frequency
GPS	Global Positioning System
AC	Alternating current
DC	Direct Current
USB	Universal Serial Bus
SMS	Short message service
LED	Light Emitting Diode
IMEI	International Mobile Equipment Identification



# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

The first chapter introduces the idea of the project. It focuses on the research background of the project, the problem statement, the objectives, scope, and outcome of the project.

### 1.1 Research Background

The kidnapping of children in Malaysia is increasing rapidly. According to Berita Harian, there were increases in the rate of children kidnapping every year from 2008 until 2018. Inevitably, there is always a potential for the parents to lose their child while they are busy shopping in the shopping mall if there are not careful enough. A tracking device is one way to help address this problem.

RFID is the use of an item added to or integrated into a commodity, entity, or individual for detection and monitoring by radio waves. Any tags can be viewed from a few meters away and beyond the reader's sightline.

Parents need to make sure that child wear the RFID rubber band tags are carried by the child and RFID readers are locations at each entrance to the shop, elevator, washroom, etc. Each time the reader senses the RFID, a signal is sent to the GSM module to monitor the child's location. If a child is reported missing, the mapping performed using the program would indicate the location of the child, including their last address.

An RFID system consists of three components a scanning antenna, a transceiver, and transponder. Uses radiofrequency waves to transmit signals that trigger the code. When enabled, the tag sends a wave back to the antenna where it is transmitted to the info. The transponder is mounted on the RFID tag itself. The reading range for RFID tags depends based on the form of tag. The type of reader is RFID level and disturbance in the ambient area or other RFID tags and readers. Generally speaking, tags that provide a better power supply often provide a wider reading range

## 1.2 Project Objective

The objective of this project is as follows:

- a) To design a device using active RFID technology
- b) To develop a prototype of a Child Location System in a Shopping Complex using RFID
- c) To implement of Child Location system which uses the communication system to send information and send it to the smartphone.

## 1.3 Scopes

The developed system is focused on the mapping the whereabouts of a child in an enclosed building or indoor environment. The system implements the use of RFID tags and readers which are place in several locations of entrances and exits in a shopping complex model. The signal is then read according to the programmed location of the Watsons store example. Then, through GSM will send a message to the mobile phone and the mapping is based on each RFID reader location.

## 1.4 Problem Statement

Shopping centers are among the areas that need to have a child protection mechanism to handle the high number of childhood cases. Although some shopping centers make announcements in the event of missing or finding children on the premises or as an example, some shopping centers will lock and monitor complex outlets as soon as children are reported missing. Also, one of the major causes of child loss is a lack of precautionary measures such as seeing parents leave their children alone while ordering food and without even realizing the child is playing or moving alone. Sometimes parents are oblivious to the situations that often occur although they are aware of the consequences.

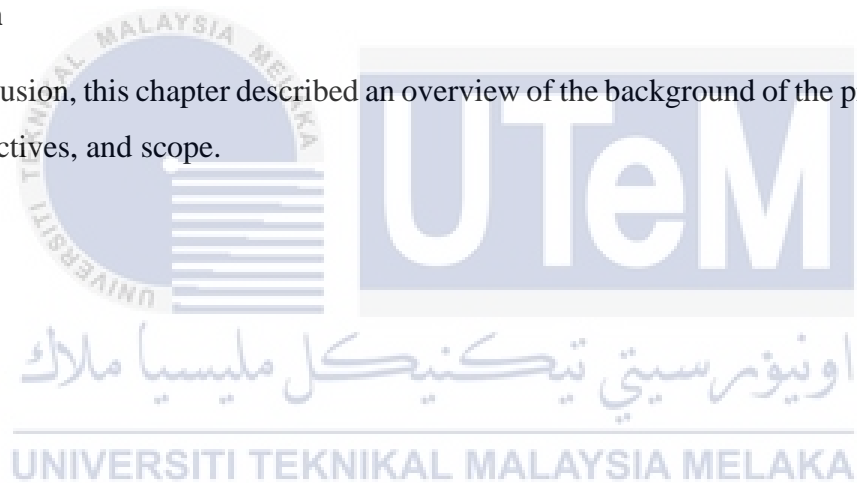
The action for security guards is to monitor parts of the mall. So the possibility of losing children to find low. The project is designed to help security guards detect missing child locations

and can automatically prevent missing children at the mall. Further, parents also find it difficult to monitor children especially when they are busy in the shopping mall. Due to busy conditions at the shopping center, parents have difficulty monitoring their children.

This system can help parents and solve their problem of monitoring their children in the mall while they are busy buying their stuff. Today, our country has seen many children in abduct cases. His cases are increasing daily. Because of this problem, many parents are worried about taking their children to a crowded place especially the shopping center. The system is designed to monitor children even in crowded areas. Parents do not worry about their children anymore.

### 1.5 Conclusion

In conclusion, this chapter described an overview of the background of the project, problem statement, objectives, and scope.





## CHAPTER 2

### LITERATURE REVIEW

#### 2.0 Introduction

This chapter describes the research that previously has been done by another research. This chapter will review the types of RFID, active RFID, GSM module, and other components that have been used. Below the previous study that is done by previous research.

#### 2.1 Radio Frequency Identification

Based on the journal radio-based identification technology (Mubarok *et al.*, 2018). The technology can identify multiple objects simultaneously without the need for direct or short-term contact. RFID sensors are sensors that identify an item using radiofrequency. These sensors are made up of two important parts transceiver reader and transponder tag. Each tag stores different data. The data is to tag identity data. The reader will read data from tags with radio waveforms. The reader is usually connected to a microcontroller. This microcontroller works to process the data obtained from the reader.

From the study, (Kumar, Khan and Umar, 2018) solutions are provided to reduce theft of vehicles within the organization. Check-in and check-out controlled by smart card-based software and RFID vehicle tags. Using RFID is economical in terms of time and cost. The RFID system consists of three elements in two combinations the transceiver (transmitter/receiver) and the antenna are normally paired with an RFID reader. The transponder (transmitter/responder) and antenna are coupled to create an RFID tag. The RFID tag is read as the reader sends a radio signal that triggers the transponder, which sends data back to the transponder. There are two categories of transponders that are connected to the two main categories of RFID identifiers. The active

transponder includes a battery that transmits signals periodically. Passive transponders do not have an energy supply of their own, depending on the reader's energy to react. Passive identifiers are also cheaper.

## 2.2 Active RFID

Furthermore, inquisition results from (Hang *et al.*, 2016) active RFID tag has a worked in power flexibly and a microchip to continually control the RF contact hardware and execute assignments. Dynamic RFID labels can radiate a more prominent sign than uninvolved RFID labels, and dynamic clients can arrive at entire networks of dynamic labels at a more drawn out separation than their reciprocals.

The active RFID implementation from (Putrada, Pambayun and Abdurrohman, 2017) improves the quality and manner of taking in and out of child reports. An active RFID reader on the bus detects the RFID card, possibly in the form of a student card. When students board the bus, without having to pull out a card and reach the reader. Reporting to the system is sent only when the child exits the bus at the designated place, and when the student drops off at the wrong place, no notification is sent at all. Student pickup status will then be sent to the MQTT server along with their up / down location on and off the bus.

## 2.3 Microcontroller

The ATMEL89S52 device is a microcontroller used in child tracking devices. Consists of a 40 pin microcontroller as a voltage range from + 4V to + 5.5V. This microcontroller can be programmed repeatedly. There are four ports for dual purposes. Externally connected for input and output operations. Microcontroller input is from RF receiver, GPS, and key receiver while LCD, buzzer activation, and SMS sent via GSM are output connections. Here, required + 5V by the power supply from the microcontroller to be programmed using embedded C. (Dhanalakshmi, 2018).

In previous studies, the useful microcontroller is the Arduino Uno is an ATmega328 based microcontroller unit. It includes everything to operate a microcontroller which is it has 14 digital inputs/outputs, 6 analog inputs, a 16 MHz crystal oscillator, a USB interface, and a reset button.

Simply connect it into a device with a USB cable with an AC with DC adapter to get going. The Arduino Uno can be driven via a USB link or an external power supply. The power source would be picked automatically. (Devapriya *et al.*, 2017).

The program needs to be applied to empower the module. The AT commands are utilized to enable the SIM908 GPS module. Fundamentally, each order needs to be stated at the top of the file. GSM and GPS must be enabled in the first section. When the SIM908 is turned on, the module will keep arranging the GSM and GPS systems. The source code for driving and configuring the SIM908 GPS module. When the system has been arranging appropriately, the gadget can transmit a warning telling guardians that the hardware is fit to be utilized. The AT+CREG order is utilized to interface the GSM to the system. The AT+CMGF=1 order is utilized to design SMS in text mode, so when arranging to 0, it goes to the convention information unit. AT+CMGS is utilized to imply that the GSM gadget can transmit a message. GPS regularly has its own AT order with a particular component. The source code for setting off the GPS highlight on the board. Either the Sim-Card on the parent gadget or the SIM908 GPS module must have the accessible credit to send the SMS. Just one phone administrator will run this machine at once. Force switch is important to turn the equipment interface module on. Before that, the start button is pushed for around 5 until 10 seconds to make sure that the LED shines, which indicates that the network is actuated effectively. (Abdullah *et al.*, 2018).

Furthermore, the study mentioned that the ATmega32 microcontroller is used to manage the reader and the GSM modem in the data transmission bus network. The bus network consists of an RFID processor, a GSM modem, and a control panel. The reader connects with the microcontroller using the RS232 serial communication interface. Due to the disparity in voltage ranges, the max232 chip is used to transform signals from the RS232 serial port to signals appropriate for use in TTL compliant digital logic circuits (power range from 0V to 5V). Also, to verify that they are properly connected, program C has been written for data exchange between RFID and GSM modem readers via a microcontroller. To show the success of reading the microprocessor tag number will read data from the RFID reader and LED will be turned on (Al-Lawati *et al.*, 2015).

## 2.4 GPS Module

The SKG13BL GPS module has been utilized to show the scope and longitude arrangements and showed in the LCD effectively. Through the estimation of scope and longitude in Google maps the specific situation of the children can be followed. Information will be sent to the parents via SMS the location of the coordinates. The necessary force gracefully is + 12V and the GPS module is associated with pin 0 port 3 in the microcontroller. Module antenna input will receive GPS Alert thus all order data in serial format is shown on the serial interface with a specific protocol. (Dhanalakshmi, 2018).

The GPS used in the previous study consisted of a satellite fleet orbiting the earth in a geosynchronized way. Partially three satellites are needed to precisely calculate their exact location based on imaginary latitude lines. In addition to providing position parameters such as height, distance, path, number of communication satellites, and more. GPS is a multi-satellite radio route gadget that estimates area, speed, and time boundaries to a serious extent of exactness (Devapriya *et al.*, 2017).

(A.Saranya, 2016) recommend that a GPS is a multi-satellite radio route arrangement where every GPS satellite conveys information that permits clients to decide the good ways from the chosen satellite to the receiving wire and as certain area, speed and time boundaries at an elevated level of exactness. GPS furnishes high adaptability and exactitude with insignificant force utilization. Within this article, the architecture of the GPS module is bending moment to handle various RF interruptions. Therefore, GPS modules are used to help activate children's location manually by sending location information to parents' mobile phones in the event of missing children in public areas such as parks, shopping malls, shopping complexes, and so on.

## 2.5 GSM Module

Based on a research article written by (Dhanalakshmi, 2018) the GSM module used are the SIM800A. It is associated with the microcontroller using RS232 which is utilized to change over sequential information to TTL rationale. This is necessary because the microcontroller works only with the TTL logic. 5V-18V power supply requirements while current requirements 1.5A or higher. The TTL series serial port is compatible with 3.3V and 5V microphones. Ready at 30MA,

you can set your sleep state to about 10mA with low power consumption. SMS support, GPRS data transmission, MMS transmission, DTMF, HTTP, FTP, PPP dialing, and other functions. At the same time, the hardware contains a reset pin. When there is a problem with the module, this pin can be used to fix it. The development board supports China Unicom 2G / 3G / 4G cards or mobile phones. This device was planned for being available to any wireless client and not a costly Smartphone client. Accessible to any cell phone client and not only an expensive cell phone client.

Journal title “RFID Imparted Student Monitoring System” by (Devapriya *et al.*, 2017) it used the RS232 SIM900A runs at a frequency of 900/1800 MHz. The modem comes with the RS232 module, which allows the Computer and the microcontroller to link to the RS232 device. On-board power supply enables you to link a broad variety of unregulated power suppliers. This modem will make audio calls, SMS, read SMS, accept incoming calls, and link to the internet via basic AT order.

Further, based on a journal study by (Abdullah *et al.*, 2018) they used the Modem GSM for a type of wireless Modem device designed to connect between computer and GSM. It requires a SIM card (Client Identification Module) such as a mobile phone to activate in connection with the network. They also have an IMEI (International Mobile Equipment Identification) number related to a mobile phone for their recognition. The modem requires AT instructions, to interact with the processor or controller, sent via serial communication. This command is sent by the controller or processor.

## **2.6 RF Transmitter and Receiver**

According to the article, radio frequencies are used primarily for the following aim. Line Of Sight does not require contact and has a broad variety of working voltages. The RF transmitter and collector get together is set up of HT12E and HT12D. It normally completes at an RF frequency of 433 MHz. The transporter recurrence is completely debilitated and no force is taken from the transmitter while the rationale 0 is submitted. The transporter is 4.5mA when rationale 1 is sent. The sender has transmitted the information in a sequential structure and is handled by the tuned recipient. The RF transmitter is utilized to give a sign from guardians that they have to know

where their children are arranged. The receiver detects the signal and uses the GPS and the GSM to transmit the children's latitude and longitude via SMS. (Dhanalakshmi, 2018).

## **2.7 Emergency Key**

In this journal, they apply the emergency key is directly connected to the kid. At the point when they feel compromised or lost in the crowd, the signal which is buzzer will be activated by tapping the alarm key. If the key has been pushed, the location will be submitted to the parents. It helps guardians with finding children and salvage them if conceivable. The parent has an association for them as well. At the point when this key is pushed, the RF transmitter transmits a sign that establishes the children's module. (Dhanalakshmi, 2018).

## **2.8 Antenna**

Based on this journal, we can see that researchers use antennas to transmit information between readers and tags using radio waves. Antennas are the medium through which tags and readers communicate with each other. Besides, antennas can activate passive tags and transfer data by transmitting wireless impulses that have electromagnetic properties. (Farpat and Reader, 2015).

## **2.9 Conclusion**

Overall, the purpose of this review is to look at past composition research trends to assist in the process of developing the Children's Location System Development project at Shopping Complex using Active RFID. Through past research, we can see how a project is constructed using the same component and some similar but different projects. Different methods are used in each study such as the system of checking and detecting which children do not board or leave the bus and issue warning messages about this. Here, it is the microcontroller's task to swap data betwixt RFID and GSM modem readers through a microcontroller. Additionally, some journals use different microcontrollers but the same method of Microcontroller is installed at + 5V power supply. ATMEL89S52 is configured using Embedded C. The software works based on the

software. Therefore, the above resources can put the methodology in line with the project to be undertaken.



## CHAPTER 3

### METHODOLOGY

#### 3.0 Introduction

This chapter describes the software and hardware-implemented. Also in this chapter, flow charts provide insights into the project for the planned report documentation. Further, the systems and connections used are clearly stated to ensure the methodology achieves the project objectives.

#### 3.1 Overview of the Project

A flowchart has been created to facilitate the development of this project. First of all, studies on the type of Radio Frequency Identification (RFID) for use have been made. After that, the research on the type of Global System for Mobile Communications (GSM) ever produced was made to examine the concept it operates. Furthermore, the software production process type of suitable microcontroller for use have been studies. Finally, a process to develop Arduino code. For this part, program production to control using microcontroller Arduino. Figure 3.1, shows the flow chart and figure 3.0 block diagram of this project.

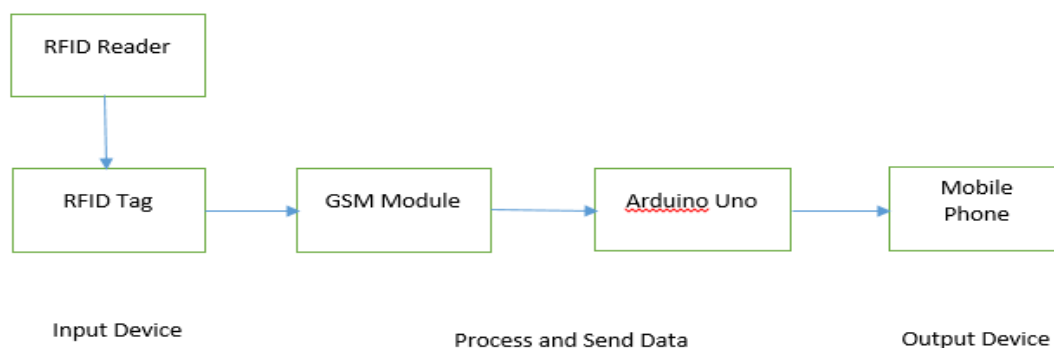


Figure 3.0 Block Diagram of Project Development