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Design and development of object tracking system /  
Khairunnisak Kamarozaman.



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**  
**FACULTY OF ELECTRICAL ENGINEERING**

**FINAL YEAR PROJECT II (FYP II)**

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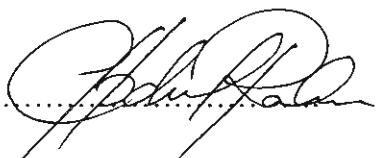
**DESIGN AND DEVELOPMENT OF**  
**OBJECT TRACKING SYSTEM**

**Khairunnisak Binti Kamarozaman**

**Bachelor of Electrical Engineering**

**July 2012**

“ I hereby declare that I have read through this report entitle “Design and Development of Object Tracking System” and found that it has comply the partial fulfilment for awarding the degree of Bachelor of Electrical Engineering (Power Electronics and Drives)”

Signature :  .  
Supervisor's Name : DR ABDUL RAHIM BIN ABDULLAH  
Date : 02 JULY 2012

**DESIGN AND DEVELOPMENT OF OBJECT TRACKING SYSTEM**

**KHAIRUNNISAK BINTI KAMARUZAMAN**

**A report submitted in partial fulfilment of the requirement for the degree of**

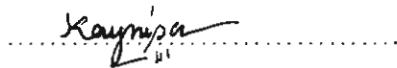
**Power Electronics and Drives**

**Faculty of Electrical Engineering**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2012**

I declare that this report entitle “Design and Development of Object Tracking System” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :   
Name : KHAIRUNNISAK BINTI  
KAMARUZAMAN  
Date : 02 JULY 2012

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## ABSTRACT

Technology achieves success only when it meets every stratum of people. Object tracking system becomes one of the most vital technologies that people need. It capable in observing, permits localization of an object and transmit the position to be displayed. It will helps in locating object position easily by sending current location to the system and within seconds, the exact position will be shown. The systems that are being used now mostly designed by using General Packet Radio Service (GPRS) that has limitation in coverage especially in Malaysia where only certain area has the connection. The existing tracking system has monthly charges and service charges that are expensive. This project presents the development of object tracking system using Global Positioning System (GPS), Global System for Mobile Communication (GSM) Module and Programmable Integrated Circuit (PIC). Thus, this project offers a low cost object tracking system using GPS and GSM Module for object localization. The system provides the ability to track object's current position or its position in any specified time and date. The result of this project is to get the data and maps showing the current location of the object detected from GPS to be displayed on mobile phone or computer.

## ABSTRAK

Teknologi mencapai kejayaan hanya apabila ia bertemu setiap lapisan manusia. Sistem pengesanan objek menjadi salah satu teknologi yang paling penting di mana manusia memerlukannya. Ia berkemampuan dalam memerhatikan, membenarkan pegesanan objek dan menghantar kedudukan yang dipaparkan. Ia akan membantu dalam mencari kedudukan objek dengan mudah dengan menghantar lokasi semasa kepada sistem dan dalam masa beberapa saat, kedudukan yang tepat akan ditunjukkan. Sistem yang digunakan sekarang kebanyakannya direka dengan menggunakan *General Packet Radio Service (GPRS)* yang mempunyai had liputan terutamanya di Malaysia di mana hanya kawasan-kawasan tertentu sahaja yang mempunyai capaian *General Packet Radio Service (GPRS)*. Sistem landasan yang sedia ada mempunyai caj bulanan dan caj perkhidmatan yang mahal. Projek ini membentangkan pembangunan sistem pengesanan objek dengan menggunakan *Global Positioning System (GPS)*, *Global System for Mobile Communication (GSM)* dan *Programmable Integrated Circuit (PIC)*. Oleh itu, projek ini menawarkan kos pengesanan objek yang rendah dengan menggunakan sistem *GPS* dan *GSM* Modul bagi pengesanan objek. Sistem ini menyediakan keupayaan untuk memantau kedudukan semasa objek atau kedudukannya dalam bila-bila masa dan tarikh tertentu. Hasil daripada projek ini, adalah untuk mendapatkan data dan peta yang menunjukkan lokasi semasa objek yang dikesan daripada *GPS* dan akan dipaparkan pada telefon mudah alih dan komputer.

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## LIST OF ABBREVIATIONS

GPS	-	Global Positioning System
GSM	-	Global System for Mobile Communication
GPRS	-	General Packet Radio Service
PIC	-	Programmable Integrated Circuit
RAM	-	Random Access Memory
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
GUI	-	Graphical User Interface
SMS	-	Short Message Service
USB	-	Universal Serial Bus
PCB	-	Printed Circuit Board
USART	-	Universal Synchronous Asynchronous Receiver Transmitter

## CHAPTER 1

### INTRODUCTION

#### 1.1 Project Background

Tracking system has always been the most important thing for security purpose in every country around the world including Malaysia. For example, tracking system is mostly used in vehicle security system to avoid theft and other application to avoid losses. Tracking system permits localization of an object and transmitting the position to be displayed. It will helps in locating object position easily by sending current location to the system. The exact position which contains latitude and longitude of the object will be shown within seconds. Presently, Malaysia is still lack of awareness in using tracking system due to high cost and it has monthly charges that are expensive. According to the current rising trend of criminal cases, especially vehicle theft and children lost, a system to track object has become an option to ensure safety. Thus making this tracking system is a critical need to develop and expand in low cost.

This project presents the object tracking system that can detect location of object using Global Positioning System (GPS), Global System for Mobile communication Module (GSM) that serves for receiving and transmitting data, a PIC 16F877A microcontroller, RS 232, USB Converter and PC GUI. The main operational unit of the tracking system is the microcontroller that communicates with each of the other operational GSM Module via its built-in UART interfaces. GSM Module will request data to GPS receiver to identify object location. The GPS read the exact location of the object

and send the data to GSM Module. Then GSM Module sends the data to PC to display the current location of the tracked object.

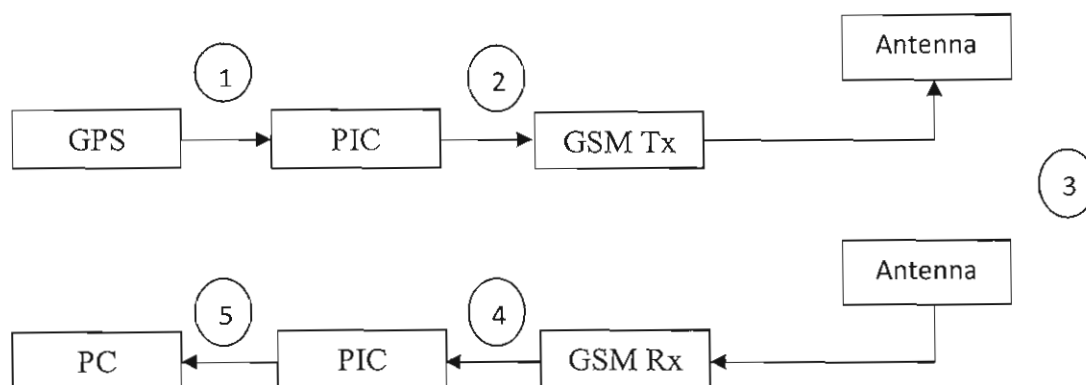


Figure 1.0: Flows of the overall process for the system

## 1.2 Problem Statements

Since Malaysia has many cases on thefts and losses that increasing rapidly nowadays, a system to overcome this problem is required to solve the problem. In addition, the existing system has several disadvantages such as:

- The existing tracking system has monthly charges and service charges that are expensive.
- The systems that are being used now, designed by using GPRS that has coverage limitation only in certain area especially in Malaysia.
- GPRS used large amount of power.
- The existing system is used for specific application, such as car tracking system.

## 1.3 Objectives

The objectives of this project are:

- To design and develop an object tracking system using GSM and GPS.
- To develop graphical user interface (GUI) for tracking system that is user friendly.
- To show the performance of an object tracking system and PIC Microcontroller 16F877A is utilized as the backend in the system.



- This project proposed an object tracking system with a low cost budget using GPS and GSM for object localization.
- The system provides the ability to track object's current position or its position in any specified time and date.

#### 1.4 Scopes

In terms of scope:

- The research uses PIC 16F877A microcontroller, GSM, and GPS.
- The software for GUI is Visual Basic.
- The system only monitors the location of an object.
- The system can be controlled by computer or mobile phone.

#### 1.5 Overview of The Thesis

This thesis report comprises of five chapters namely introduction, literature review, methodology, result and discussion and finally conclusion and recommendation.

Chapter 1 – Introduction explains the overview of the project. The project background, problem statement, objectives and scope are clearly defined to give readers an overview of the project.

Chapter 2 – Literature review on the other hand contextualized the definition, concept and other relevance information regarding the project topic. Many similar researches or related works were viewed in order to determine the methodologies and approaches carried out in the previous research in order to develop idea and see things in different perspective of view.

Chapter 3 – Methodology discussed the phases implemented in conducting the research. In short, the phases include Data Collection, Planning, Analysis, Design, Installation and Configuration and finally testing. All the activities in these phases must be carried out systematically in accomplishing the project.

Chapter 4 – The result and discussion of the research specifically with conducting comparative study on GPS environment, GSM Module, PIC Microcontroller 16F877A, and the software.

Chapter 5 – The final chapter concludes the research study in overall. Recommendations for current use of GPS as well as future work regarding the matter are clearly defined in Chapter 5.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Tracking System

Tracking system currently has been applied to many popular applications, including vehicle tracking system, fleet management and location based services. Generally tracking is the observing of persons or objects on the move and supplying a timely ordered sequence of respective location data to a model that is capable to serve for depicting the motion on a display capability. Tracking system can be divided into two which are tracking in virtual space and tracking in real world. In virtual space technology, a tracking system is generally a system capable of rendering virtual space to a human observer while tracking the observer's body coordinates meanwhile within the real world, there are a variety of technologies employed within asset tracking systems. Some are 'lag time' indicators, that is, the data is collected after an item has passed a point for example a bar code or choke point or gate. Others are 'real-time' or 'near real-time' like Global Positioning Systems depending on how often the data is refreshed. Tracking systems occasionally use radio communications to discover the whereabouts of mobile units.

#### 2.2 Tracking System Using GSM

A low cost automotive localization system using GPS and GSM-SMS services had been presented by Ioan Lita, Ion Bogdan Cioc and Daniel Alexandru Visan. The system proposed permits localization of the automobile and transmitting the position to the owner on his mobile phone as short message (SMS) at his request. The system can be

interconnected with the car alarm system and alert the owner, on his mobile phone, about the events that occurs with his car when it is parked. The system is design with GPS receiver, a microcontroller and a GSM phone. Additional, the system can be settled for acquiring and transmitting of information, when requested, about automobile status and parameters (engine status, speed, direction, etc.) or alert when it started engine, exceed a given speed limit or if leave a specific area. By using the PC connection, the system can be used as navigation system. Optional, the system can be used as car tracking system if connected with GSM/GPRS phone.

Tian Zhihong and Yang Jinsheng have outlines a design which incorporates the power of concurrent GPS and GSM networks positioning technology to provide location-based services for an electrical wheelchair. It offers a better monitor service for elder and the person who has a handicap in the using of a wheelchair. In contrast to methods which depend solely on GPS positioning, the proposed method provides higher positioning accuracy and is capable to compensate the problem of the lost of GPS signals in urban areas or indoors. The design is composed by a GPS message transmission, a 32-bit DSP microprocessor as controller and a web-based management server designed on the LabWindows/CVI for monitoring and tracking the wheelchair's position.

### **2.3 Tracking System Using GPRS**

Wael M El-Medany, Alauddin Alomary, Reyadh Al-Hakim, Sufyan Al-Irhayim and Mustafa Nousif proposed a hardware design and implementation of GPRS based positioning system using PIC microcontroller. The system is implemented using the microchip PIC 16F877A microcontroller. The system has been tested on a test board, and then a PCB (Printed Circuit Board) layout has been implemented for the final system prototype. The system provides the ability to track current position of the vehicle or its position in any specific time and date by analyzing the received data from the GPS receiver.

## CHAPTER 3

### METHODOLOGY

#### 3.1 Project Methodology

The complete flow of the project methodology and all the steps that have been done in order to complete the project successfully are shown below. In addition, the flows of the overall process for the system are shown in Figure 3.0.

The components are used in the projects as follow:

- i. Global Positioning System (GPS)
- ii. Global System for Mobile Communication (GSM)
- iii. PIC 16F877A
- iv. Universal Serial Bus (USB) Converter serial converter
- v. RS 232

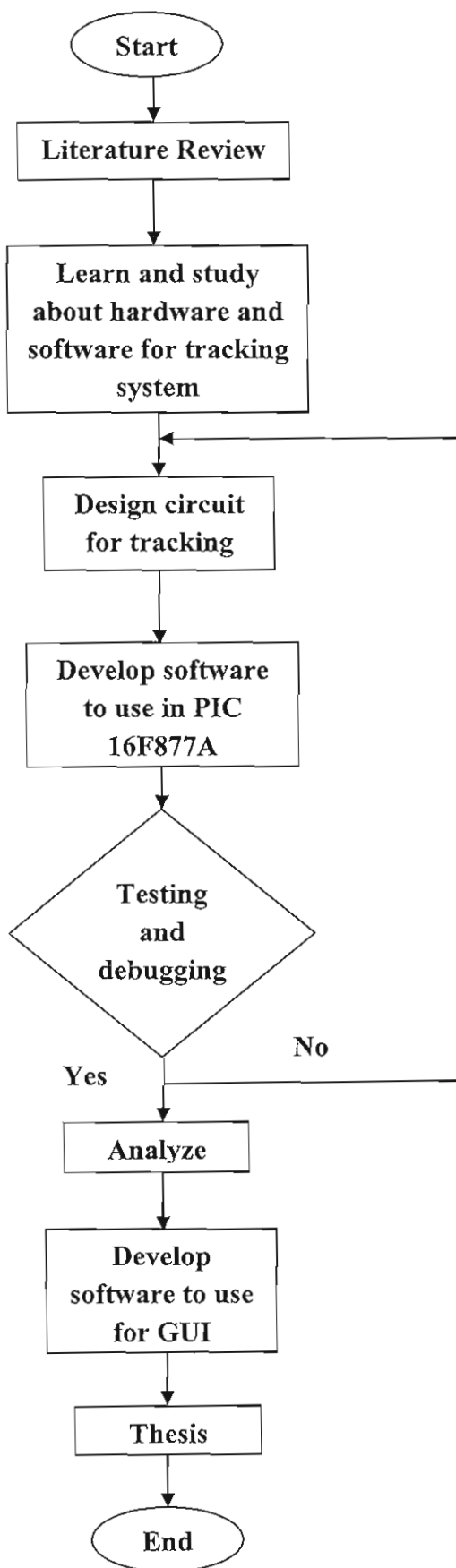


Figure 3.0: The flow chart of the project methodology

This research is based on software and hardware project which are expected to finish within 2 semesters period. The project is started with literature review that is based on reading and understanding previous successful project on tracking system and the system that is related. This step is vital in order to have clear understanding and also for the overview of what the project is actually about.

Next is learning and studying about hardware and software that are used for tracking system. The functions of each and every component that will be used are identified in order to design the circuit correctly. As for software, the functions for every icon and symbols in the software are studied so that it will be easier to use when constructing the circuit.

After understanding the functions of the components used, the circuit is fabricated for PIC. Then, software is used to develop programming codes to use for the system. The software used are Micro C, Proteus and Visual Basic.

Then, testing and debugging the system is done to get the output needed. If any errors occur, the circuit constructed and the programming codes are checked to identify the problems. If the system runs without errors and the output data needed is get, the data is analyzed and compared whether it is as expected or otherwise.

Finally, a brief thesis on the project is written. The thesis consists of five chapters which are Chapter 1 for Introduction, Chapter 2 for Literature Review, Chapter 3 for Methodology, Chapter 4 for Result and Discussion, Chapter 5 for Conclusion and Recommendation.

### 3.2 System Design

The project is started by designing circuit using Proteus. Then, programming code for PIC 16F877A is developed using Micro C. After designing the circuit and developing the programming code, the program is compiled and simulated to get the output data. When no errors occur, circuit is constructed using hardware. Then, it is tested by interfacing with the program developed. Lastly, the GUI is developed using Visual Basic (VB). The flow of the project development is shown in figure 3.1 below:

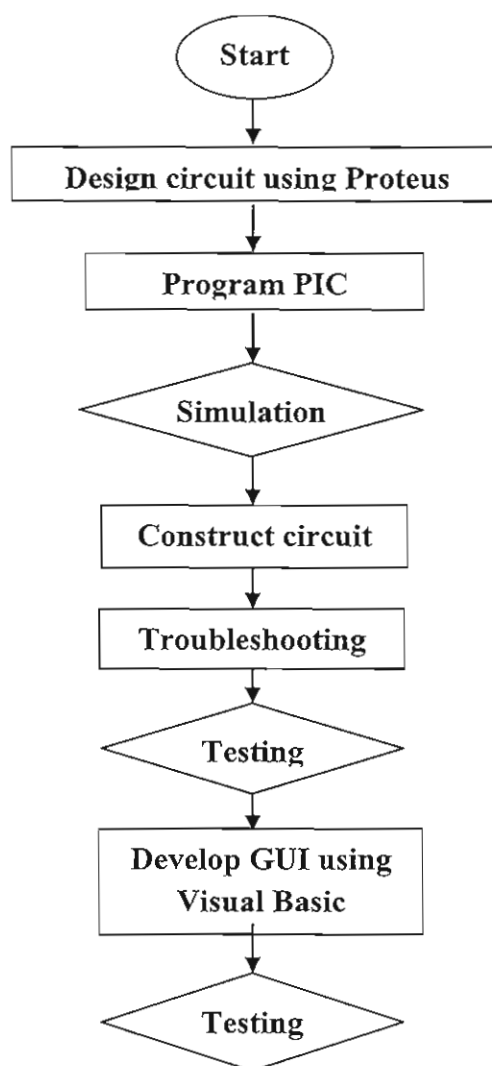


Figure 3.1: Flowchart for project development