UNIVERSITI TEKNIKAL MALAYSIA MELAKA

THE DEVELOPMENT OF MICROCONTROLLER BASED WIRELESS STOLEN CAR DETECTION SYSTEM

This report submitted in accordance with requirement of the UniversitiTeknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Electrical Engineering Technology
(Industrial Power) (Hons.)

by

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SESI PENGAJIAN: 2015/16 Semester 1

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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 Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

……

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ABSTRAK

Projek ini membentangkan sistem keselamatan menggunakan perkhidmatan GSM-SMS. Pembangunan GSM Sistem Keselamatan Kereta adalah penyelesaian kepada semua pemilik kenderaan untuk meningkatkan keselamatan kenderaan mereka daripada kecurian kereta. Pengawal mikro akan memproseskan maklumat bahawa keadaan kereta dalam keadaan merbahaya. Ia akan memproses maklumat dan dihantar ke menggunakan Global Sistem Komunikasi melalui telefon bimbit. GSM menghantar keadaan kereta kepada pemilik melalui telefon mudah alih sebagai pesanan ringkas (SMS). GSM telah digunakan secara meluas dalam sistem komunikasi dan komunikasi tanpa wayar ini adalah berkesan dengan penggunaan Perkhidmatan Pesanan Ringkas (SMS). SMS telah digunakan kerana peningkatan penggunaan telefon bimbit pada masa kini. Sistem ini saling berkaitan dengan sistem penggera kereta dan memberi isyarat kepada pemilik pada telefon bimbitnya. Sistem ini dirangka dengan peranti electronik iaitu mikropengawal PIC16F877A, MAX232, LCD 16x2 dan GSM Modem. mikropengawal telah diprogramkan menggunakan perisian microC PRO dan perisian Proteus 8 Profesional. Sistem keselamatan yang boleh digunakan oleh pengguna kereta untuk mengetahui kereta yang dicuri dalam masa yang singka

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ABSTRACT

This Project presents a security system using GSM-SMS services. The development of GSM Car Security System is a solution to all vehicle owners to increase the security of their vehicle from car theft. The microcontroller is processes the information the dangerous condition of the car. It will process information and sent to the using Global System Communication for mobile phones. The GSM transmitting the condition of the car to the owner on his mobile phone as a short message (SMS). GSM has been used widely in mobile and this wireless communication is effective with use of Short Message Services (SMS). SMS was used because the increasing use of mobile phone nowadays. The system are interconnected with the car alarm system and alert the owner on his mobile phone. This system is compose with hardware which is microcontroller PIC16F877A, MAX232, 16x2 LCD and a GSM Modem. The microcontroller were programmed using microC PRO and using Proteus 8 Professional software. This security system can be used by the car users in order to discover the stolen car in short time.

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DEDICATION

I dedicate this theses especially to my parent. I hope this thesis achievement will fulfil the dream that you had for me. Special thanks to my supervisor, Prof Madya Mohd Ariff Bin Mat Hanafiah and thank you very much too to all my friends especially Muhammad Zulfitri Bin Zainal Abidin and Muhammad Hafiszan Bin Mohd for their support and help in this project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

GSM	-	Global System for Mobile Communication
SMS	-	Short message service
LAN	-	Local Area Network
WANET	-	wireless ad hoc network
WPAN	-	Wireless Personal Area Network
WLAN	-	Wireless Local Area Network
WMAN	-	Wireless Metropolitan Area Network
WWAN	-	Wireless Wide Area Network
WLL	-	Wireless Local Loop
TDMA	-	time division multiple access
CDMA	-	Code-Division Multiple Access
UHF	-	ultra-high-frequency
IR	-	Infrared
GPS	-	global positioning system
DTMF	-	Intelligent Electronic Devices
CAN	-	Control Area Network
ECM	-	Engine Control Module
WDT	-	Transmission Control Protocol/Internet Protocol
TDMA	-	Variation Of Time Division Multiple Access
Fdma	-	Frequency Division Multiple Access

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HLR	-	Home Location Register
BBS	-	Base station system
UE	-	User Equipment
MT	-	Mobile Termination
TE	-	Terminal Equipment
TA	-	Terminal Adapter
SIM	-	Subscriber Identity Module
PID	-	Protocol Identifier
DCS	-	Data Coding Scheme
LCD	-	Liquid Crystal Display

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CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter explains about the project. The explanation include the problem statement of this project and also the objectives of the research. There are also have a few guidelines listed.

1.1 Background

The development of microcontroller based wireless stolen car detection system is the major concern nowadays. By developing this project, the car theft cases can be avoided. If the presence of the intruder is detected, the owner of the car will be informed by receiving a message on their hand phone. The hardware development and software design are combine this project. For hardware development, this system is controlled by a microcontroller PIC 16F877A and for the software design is conduct by using proteus 8 professional.

This project use Global System for Mobile Communication (GSM). It can perform in function which is detecting vehicle theft. GSM system will send the SMS to owner to tell them their car is in a dangerous situation. This system can help to protect the car from being stolen when the pic send signal to GSM. The overall system is programme in PIC in order this system can detecting, identifying, sending SMS and the user always beware in every possible action.

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1.2 Problem Statement

In Malaysia, the car theft occur at the parking places which is it has become a matter of concern. This current issues is become higher in this country. It is because the vehicles does not have the security system. Sometimes, the owner does not realized when the car was stolen because they are far away from the car. The theft try hard to steal the car such as they looking for exposed wiring that can be cut, cut the steering wheel itself if there's a steering wheel lock and break the window or break the lock to gain entry into a locked car.

Thus, the GSM security system provides the solution for this problem by using PIC microcontroller. It can perform in two function which is detecting vehicle theft and give the information of location the car by SMS. GSM system is install in the vehicle for receive and send the information wirelessly to the owner of the car. This car security system is one tool that can help owner to avoid car theft in lower cost.

1.3 Objective

The project objectives are:

1) To develop microcontroller to detect the theft based on the related software.
2) To propose the notification system by implement modem in this project.

1.4 Scope of project

There are the scopes that have been outline in order to achieve the objective for this project

1) It will based the microcontroller PIC16F877A and it will be program using microC PRO software and design the circuit using Proteus 8 Professional software.

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2) The project to be develop a GSM system that can be used to reduce based on the car theft problem by deliver a warning SMS to the users.

1.5 Medium of wireless

Wireless network is a medium that not use the wire and the function this network is to share information and resource between devices by frequency signals. It works on radio waves and microwaves. There are several type of network such as network formation and architecture, communication coverage area, access technology and satellite networks.

1.5.1 Network formation and architecture

1.5.1.1 Infra structure based network

Infrastructure-based wireless networks have or access point base stations. For mobile terminal the base stations can access. Base station are connect the coordinated control which perform the network control functions. Base station coordination can be function as networks scheduling, dynamic resource allocation, power control, and handoff which control the transmission schedule.

1.5.2 Communication coverage area

1.5.2.1 Wireless Local Area Network (WLAN)

WLAN is a wireless local area network. It is limited area coverage which is links two or more devices using a wireless distribution method whether spread-spectrum or OFDM radio. WLAN gives the ability to move around to users within a local coverage area and the user still be connected to the network because WLAN can provide a connection to the wider Internet. WLANs also call Wi-Fi brand at the marketed.

1.5.2.2 Wireless Metropolitan Area network (WMAN)

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WMAN is a Wireless Metropolitan Area Network. It is also called Wireless Local Loop (WLL). The effectiveness can reach transfer speeds of 1 to 10 Mbps within a range of 4 to 10 kilometres by using WLL. It can reach speeds on the order of 70 Mbps over a radius of several kilometres as it also know WiMAX of wireless metropolitan area network.

1.5.2.3 Wireless Wide Area Network (WWAN)

WWAN is the wireless wide area network. It can coverage a large area by connecting separate areas of coverage wirelessly. The WWANs use as 3G or 4G networks because wireless WANs commonly use 3G and 4G mobile network connection types. WWANs usually used low data rates based on publicly shared data networks owned by service providers. WLAN are typically privately-owned networks that cover a smaller area such as a warehouse with data rates based on usage. Normally, WWANs are primarily used for smartphones and other handheld devices offered by cellular service providers.

1.5.2.4 Wireless Personal Area Network (WPAN)

WPAN is a wireless personal area network. WPAN is wireless connection that interconnecting devices centred on an individual person's workspace such as office or school. It is a personal area network which is. Typically, a WPAN only can use about 10 meters which a very short range such as Bluetooth.

1.5.3 Access Technology

1.5.3.1 GSM Network

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Short for global system for mobile communication. GSM is type technology that send the SMS to the cell phone. Individual may receive the amount of coverage from GSM modem.

1.5.3.2 TDMA Networks

TDMA is a time division multiple access. In digital cellular telephone communication, to use the TDMA it is divide into three time parts in cellular channel. Each slots the amount of data that can be carried will increase.

1.5.3.3 CDMA Networks

CDMA is a Code-Division Multiple Access. CDMA divide into two generation which is in second-generation (2G) and third-generation (3G) wireless communications. The behaviour CDMA is a multiplexing where it allows numerous signals to occupy a single transmission channel and every use available bandwidth can optimize. In the cellular telephone systems, the ultra-high-frequency (UHF) use 800-MHz and 1.9-GHz bands.

1.5.4 Satellite Networks

1.5.4.1 Radio Networks

The radio network have two types of networks which is one-to-many and two-way radio. Both network currently use around the world. One to many network use for public information and mass media entertainment on broadcast network and two way radio used more for public safety and public services such as police and delivery services. At the same time, send and receive messages are able simultaneously by using two different frequencies by cell phones.

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1.5.4.2 Microwave network

Microwave is use electromagnetic for transmission energy. The frequency spectrum range in 1.0 gigahertz (GHz) to 300 GHz. It is widely used for point to point communication because the wavelength is 30 centimetres down to 0.1 cm. The small wavelength allows it connect directly them in narrow beam which pointed at the receive antenna

1.5.4.3 Infrared Networks

IR wireless is convey data through infrared (IR) radiation.by using of wireless technology in system. The Infrared is electromagnetic energy in red light. In electromagnetic spectrum range, visible red is the shortest-wavelength IR borders. The radio waves is the longest-wavelength IR borders. In short and medium range communications and control IR wireless is used. Between the transmitter (source) and receiver (destination) there must be a visually unobstructed straight line through space in line of sight mode

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CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter discusses about the literature and review of structural analysis and some definition of the components used in this project such as GSM modem, PIC16F877A and IC MAX232. There have many difference sources and researches about the concept, design and implementation of the development of microcontroller using GSM. It also included the investigation of what others have done in this area. This study included the areas of hardware and software development. This chapter will explain the literature reviews related to the development of the car system which based on information that obtained from various sources, articles, technical reports, general reports, websites, books and personal communication about GSM. At the same time, to understand on how to use the software and device in the GSM control system.

2.1 Related Work

2.1.1 GPS Vehicle tracking system

The system using GPS and GSM-SMS service which is can track the location of car. This system connected with the car alarm system and can alert the owner through SMS on his mobile phone. This system combination from GPS receiver, microcontroller and a GSM. The GPS receiver receive the data latitude and longitude from satellites. Then the microcontroller send this

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information to GSM. GSM receive the information and can alert the owner. This system is low cost and very useful for car theft detection system. If the car was stolen, it will detect and inform the location within in second according to Shital Mohol, Amit Pavanikar and Ganesh Dhage, 2014.

2.1.2 A Smart Anti-theft System for Vehicle Security

Commonly parking places occur the car stolen. So, this proposed work is an attempt to develop a smart anti-theft system. This system use GPS and GSM system to prevent theft and tracking the location of car after car was stolen. The system contain GPS module, GSM modem, Infrared sensors, DTMF decoder IC MT8870DE, 8051 microcontroller, relay switch, vibration sensor, paint spray and high voltage mesh. It is use two way communication which is GSM will receive and transmit the data. The main circuit combination of two circuit which is for detecting the motion of car using infrared sensor and DTMF tone decoding for switching on and off the relay. When the thief try to open the car door, the sense of motion will sent the signal to 8051 microcontroller. Then, the microcontroller will trigger the circuit to relay. The microcontroller send signal to GSM mobile. So, calling signal send to owner's car to inform the about the condition of their car in dangerous. The second circuit take the action which is ignition cut-off, fuel supply cut-off, windscreen paint spray and electric shock. It will fail the car theft from occur according to Pritpal Singh, Tanjot Sethi, Bibhuti Bhusan Biswal, and Sujit Kumar Pattanayak, 2015.

2.2.3 Design and Implementation of a Vehicle Theft Control Unit using GSM and CAN Technology

The purpose of this project is to design and develop a theft control system to avoid the theft of a vehicle. The system based on embedded system which use Global System for Mobile communication (GSM) technology, Control Area Network (CAN) Bus and Radio Frequency Identification system (RFID). The RFID reader will connect microcontroller through serial interface

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