UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BUS TRACKER BY USING GLOBAL POSITIONING SYSTEM (GPS) AND GLOBAL SYSTEM MOBILE (GSM)

This report is submitted in accordance with the requirement of Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree in Electronic Engineering Technology (Telecommunication) with Honors.

by

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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 Engineering Technology (Telecomunication) with (Hons.). The member of the supervisory is as follow:

……

(NURULHALIM BIN HASSIM)

ABSTRAK

Projek ini adalah mengenai reka bentuk dan pelaksanaan Bus Tracker dengan menggunakan Global Positioning System (GPS) dan Global System Mobile (GSM). Ia terdiri daripada integrasi antara penerima GPS, mikropengawal dan modul GSM. Kombinasi teknologi-teknologi ini akan menghasilkan sistem pengesanan. Satu sistem pengesanan menggabungkan dua sistem yang diselaraskan oleh pengawal penerima GPS dan dikawal oleh pengguna menggunakan arahan melalui modul GSM sebagai pemancar dan penerima data. Projek ini juga boleh dibahagi kepada dua bahagian utama iaitu kerja tangan atau perkakasan dan perisian komputer. Pembangunan pekakasan termasuklah GPS, sambungan pendawaian mikropengawal dan integrasinya dengan modul GSM. Pembangunan perisian termasuklah membangunkan kod sumber pengawal mikro dan perintah mesej GSM. Apabila projek ini selesai, seorang pengguna boleh menggunakan pesanan ringkas (SMS) untuk menghubungi dan mengenalpasti lokasi terkini alat ini.

ABSTRACT

This project is about the design and implementation of a Bus Tracker by Using Global Positioning System (GPS) and Global System Mobile (GSM). It comprises of integration between a GPS receiver, a microcontroller and a GSM module. This combination of technology will produce a tracking system. This tracking system integrates two system which are the coordinates extracted from the GPS receiver and control capability by users using command through the GSM module. This project can be divide into two main parts which are hardware and software development. The hardware development includes the GPS, the microcontroller wiring connection and its integration with the GSM module. The software development includes developing the microcontroller source code and GSM message command. For the end result, a user can use short messaging system (SMS) from their phone to contact and find out the current location of this device.

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LIST OF ABBREVIATIONS

BPSK	-	Bi-Phase Shift Keying
CDMA	-	Code Division Multiple Access
CEPT	-	European Conference of Postal and Telecommunication Administrations
DOD	-	Department of Defense
EFR	-	Enhanced Full Rate
FOC	-	Full Operational Capability
GPS	-	Global Positioning System
GSM	-	Global System Mobile
IOC	-	Initial Operational Capability
LPC	-	Linear Predictive Coding
ME	-	Mobile Equipment
PCB	-	Printed Circuit Board
SPAD	-	Suruhanjaya Pengangkutan Awan Darat
SIM	-	Subscriber Identity Module
SMS	-	Short Message Service
UMTS	-	Universal Mobile Telecommunication System
USB	-	Universal Serial Bus
UTC	-	Universal Time Coordinated
VLR	-	Visitor Location Register

CHAPTER 1

INTRODUCTION

1.1 Project Background

A vehicle tracking system consists of an electronic device installed on a vehicle so that it can be tracked by its owner or a third-party for its position. Most of the vehicle tracking system uses Global Positioning System (GPS) to get an accurate reading of the vehicle position. Communication components such as cellular Global System Mobile (GSM) and satellite transmitter will be combined to transmit the vehicle's position to remote user. Vehicle's information can be viewed by using a software on a computer.

Vehicle tracking systems are commonly used by fleet operators for fleet management functions such as routing, dispatching, on-board information display and security. Other applications include monitoring driving behavior, such as an employer monitoring an employee, or a parent monitoring a teenaged driver. Vehicle tracking systems are also popular in consumer vehicles as a theft prevention and retrieval device. The police can simply follow the signal emitted by the tracking system and locate the stolen vehicle. When used as a security system, a Vehicle Tracking System may serve as either an addition to or replacement for a traditional Car alarm. The existence of vehicle tracking device then can be used to reduce the insurance cost, because the loss-risk of the vehicle installed with this system drops significantly.

Vehicle tracking is also useful in many other application such as Asset Tracking scenarios where companies needing to track valuable assets for insurance or other monitoring purposes. They can now plot the real-time asset location on a map and closely monitor movement and operating status. Meanwhile, in the field of sales mobile the sales

professionals can easily access their real-time locations. For example, in unfamiliar areas they can locate themselves as well as their customers and prospects. They could also get driving directions and add nearby last-minute appointments. Benefits from this system include increased productivity, reduced driving time and increased time spent with customers and prospects.

It is has been reported that, with similar system the users has been able to get many benefits by auditing employee hours to insure better utilization of vehicles. This system has also proven its ability to reduce mileage hence, reducing the fuel costs through monitoring unauthorized private use of company vehicles (Sabudin, 2010). Productivity will also be increased through better budgeting of time and resources.

1.2 Problem Statement

Proposed design for this project is mainly to find cost-effective, reliable and accurate vehicle tracking device. When vehicles were spread out all over, the user often found it difficult to keep track of what was happening. They require some type of system to determine where each vehicle was at any given time and for how long it has travelled. There is also the need for tracking when an owner is trying to locate a lost vehicle.

GSM and GPS based tracking system will provide effective, real time vehicle location reporting. A GPS- GSM based tracking system will inform where the vehicle is and where it has been, and how long it has been at that location. The system uses geographic position and time information from the Global Positioning Satellites. The On-Board module consists of GPS receiver and a GSM modem.

During vehicle motion, its real-time parameters such as location are reported by SMS message. The system takes advantage of wireless technology in providing powerful

transportation management. The use of GSM and GPS technologies allows the system to track vehicle and to provide the most up-to-date information about ongoing trips.

We can also use it for application that require real time control. As an example this system also can be used for time traffic surveillance. It could be also used as a valuable tool for tourist.

1.3 Objective

The objective of this project is to design and develop a Vehicle Tracking System using GPS and GSM Technologies. In order to fully understand both GPS and GSM technology, the research will study on how both technology works. The objective of this project are:

I. To study and investigate the basic operation of the GPS module and GSM module.
II. To design and develop a tracking system.
III. To construct the hardware for GPS/GSM tracking system.

1.4 Project Significance

This study was chosen because of the concerns over safety of public transport users especially women. For example, majority of women using the public transport at night are usually without any company. The statistic of rape and rob cases at the bus stop are increasing every year (Jusoh, 2010). Jusoh, M. T. B., 2010. Statistik ragut 2010, (SPAD). Thus, the main objective is to ensure safety of women passenger so that they can manage their travelling time with flexibility.

The passenger can manage their time better if there are able to determine the current location of the bus, without having to wait long hours at the bus stop. This can reduce the crime cases in Malaysia and at the same time the user can optimize their time better.

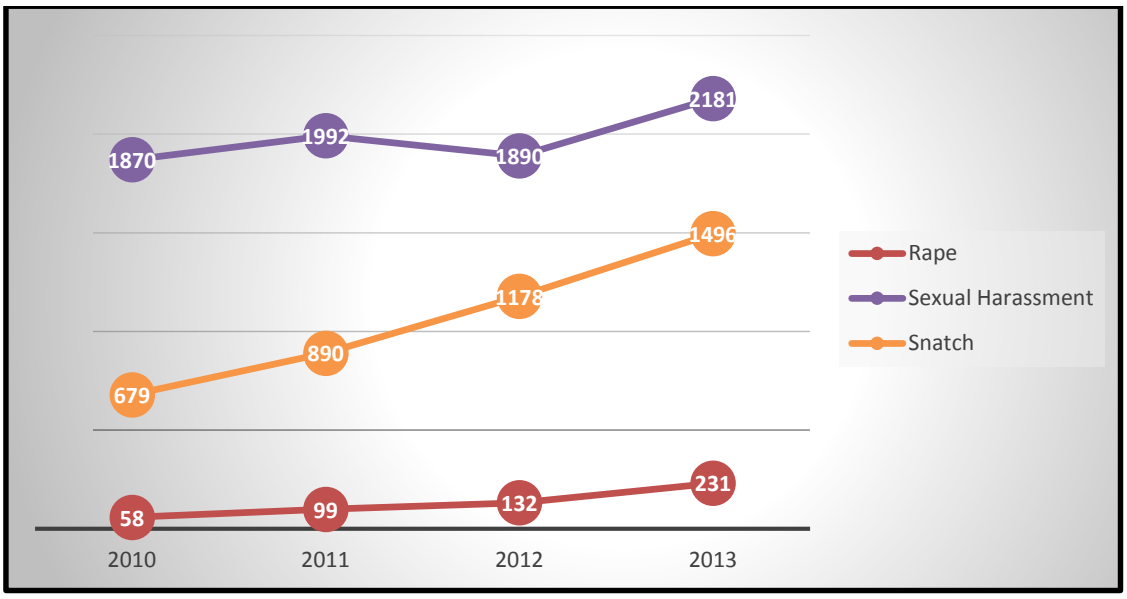

Figure 1.1: The Statistic of Crime at the Bus Station by SPAD.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

This thesis relies heavily on the use of both GPS and GSM. This chapter will begin with an overview of the Global Positioning System explaining about the structure of GPS and the characteristics of GPS. Furthermore, details about the longitude and latitude and how to understand about the location tracking device will be explored.

2.2 Background of Tracking Device

For a long time in history, people has been searching for accurate navigation and positioning methods to determine their location and destinations. The Global Positioning System (GPS) is the best achievement in this search for precise positioning. Though originally intended for military use, GPS has been found useful in many civilian applications including surveying and navigation, thus exceeding its original purpose. The United States Department of Defence runs a freely available and highly accurate positioning system called GPS. This section will provide an overview of GPS and the longitude/latitude co-ordinate system used in this thesis.

2.3 Global Positioning System (GPS)

2.3.1 GPS Background Information

The GPS System was created and realized by the American Department of Defense (DOD) and was originally based on and run with 24 satellites (21 satellites being required and 3 satellites as replacement). Nowadays, about 30 active satellites orbit the earth at a distance of 20200 km (Hoffman-Wellenhof, B, H. Lichtenegger and J. Collins 2001, p. 382).

GPS satellites transmit signals which enables a GPS receiver to extract its location, if it is positioned on the surface of the earth, in the earth atmosphere or in a low orbit. GPS is being used in aviation, nautical navigation and for the orientation of shore. The GPS signal can be used without a fee by any person in possession of a GPS receiver. Furthermore, it is used in land surveying and other applications where the determination of the exact position is required. At first only 18 satellites were be operated. In 1988 the number of satellites is raised to 24, as the functionality is not satisfactory with only 18 satellites (Thuong Le-Tien, Vietnam in 2010).

The first Block I satellite carried sensors to detect atomic explosions. This satellite is meant to control the abidance of the agreement of 1963 between the USA and the Soviet Union to refrain from any nuclear tests on the earth, submarine or in space. When a civilian airplane of the Korean Airline (Flight 007) was shot down after it had gone lost over Soviet territory, it was decided to allow the civilian use of the GPS system. In 1986, the accident of the space shuttle "Challenger" meant a drawback for the GPS program, as the space shuttles were supposed to transport Block II GPS satellites to their orbit. Finally the operators of the program reverted to the Delta rockets which more intended for the satellite transportation in the first place.

In 1989, the first Block II satellite was installed and activated. Temporal deactivation of the selective availability (SA) was done during the Gulf war. In this period civilian receivers were used as not enough military receivers were available. On July 01, 1991 SA is activated again. The Initial Operational Capability (IOC) was announced in 1993 (Thor Hogan, Vic Villhard 2004, p. 12). In the same year it was decided to authorize the world wide civilian use free of charge.

The last Block II satellite completed the satellite constellation in 1994. Full Operational Capability (FOC) was announced the following year. In the year 2000, final deactivation of the selective availability was done and therefore improving of the accuracy for civilian users from about 100 m to 20 m.

2.3.2 Longitude and Latitude Co-Ordinate System

The location of any point on a planar surface can be fully described by both a horizontal and a vertical co-ordinate. Had the earth been truly flat and rectangular as it had been perceived in the past, a simple equally spaced grid system could be used to describe any location on earth. However, the earth is neither flat nor rectangular. It is not even a perfect sphere. The fact of the matter is the earth is an oblate ellipsoid, a slightly egg shaped sphere. A grid-like system of latitudes and longitudes was devised to describe precise locations on earth. Both latitude and longitude are measured in terms of degrees, (°). Figure 2.1 shows a map of the earth including basic longitude and latitude information.

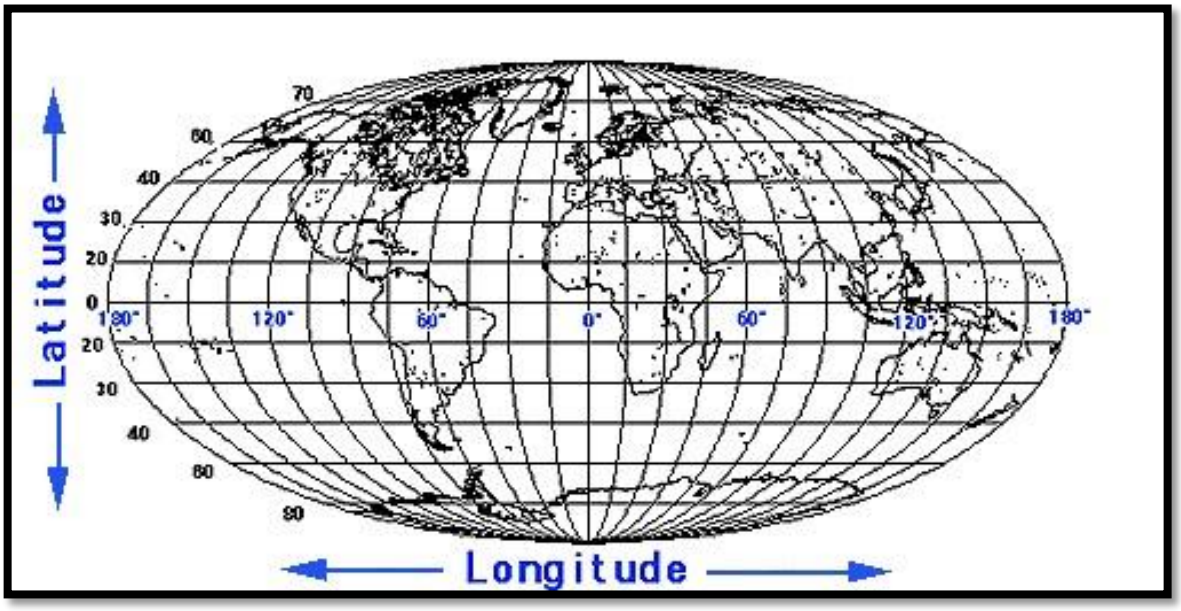

Figure 2.1: The earth divided into Longitude and Latitude.