



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF ASSISTED GLOBAL NAVIGATION
SATELLITE SYSTEM (A-GNSS) VEHICLE TRACKING
SYSTEM**

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

by

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ABSTRAK

Pembangunan Navigasi Global Sistem Satellite yang dibantu (A-GNSS) pengesanan kenderaan yang dicuri dan mencari lokasi kenderaan. Projek ini dicipta untuk membantu pengguna bagi mengesan kenderaan jika berlaku kecurian kenderaan. Projek ini membantu pengguna kenderaan dalam mengesan kenderaan yang dicuri dan menghantar lokasi kenderaan jika pengguna ingin mengetahui di mana lokasi kenderaan mereka. Peranti pengesanan memaklumkan kepada pengguna dengan menghantar latitud dan longitud lokasi kenderaan yang boleh dilihat dari mana-mana lokasi. Projek ini terdiri daripada beberapa komponen yang menggunakan GPS, GPRS Shield, dan Arduino UNO. Pada proses pertama. Pengguna menyedari bahawa kenderaan mereka telah dicuri. Kemudian, pengguna menghantar permintaan lokasi kenderaan mereka daripada modul GPS melalui GPRS Shield dan dikawal oleh Arduino UNO. Selepas itu, GPS mengesan lokasi kenderaan yang dicuri dan GPRS Shield menghantar kembali lokasi kenderaan (latitud dan longitud) ke telefon pengguna, Pengguna akan dapat melihat lokasi kenderaan yang dicuri dengan menggunakan peta google. Akhir sekali, pengguna boleh mengambil tindakan untuk memberitahu atau melaporkan kepada pegawai polis bahawa telah berlaku kecurian kenderaan.

ABSTRACT

Develop an Assisted Global Navigation Satellite System (A-GNSS) vehicle tracking system for stolen vehicles is application that can track and locate the vehicle location. This project needs to be created to help the user to detect their vehicle if their vehicle was stolen. This device helps the user of the vehicle in tracking the vehicle and send the data from the data location if the user wants to know the location of their vehicle. This tracking device can inform the user to send the location data that can be observed from any remote location. This project consists of several components that use, including GPS, GSM/GPRS and Arduino UNO. At the first process, the user knows that their vehicle was stolen. Then, the user sends request location of their vehicle location to GPS module through the GSM and controlled by an Arduino. After that, GPS take the location of a vehicle stolen and GSM sends back the location of the vehicle (latitude and longitude) to the user phone, user will can see the location of their stolen vehicle using google map. Lastly, users can immediately may take action to notify or report to the local police officer that vehicle thief occurred.

DEDICATION

To my beloved parents Nik Azami Bin Nik Ali and Che Zawiah Binti Ismail.

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LIST OF ABBREVIATIONS SYMBOLS AND NOMENCLATURE

A-GNSS	- Assisted Global Navigation Satellite System
BAN	- Body Area Network
DoD	- Department of Defence's
EGBOSM SS	- European Geostationary Navigation Overlay service
FTDI	- Future Technology Devices International
GAGAN	- GPS Aided GEO Augmented Navigation
GPRS	- General Packet Radio Service
GPS	- Global Positioning System
GSM	- Global System for Mobile Communication
ICSP	- In-circuit Serial Programming
IMEI	- International Mobile Equipment Identity
LBS	- Local Based Station
LCD	- Liquid Crystal Display
NAVSTAR	- Navigation Satellite Timing & Ranging
NMEA	- National Marine Electronics Association
PWM	- Pules Wide Modulation
TTL	- Transistor-Transistor Logic
UART	- Universal Asynchronous Receiver/Transmitter
USB	- Universal Serial Bus

- UWB - Ultra-Wide Band
- WAAS - Wide Area Augmentation system
- WLAN - Wireless Local Area Network

CHAPTER 1

INTRODUCTION

1.0 Introduction

The point of this project is to build up an Assisted Global Navigation Satellite System (A-GNSS) vehicle tracking system for stolen vehicles. GNSS meaning of Global Navigation Satellite System, it's an umbrella term that covers all over the earth's surface and continuously transmit signal that enables the user to determine their location of the stolen vehicle. Local based services (LBS) is an application that coordinates the knowledge of the geological area of the cell phone (Ghosh, 2016). The Global Positioning System (GPS) is one part of GNSS. It refers to the NAVSTAR Global Positioning System, a heavenly body, satellite created by the United Department of Defence's (DoD). GPS is currently the most generally utilized GNSS in the world and gives continuous positioning and timing information globally under any weather condition. Global System for Mobile Communication (GSM) is a digital cellular communication.

A GSM Modem is a remote modem that works with a GSM remote system. Remotes modem carries on like a dial-up modem. The capability of a tracking device to trace the vehicles is important in numerous applications. For example, instability of personal vehicle, mass travel frameworks and others. Furthermore, the quantity of vehicle set out toward universally is additionally expected to increment quickly. Later,

this device helps the user of the vehicle in trace the stolen vehicle and send the country location of the vehicle if the user wants to know where their vehicle area. This tracking device can trace the location and send the data longitude and latitude of the vehicle, positioning can be examined from any remote field.

1.1 Statement of the problem

The problem statement of this project is vehicle stolen is notable rated as one of the high theft case vehicle in Malaysia (Alzahri, F.B.B. and Sabudin, 2016). Nobody like his/her vehicle gets stolen. The vehicle manufacturer introduced a base standard security system such alarm based security system. In any event, it's not sufficiently potent. The criminal takes just a couple of minutes to deactivate the security system. Besides, no one will give consideration when the alert system sounded, that's why this system is developed to tackle this problem. This project should be developed to help us to detect their vehicle if the vehicle thief happened. That problem is how making the tracking system that able to send data when the user wants to track the vehicle. This problem makes the user worry about the safety of their vehicle when to park their vehicle at the public parking. It is targeted that this project will serve as a good guide of how important it is to prevent vehicle theft, security or position tracking in the country. Therefore, a simple device, low billing cost, and low network usage must be established.

1.2 Objective

The main point of this project is to develop a prototype of Assisted-GNSS vehicle tracking system to detect the location of a vehicle stolen. Three objectives are listed to achieve the project aim as follows:

- 1) To build a vehicle module by integrating the GSM module, GPS module, and Arduino microcontroller.
- 2) To develop an Arduino program that controls the processes executed by the vehicle module.
- 3) To integrate the information received from the vehicle module with the Google Maps.

The first objective of this project is to build a vehicle module by integrating the GSM module, GPS module and Arduino module. This module must connect to be a one device that must put into the vehicle. This device can give the area location of the vehicle. Besides, for the second objective is to develop an Arduino program that controls the processes executed by the vehicle module. This part uses Arduino software. The coding is must relate to vehicle device to be a successful project. Lastly, for the third objective is to integrate the information received from the vehicle module with the Google Maps. The location of the vehicle can be look by Google Maps from data, latitude and longitude from GSM.

1.3 Scope

The scope of this project is GPS limitation only can be used for outdoor location, it's because these signals spread from the satellite to the receiver antenna along the visible pathway and can't penetrate water, soil, dividers or distinctive obstruction very well. Therefore, in the building, another system is use known as network base.

In addition, the scope of this project is GSM is functional to transmit the information and receive the message from the owner of the car by giving a data (latitude and longitude) from GPS and user also can send the message request to GSM by using GSM technology

1.4 Project overview

In this project, we develop a vehicle model that comprises of a microcontroller, GPS module, and a GSM module. Based on Figure 1.1 below an Arduino UNO ATmega328 used as the microcontroller of the system that's responsible to control the devices by receiving, processing input signal and sending the output. The device communicates with the satellite through a GPS module the capacity of GPS module is to estimate the area of the vehicle and sustain the data to the microcontroller. This project also uses Global System for Mobile Communication (GSM) that transmit the latitude and longitude of the vehicle location. The process starts with the user realize the vehicle was stolen. Then, the user sends request location of their vehicle location. After that, GSM sends the data location of the vehicle (latitude and longitude, the user will see the location of the vehicle using google map on the Android phone. Lastly, users can immediately take an action to notify or report to the local police officer. Thus, the possibility of the vehicle can be perhaps stolen become a decrease and it can ease the policeman's work to trace the vehicle missing.

The full understanding of a project will enable understudy to acquire learning about the structure of the project. In the meantime, the limitation on scope must encourage the student to more exploration in the future also the issue that happened can be understandable.

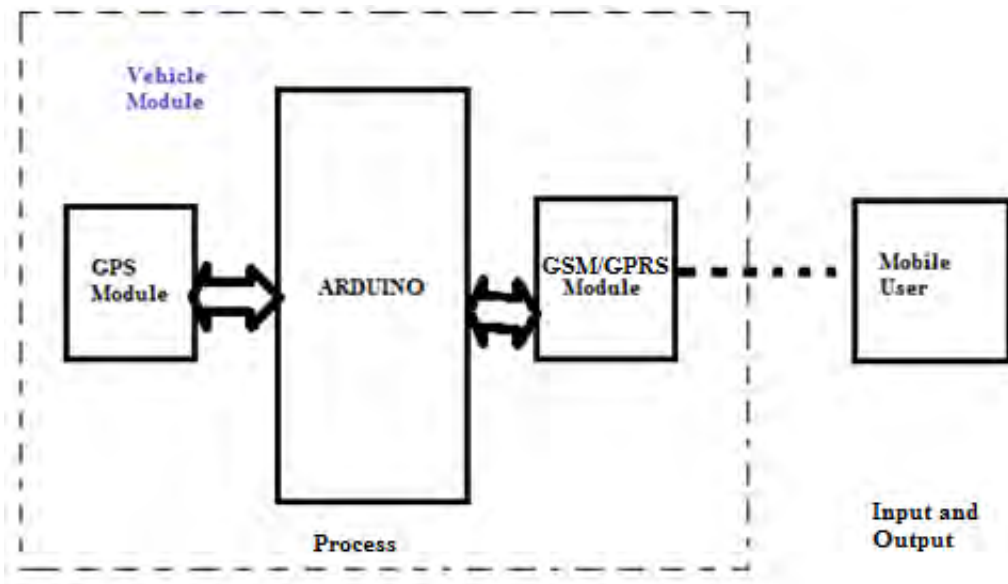


Figure 1.1: Block diagram vehicle tracking

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter reviews several topics about the previous work and literature study which are related with this project. The project of vehicle tracking system is focus on outdoor system. Besides, the details of product, function of component and concept of project also described in this chapter.

2.1 Location Based Services (LBS)

LBS refer to applications that integrate the knowledge of the geographical location of a mobile device with other information to provide services. Such applications include navigation, tracking of vehicle, emergency services and monitoring (Ghosh, 2016). This service that uses location data to control features is widely used in a variety of contexts such as transport. The user need to include a geographical position, at that point the LBS can give the most relevant data to them. For example, when an individual is going in a strange place. LBS can help him/her find a few spots like a tourist attraction, hotel, the nearest hospital and so on. Forgiving more flexible and convenient LBS the polygons spatial query has been proposed and attracted considerable interest recently. (Zhu, Liu and Li, 2017)

2.2 Tracking System Technology

Vehicle tracking system was early implemented in the marine industry, but the technology is fast growing from time to time. The vehicle tracking system is being utilized as a part of a many approaches to track and show vehicle area progressively. As vehicle ownership becomes more affordable due to growth of countries, the global number of vehicle ownership is expected to increase. (Mistary and Chile, 2016).

The tracking system is the system that can trace the vehicle if there should be an occurrence of a moving target and it additionally can be bolstered the appropriate data for the objective in some application. There are numerous innovations are sent for the following system, for example, GPS, Wireless Local Area Network (WLAN IEEE 802.11b), cell arrange, Bluetooth, Ultra-Wide Band (UWB, Body Area Network (BAN), and Wireless sensor systems (WSNs). This power utilization, practical and its continuance are restricted of these is an innovation. Then, this innovation, which is reacted our desire (ease, low power utilization, precision and perseverance) (Aziz, K., Tarapiah, S., Ismail, S.H. and Atalla, 2016)

There are several types of tracking system that can be used, and every tracking system has own advantages and disadvantages. The comparison of the features and characteristic of each tracking system is shown in the Table 2.1 below. From the comparison below shows GPS and GSM are more suitable to be tracking system for this project. It is because GPS and GSM can be tracked every time by using the satellite to transmit and receive the information through SMS via smartphone.

Table 2.1: Comparison between Radio Frequency (RF), Infrared (IR) and GPS and GSM system.

Radio frequency	Infrared	GSM and GPS
Portable	Portable	Portable
The circuit can be costly and complicated	Low cost and simple circuit	Higher cost because it's a new technology also it a simple circuit
Sensitivity to weather	Sensitivity to weather,	Sensitive if rainy day
Can penetrate most solid ad pass through walls	Cannot cross any obstacle	Not easy to transmit in a rainy environment
Two devices do not require to be line of sight	Requires line of sight and only can be tested in indoor environments.	Two devices do not require to be line of sight
Wide range from a few meters to millions of kilometres	Small range	Low limitation range

2.3 Assisted Global Navigation Satellite System (A-GNSS)

GNSS remains for Global Navigation Satellite System, it includes all worldwide satellite situating frameworks. This incorporates groups of stars of satellites circling over the world's surface and constantly transmitting signals that empower clients to decide their position GNSS is utilized as a part of a joint effort with a GPS framework to give exact area situating anyplace on earth. GNSS and GPS cooperate, yet the principle contrast amongst GPS and GNSS is that GNSS good gear can utilize route satellite from another system past the GPS framework and more satellites imply expanded recipient precision and unwavering quality. All GNSS collectors are good with GPS, however, GPS beneficiaries are not perfect with GNSS.