UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART TRACKING SYSTEM USING GSM

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

by

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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 in Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Sejumlah besar kenderaan dilaporkan hilang setiap tahun dan malangya jabatan polis tidak dapat menemui separuh daripada kenderaan yang hilang sehingga hari ini. Oleh itu, untuk meningkatkan keselamatan dan mengelakan kecurian kenderaan, sistem penjejakan yang bermanfaat dengan sangat cekap dan boleh dipercayai diperlukan. Tujuan projek ini adalah untuk menggabungkan GPS dengan teknologi GSM dan mengaitkan dengan aplikasi android. Projek ini dibahagikan kepada tiga fasa. Pada fasa pertama projek ini, interaksi antara sensor getaran (vibration sensor), modul Arduino dan GSM. Apabila penceroboh atau jenayah cuba memasuki kenderaan pemilik, sensor getaran akan dicetuskan. Data sensori ini akan dianalisis oleh Arduino dan kemudiannya menghantar amaran kepada telefon pintar pengguna sebagai sistem pesanan ringkas (SMS) melalui teknologi GSM. Fasa kedua projek ini adalah memasangkan modul GPS dengan modul GSM dan Arduino. Apabila penyusup cuba mencuri atau mengusir kenderaan, Arduino akan menghantar isyarat kepada modul GSM dan pengguna akan menerima amaran melalui (SMS) ke telefon pintar pengguna. Apabila arahan yang dihantar oleh pengguna sepadan dengan arahan yang telah diprogramkan dalam sistem, pengguna akan menerima koordinat latitud dan bujur dari modul GPS ke telefon pintar mereka melalui modul GSM. Fasa terakhir projek ini adalah menggunakan perkhidmatan telefon pintar dengan Arduino and mekanisme enjin. Dengan menggunakan perkhidmatan ini, pengguna boleh mengesan pergerakan kenderaan dan mengarahkan sistem untuk mengawal mekanisme enjin kenderaan dengan menghentikan kenderaan.

ABSTRACT

A large number of vehicles were reported missing every year and the worst case is the police department are not able to found even half of the missing vehicles until today. Hence, in order to improve the safety and enhance the security of the vehicle, a beneficial tracking system with highly efficient and reliable is needed. The purpose of this project is to combine the GPS with GSM technology by interfacing with an android application. This project is divided into three phases. The first phase of this project, is the interaction between vibration sensor, Arduino and GSM module. When the intruder or criminal trying to enter into owner's vehicle, the vibration sensor will be triggered. This sensory data will be analyzed by Arduino and later send an alert to user's smartphone as a short-message system (SMS) via GSM technology. The second phase of this project is pairing GPS and GSM module with Arduino. When the intruder trying to steal or drive away the vehicle, Arduino will transmit a signal to GSM module and the user will again receive an alert via (SMS) to user's smartphone. When the command that send by user is match with commands that already programmed in the system, the user will receive the latitude and longitude coordinates from GPS module to their smartphone via (SMS). The last phase of project is pairing a smartphone application with Arduino and engine mechanism. The user must have SMS feature on their smartphone where they can interface with GPS and GSM module. Using this feature, the user can track the movement of the vehicle and instruct the system to take control on vehicle's engine mechanism by controlling the speed of vehicle. In conclusion, this system able to reduce vehicle loss and eventually help to minimize vehicle theft rate in the country.

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DEDICATION

I dedicated this thesis to

My beloved parents, Mr & Mrs Pitchamuthu Govindan

My generous supervisor, Madam Wan Haszerila

My supportive panels and lecturers

My motivational and loyal friends

Thank you everyone for the support throughout this journey

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CHAPTER 1

INTRODUCTION

1.0 Introduction

The vehicle tracking system is a device that tracks the location of vehicle once it got stolen by intruder or theft and retrieve the vehicle from the theft with the help of police department. There are several important goals that can be achieved once this device is implement on the vehicle's interior. By the time a person realized that their two-wheeler or four-wheeler vehicle got stolen, it is too late for them to seek for people's attention and asking for a help or call the police department and explaining the incident, while the intruder might already gone too far from the original location and starts to dismantle for the parts. At this point, tracking device can be used to tighten the vehicle's security, by sending an alert or warning to owner if someone trying to open and break into car, so that the owner would have enough time to prevent their vehicle from got stolen, either by locked the car for a particular time or deactivate the engine system.

Most of the automobile manufacturer nowadays have thrived with technology where they have enhanced the security feature of the vehicle by built in multiple security measures. However, technology development also has backdrop where adept thefts has their own smart tools to weaken the vehicle's security system and eventually steal away the vehicle especially cars, without anyone noticing. Therefore, by fixing a tracking system inside the vehicle, the owner can track vehicle's current location with help of Global Positioning System (GPS), Global System for Mobile Communication (GSM) and satellite transmitter.

Besides that, this system could be a helping hand for the police to look for the lost vehicle by simply using the signal sent by the system. This tracking device can be used to protect their loved ones. This tracking system can be used for other purpose as well which is help in businesses to minimize the operational cost. However, inventing a system against the theft whom trying to steal someone's valuable vehicle is the main concern here since the vehicle theft rate in Malaysia is on rise over the year.

1.1 Objectives

There are some objectives that need to be achieved in this project:

a) To design a tracking system by using GPS and GSM technology to make sure the owner can track the location of their vehicle all the time.

b) To develop a warning system by using vibration sensor and utilize android features to enhance the security features in a vehicle.

c) To evaluate the performance of developed system.

1.2 Scope of the project

The system started to utilize once the microcontroller receives signal pulse from Vibration sensor. Vibration sensor determine the activation of the system from the moment the intruder in contact with the vehicle which is related to the sensing range between intruder and the other part of the vehicle, like for example, vehicle door. When someone tries to have contact with the vehicle door, the sensor produced pulses and send it to Arduino and this will send an alert to user smartphone through a Short Message Service (SMS) by using GSM technology. The person has to react within one minute once the person receives the SMS, otherwise the system will understand that it is not an emergency situation and stop sending the alert but continue collecting the GPS data. Once the vehicle started moving from the original location, the Arduino interface with GSM and GPS module to send alert to the user smartphone and updates the current location of the vehicle from time to time. Based on the data received from microcontroller, the user can interact with Arduino to limit the speed of the vehicle and turn on the anti-theft alarm of the vehicle through smartphone application.

1.3 Problem Statement

There are almost 60-80 vehicles being stolen every day in Malaysia and there is only two main reason that local brand vehicles are still on high demands among Malaysian car thieves because the vehicles spare parts are still demand for higher prices in black market and the local brand vehicles can be easily modify and has the tendency to resell it at higher price as well [1]. For some people they do not use vehicle just for professional and luxury purpose but they would feel emotionally connected with the vehicles because some people bought their first vehicle with a dream and passion and even assumed it as their lucky charm. So, when the vehicle got stolen, people would be emotionally affected and the worst thing is when they did not have any idea where is their vehicles and they are clueless about finding the vehicles back and realized the probabilities to recover their vehicle is exceptionally little. Therefore, this project is about tracking the location of vehicle once it got stolen and take control on the vehicle mechanism through smartphones. It is possible to operate a system through a smartphone by using GSM as the main communication tool between smartphone and system and interface it with GPS and sensors as well. The aim of this project to create a tracking system at affordable prices for all vehicle owner. The idea behind of this project is also inspired by real incidents.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter discussed about the previous project and other related technical process that have been done by another researcher which is related to the proposed system. The source of information related to the proposed system is obtained from journal, articles, research paper and Internet. The sources have been read, reviewed, analyzed and compared in order to identify the technology been used, the working principle and methods that apply to implement their projects.

2.1 Review on Development of Vehicle Tracking and Monitoring System on Various Techniques and Features.

There are few journals from previous project which related to the proposed project have been studied and included in the next section to understand better about the proposed project, expand knowledge regarding the technical issue in the project and to innovate and improvise the proposed topic for better version.

2.1.1 Android Based Vehicle Anti-Theft Alarm and Tracking System in Hand held Communication Terminal

Manyi Qian, Hailin Gao and Weihong Liu (2018) [2] had done a project, which entitled as "Android Based Vehicle Anti-Theft Alarm and Tracking System in Hand-held Communication Terminal".

The purpose of this project is to prevent the vehicles from being stolen and to improve vehicle safety system in China by tracking the current location of the vehicle and activate long-distance remote alarm which is known as anti-theft alarm. This system is developed by using different type of sensor such as acceleration sensor, direction sensor and magnetic sensors and Android OS, Internet or other communication network, (GSM) and GPS. The sensors are built-in a smartphone, so that whenever the smartphone/sensor detects any movement, the sensory data will be analyze by the application that installed in the smartphone and later on, abnormal information, (contain warning messages and the longitude & latitude of the vehicle) will be send to the owner's smartphone through Internet or other communication network (GSM). Based on the information receives, the user now can track the location of the vehicle by using GPS and as well as can activate the anti-theft alarm. There are two smartphones were used, one will be placed hidden inside the car and another one will be handled by the user and the whole communication between smartphones are based on the Internet or any other communication network (GSM) if Internet not available. Figure 2.1 shows the architecture of Anti-Theft Alarm and Tracking System.

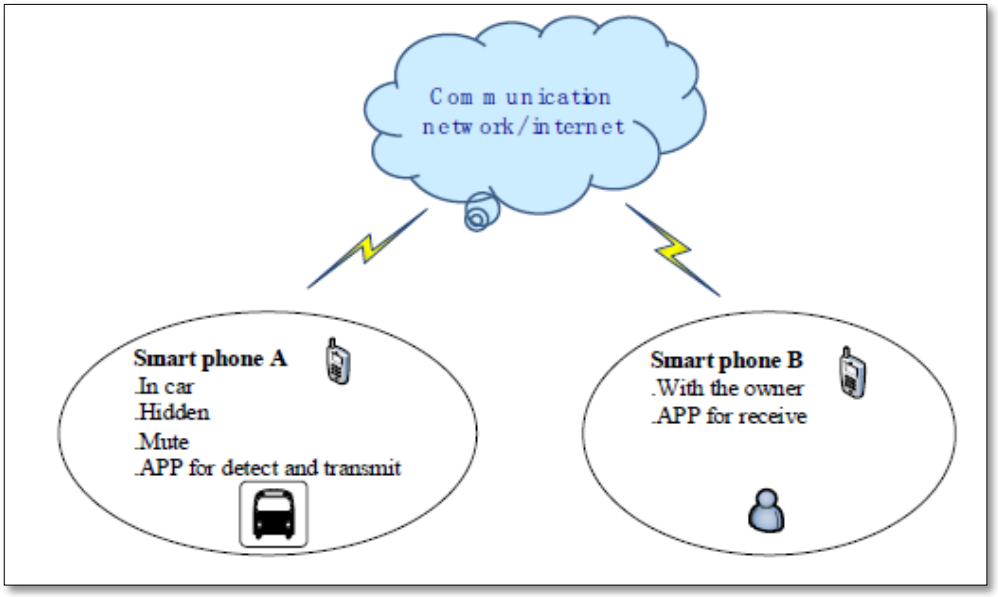

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Figure 2.1: The Architecture of Anti-Theft Alarm and Tracking System

2.1.2 Vehicle Anti-Theft Tracking System Based on Internet of Things

Zhigang Liu, Anqi Zhang and Shaojun Li (2013) [3] had done a project, which entitled as "Vehicle Anti-Theft Tracking System Based on Internet of Things". The purpose of this project is to monitor the movement of vehicle by using GSM and GPS technology. The system is integrated with RFID module, sensor (PIR & vibration sensor), GPS module (EM-406A model), microcontroller (PIC16F877A) and GSM module (SIEMENS TC35i). The system is initially controlled by RFID module, based on the active tag that attached on owner's vehicle key and the reader that fixed inside the vehicle. When the owner gets inside the vehicle, a signal from the activate tag will send to reader and it will turn off the power circuit of the system. The system starts working once the owner leaves the vehicle, move away from interrogation zone. When the vehicle is been intruded by intruder or criminals, the vibration and pyroelectric infrared sensor will be triggered. These sensory data will be analyzed by master control module and it will send a signal to GSM module. Later the GSM module collect information from GPS module and notify the owner via SMS. When the owner finds their vehicle move away from initial position or been stolen, the owner can track movement of the vehicle from their Android software. By using the same android software, the owner can communicate with GSM module via SMS and through the GSM module, the owner sends alert or information to microcontroller (master control module) to lock and unlock the car. Figure 2.2 represent the block diagram of Vehicle Anti-Theft Tracking System Based on IoT.

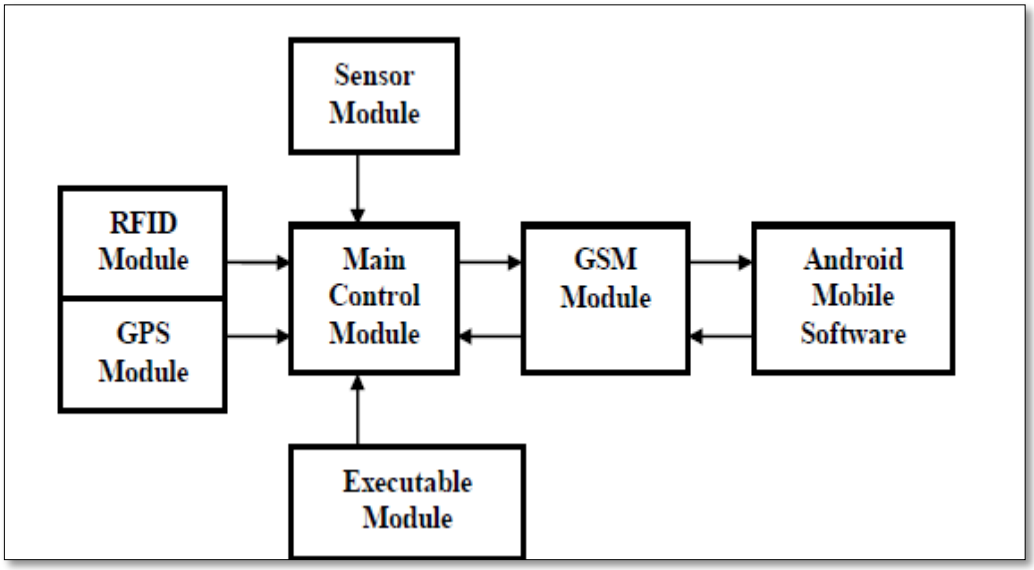

Figure 2.2: The block diagram of Vehicle Anti-Theft Tracking System based on IoT