



CAR IMMOBILIZER USING WIRELESSLY FOR VEHICLE SECURITY ANTI-THEFT SYSTEM



**FACULTY OF ELECTRICAL AND ELECTRONIC
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CAR IMMOBILIZER USING WIRELESSLY FOR VEHICLE SECURITY ANTI-THEFT SYSTEM

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



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2020

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Tajuk: Car Immobilizer Using Wirelessly For Vehicle Security Anti-Theft System

Sesi Pengajian: 2020

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DEDICATION

I dedicate my dissertation to my family and my friends. A particular feeling of gratitude to my dear parents, Cheah Kong Ming and Ho Chiang Inn who always stay beside me and encourage me with the words that raise me up. My brothers Eng Yoong and Eng Shen have always feel free to share their experiences with their final year project during their degree in electrical engineering.

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ABSTRACT

Security has become a matter of concern, especially theft of vehicles in common parking spaces. Use of an embedded system integrated with GPS and GSM to implement an efficient automotive security system for anti-theft. This proposed project is to develop an anti-theft system based on GSM and GPS to improve the security of vehicle and determine the actual location where the vehicle parked at. This system includes of neo-6m GPS module, sim900A GSM module, Arduino uno atmega328p, 4x3 matrix keypad, IR sensor, and buzzer. GPS module is use to track the location of the vehicle while the GSM module enable the communication between the user and microcontroller. The password authentication is verified by using keypad. Arduino the heart of the system which is used to receive or send message to the user and give command to other components. IR sensor is a sensor for detect the condition of vehicle and buzzer is act as alarm. The system work when the IR sensor is active which means the vehicle has break in, then a message will send through GSM and Arduino to the user. the theft required to enter password to start the engines. If fail the engine would not get start and the buzzer will turn on to alert the theft. The user now can track the vehicle using mobile phone and the actual location is shown in Google map. This system is helpful to make sure your vehicle is safe and secure. The sensitivity of the sensor and the range of the distance that can de detect from GPS can be improved to make this system complete.

ABSTRAK

Keselamatan, terutamanya kecurian kenderaan di tempat letak kenderaan biasa menjadi perhatian. Sistem keselamatan automotif yang cekap dilaksanakan untuk anti-pencurian menggunakan sistem tertanam yang disatukan dengan GPS dan GSM. Projek yang dicadangkan ini adalah untuk mengembangkan sistem anti-kecurian berdasarkan GSM dan GPS untuk meningkatkan keselamatan kenderaan dan menentukan lokasi sebenar kenderaan itu diparkir. Sistem ini mengandungi modul GPS neo-6m, modul GSM sim900A, Arduino uno atmega328p, pad kekunci 4x3, sensor IR, dan buzzer. Modul GPS digunakan untuk mengesan lokasi kenderaan sementara modul GSM membolehkan komunikasi antara pengguna dan mikrokontroler. Pengesanan kata laluan disahkan dengan menggunakan pad kekunci. Arduino inti sistem yang digunakan untuk menerima atau mengirim mesej kepada pengguna dan memberi perintah kepada komponen lain. Sensor IR adalah sensor untuk mengesan keadaan kenderaan dan buzzer bertindak sebagai penggera. Sistem ini berfungsi apabila sensor IR aktif yang bermaksud kenderaan itu pecah, maka mesej akan dihantar melalui GSM dan arduino kepada pengguna. kecurian yang diperlukan untuk memasukkan kata laluan untuk menghidupkan enjin. Sekiranya gagal enjin tidak dapat dimulakan dan bel akan menyala untuk memberi amaran kecurian. Pengguna sekarang dapat mengesan kenderaan menggunakan telefon bimbit dan lokasi sebenarnya ditunjukkan di peta Google. Sistem ini berguna untuk memastikan kenderaan anda selamat dan terjamin. Sensitiviti sensor dan jarak jarak yang dapat dikesan dari GPS dapat ditingkatkan untuk menjadikan sistem ini lengkap.

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LIST OF SYMBOLS

D	-	Displacement
t	-	Time
d	-	Distance
lt	-	Latitude
lg	-	Longitude
v	-	Velocity
a	-	Acceleration
rpm	-	Rotate per minute



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LIST OF PUBLICATIONS



CHAPTER 1

INTRODUCTION

Nowadays with the increase in population has leads to increase in vehicles. Many branded companies promote new vehicle in the market with latest and advanced technologies to improve the security and safety of the vehicles. Meanwhile, the GPS and GSM is very common technology that used on design a security system. Both GSM and GPS can be function together at the same time to provide a better security system. The latest system like GPS system is very useful and it helps to track the location of vehicle everywhere. The hardware of the system is very small and assembled on the vehicle that makes invisible to the person who look from inside or outside of the vehicle. The system also helps to detect the shortest way to go to the desire destination within short time. Another system is GSM known as Global System for Mobile Communications is widely used in industry today because of the exist of the internet. This system mostly embedded in mobile phone GSM had been designed to be a secure wireless network. Using a pre-shared key and treat-response and pass through the-air encryption it considered the user authentication.

1.1 Background

The increase in the vehicle has resulted in increased criminal activity. The rise in crime means the increase in the theft of motor vehicles. Theft of motor vehicles in the United States involves the robbery or attempted theft of a motor vehicle that is described by the UCR system as a self-propelled vehicle operating on the surface rather than on rails. The FBI's Uniform Crime Reporting (UCR) initiative is a national, voluntary collaborative project of almost 18,000 local, university and college, city, state, tribal and federal law enforcement departments who collectively monitor crime data brought to their attention.

In its definition of motor vehicle theft, the FBI consider all of transportation is the target of the theft. FBI is mainly focus on the theft or attempted theft of automobile and motorcycles. In 2016 motor vehicle theft lost around \$6 billion. The gross per-theft dollar loss was \$8,407. Based on the FBI report, the engine vehicle was stolen is quite positive compare to the motor vehicles because of the vehicle engine was much difficult to take apart. In 2018, 748,841 vehicles were stolen, showing 3.1 per cent lower than in the previous year.

Since from 1991, the massive trended downward of the vehicle robberies cases are in year 2017 which shows statistically dropping to 773,139 cases is about 55 % refer to the FBI reports. The National Insurance Crime Bureau credits law enforcement actions to contribute to the reduction of theft, together with the development of unique anti-theft initiatives, technology and insurance organizations such as the NICB. Preliminary FBI statistics indicate that vehicle thefts decreased by another 3.3 per cent in the first half of 2018.

Given the drop of car robberies over the past two decades, market experts caution that hackers are increasingly finding fresh and innovative methods to snatch automobiles. Car burglary often seeks a way to get into the car, although the new equipment was used to improve the security mechanism. The car burglary has thousands of tactics include acquiring smart key that get rid of the cabling for stealing car. The smart key is able to change the vehicle identification numbers. To make sure the car loans to be success, they will use the stolen identities to make the loan.

Year	Vehicles stolen	Percent change
2009	795,652	-17.0%
2010	739,565	-7.0
2011	716,508	-3.1
2012	723,186	0.9
2013	700,288	-3.2
2014	686,803	-1.9
2015	713,063	3.8
2016	767,290	7.6
2017	772,943	0.7
2018	748,841	-3.1

Table 1.1: Total vehicle stolen in U.S from 2009-2018

1.2 Problem statement

The rate of vehicle theft is very high all through the world and the situation are even worse in developing country especially in Malaysia. The security system in the high technology era supposed to be perfect but refer to the statistic above shows that the vehicle theft is still uncontrollable beyond to competence of the security system. The security system may still have space to improve to make the system perfect. This happened due to the insufficient of range of the sensor that can be detect. The owner has no idea when their vehicle is missing because there is nothing alert them. Assume that if they can see their vehicle condition by using cell phone and they get notice when their vehicle get stolen.

1.3 Research objective

In this project, the following objective are to be achieved:

- To develop an anti-theft system based on IoT
- To improve the security system of the vehicle
- To determine the final location of where the vehicle stopped.

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1.4 Scope of research

The scope of this project is to improve the security system of vehicle. Vehicle is considered as one of the properties of the human. This anti-theft system will apply on the car in Malaysia. There are a lot of components used to design this system. GPS and GSM are the most common module that use in any protection system. GPS is function as to track the movement of the vehicle and helps to locate the location where the vehicle stopped. While GSM is the common module that use in electronic device that provide the communication between the device and user. The microcontroller Arduino Atmega 328p is used as the brain of the whole system. The IR infrared obstacle avoidance sensor has the detection range about 2-30cm

approximately. There is 4x3 matrix membrane keypad is used. Buzzer is one of the components that build in this project as it is function as the alarm.

1.5 Thesis outline

Based on the topic that had been introduce previously and approach, this thesis consists of 3 chapter as follow:

- Chapter 1 is the introduction of overall of the topic which include the problem statement, the objective of the project, and scope of the project.
- Chapter 2 is about literature review. This chapter is briefly summarized the overview of the anti-theft vehicle security system. this chapter will further explain the details of common anti-theft security system that use in technology nowadays which is based on IoT, GPS, GSM, fingerprint, passcode, and RFID.
- Chapter 3 is methodology as usual the format of the report. This chapter will present the details method that have been use on developed an anti-theft security system based on IoT and how the project design to be.

1.6 Summary

In summary, this chapter is present about how important the vehicle security anti-theft system based on GSM and GPS contribute to the engineering fields in Malaysia. Both of the GSM and GPS system are very effective and useful to improve the vehicle security system cause of living in the IoT era. Internet access is widely spread through the world and easily to get can all information at everywhere. Nothing can hide from internet if the information expose. As the result, the IoT is implement into the anti-theft system with the GPS and GSM.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The security of the vehicle is a matter that needs to be consider in high-tech world. Thieves have a lot of way to break down the vehicle security system. Therefore, the improvement of the security system of the car is a must. GSM and GPS are one of the best choice to improve the security of vehicle, but there is only single protection of vehicle. What is needed to improve is to develop double or triple protection security system of vehicle. The system might work with IoT, RFID, fingerprint, and password authentication system. Below will further discuss about those system.

2.2 Global positioning system (GPS)

GPS is a short term of Global Positioning System that used to trace the location of vehicle. A GPS framework could be able to figure out its position accurately with the timing signal send by the satellite over around the world. satellite stations send the location information to the GPS receiver channel. It consists of internal RTC back-up and the microcontroller can be connected directly to USART. The module itself provide the current speed, time, date, longitude, latitude and travel distance among other data. Those data is very useful in many application such as satellite navigation, trace system and artificial intelligent robot.[1][2]

One of GPS module was sim908 module that used by Mrinmoy Dey and his colleagues who from the ECCE experiment in 2018. The sim908 module is built in with Quad-Band GSM/GPRS module which combines GPS technology for satellite navigation. The sensitivity of the module is able to capture the location of moving vehicle every 10 seconds. By using Haversine formula, we can figure out the displacement of the vehicle to the user.[3]

However, the accuracy is one of the importance elements to be considered. In order to estimate the particular position or changes from its original position and reduce unpredictable data lost from the GPS, the GPS system is embedded with a smart intelligence tool. When the GPS signal is out of the detection range or fault, these programmed smart intelligence tool will estimate the location of vehicle. Kalman Filter who successfully made the GPS measurement is updated whenever, the speed and attitude within the last time. As well as the meter for measure acceleration of vehicle are recorded within the index as input therefore the changes of position is additionally saved as output. The GPS memory which will store the right location of the vehicle is about first 5minutes of GPS signal losses to track the vehicle from its stationary state. As the conclusion, the road experiment prove that the ensemble configurations are ready to improve the accuracy in relocate position of the vehicle under several situations.[4]

2.3 Global system for mobile communication (GSM)

Global system for mobile(GSM) modem is a specialized type of modem that need to insert a SIM card to make the system operate as a mobile communication system. It must include both parties to make the communication to be done. Circuit switching is the process that use in the GSM. This would allow communication between two devices. For an instance, the purposed of the GSM installed in the vehicle is to let the owner know the information of vehicle. This system will automatically send the message to the one who has close relationship to the user for seeking help in case of accident happen. GSM network consists of 3 main system.[5]

The switching system is an operating system in which a lots of importance tasks are stored. Which the SS systems have 5 databases that carry out different activities. SS system's key task are to manage call handling and related services for subscribers. SS systems consists of

5 type of databases. One of the data based from SS systems is the MSC that takes care of mobile calls and phone calls routing in cooperation with the Home Location Register and Visitor Location Register. The authentication center (AUC) is a core component of a global home locator registry network for mobile communications (GSM). When a phone has a live network signal, the AUC validates any SIM card attempting to connect to the network. It also provides protection to ensure third parties would not be able to access the network services

In cellular communication the base station plays a key role. BSS are basically components of outdoor use and important for connecting users from MS to mobile network. For all communication radio transmission is used. BSC and BTS system are both divided from the BS which known as the Base Station. BTS abbreviation as Base Transceiver Station plays with the communication using mobile station radio transmission. While the BSC (Base Station Controller) function is to create a medium that connect between user MS and BTS. BSC also has the function to manage and control the data information between these two stations.

MS consists of a smart card and a mobile unit which is also referred to as a subscriber Identity Module (SIM) card. This kind of card is made to fit in the GSM module and allow better flexibility for the user. International Mobile Equipment Identity (IMEI) is a specific code that use to identify the document and information of equipment.[1]

In 2010 MZ Parvez, KZ Ahmed, QR Mahfuz and MS Rahman developed a theoretical model of vehicle tracking system based on the GSM network. Many of researchers have tried to design a computerise vehicle tracking system that will trace and show the location of vehicle by using their communication device From the research, shows that the mobile phone was highly recommended to use to implement in the vehicle tracking system.[6]