



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DEVELOPMENT OF HOME SECURITY ALERT SYSTEM
USING GSM MODULES**

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

by

FATIN NABILAH BINTI ABD HALIM

B071210212

900504-02-5572

FACULTY OF ENGINEERING TECHNOLOGY

2015

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: DEVELOPMENT OF HOME SECURITY ALERT SYSTEM USING GSM MODULES

SESI PENGAJIAN: 2014/15 SEMESTER 2

Saya **Fatin Nabilah Binti Abd Halim** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. ****Sila tandakan (✓)**

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:

Cop Rasmi:

Alamat Tetap:

1775, Lorong Selasih 2A/4 Taman
Selasih 09000 Kulim

Kedah Darul Aman,

DECLARATION

I hereby, declared this report entitled Development of Home Security Alert System Using GSM Modules is the results of my own research except as cited in references.

Signature :

Name : **Fatin Nabilah Binti Abd Halim**

Date :

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 (Industrial Power) (Hons.). The member of the supervisory is as follow:

.....

(Project Supervisor)

.....

(Project Co- Supervisor)

ABSTRACT

Conventional safety system is the most important system used to protect one's life and property. Nowadays, a lot of cases related with the safety of house. As advised prepared salvation conventional systems have a certain limit. In an age of high technology, users are looking forward to a product or system that ensures the safety of their belonging. In addition, to facilitate them in doing daily activity. This project developed to solve residents' problems about the safety of their premises or houses. The main objective of this project is to design and develop the system that will alarming the user when have any intrusion, fire and gas leakage by SMS via GSM module. Besides that, it is also to deliver a warning SMS to the users instantly when intrusion or fire and gas leakage occurs. Thus, research project is formed to accomplish the will of the user. *Development of Home Security Alert System Using GSM Modules* project is a security system that encompass two important parts namely development of software and development of hardware. Something can be proven insistence project through development of hardware. For this project, the magnetic switch, temperature sensor and gas sensor are used. Magnetic switch is used for the detection of intruders or any movement that indicates an intrusion is going on. Magnetic switch will be installed at the gate and casement home where intruders normally break in through. Fire sensor is installed around the house to get a pre-alert during fire that may be caused by short circuit or overload current. Meanwhile, for gas sensor it mounted at the kitchen for early detection of gas leakages. Software Development for this project consists of microcontroller in C language embedded, Proteus to simulate the circuit that is related and GSM modem. Overall, this project work is all sensor which is magnetic switch, gas sensor and fire sensor will react and deliver microcontroller to send the SMS to user via GSM immediately. Analysis and discussion forms they have been run and in the end, positive results have been achieved.

ABSTRAK

Sistem keselamatan konvensional adalah sistem paling penting yang digunakan untuk melindungi nyawa dan harta benda seseorang. Oleh itu, sebuah projek yang sangat bagus dibentuk supaya menepati kehendak pengguna. Projek "*Development of Home Security Alert System Using GSM Modules*" dibangunkan untuk menyelesaikan masalah penduduk tentang keselamatan premis. Objektif utama projek ini adalah untuk mereka bentuk dan membangunkan sistem yang akan membimbangkan pengguna apabila ada sebarang pencerobohan, kebakaran dan kebocoran gas melalui SMS melalui modul GSM. Selain itu, ia juga adalah untuk menyampaikan SMS amaran kepada pengguna serta-merta apabila pencerobohan atau kebakaran dan gas bocor akan berlaku. Sistem keselamatan ini merangkumi dua perkara penting iaitu pembangunan perisian dan pembangunan perkakasan. Sesuatu projek dapat dibuktikan kekukuhannya melalui pembangunan perkakasannya. Untuk projek ini, suis magnet, pengesan gas dan pengesan api digunakan. Suis magnet digunakan untuk mengesan sebarang penceroboh. Suis magnet ini dipasang di pintu pagar rumah untuk mengelakkan dari sebarang kecelakaan. Selain itu juga, untuk mengelakkan daripada sebarang kebakaran, pengesan api dipasang disekitar kawasan rumah manakala pengesan asap pula dipasang di dapur untuk mengesan sebarang kebocoran gas. Pembangunan perisian untuk projek ini terdiri daripada mikropengawal yang diprogramkan dalam bahasa C terbenam, dikawal selia oleh unit bekalan kuasa, Proteus iaitu litar simulasi, relay, modem GSM, LCD, nod perolehan data dan pembangunan program antara muka. Keseluruhan cara projek ini berfungsi adalah seperti berikut; Pengesan mengesan sebarang pencerobohan, api dan juga kebocoran gas LPG, peranti penderiaan berkaitan bertindak balas dan mikropengawal menghantar isyarat penggera dikodkan kepada rangkaian pengesan tanpa wayar yang dipasangkan di rumah. Sebaik sahaja isyarat penggera itu diterima, ia akan menghantar penggera pesanan ringkas kepada pengguna melalui rangkaian GSM serta-merta.

DEDICATIONS

Special thanks to my family especially Mak and Ayah

Special thanks to my supervisor, Puan Intan Mastura

Special thanks to colleagues, especially Nik Nazirul Amin

ACKNOWLEDGMENTS

First of all, I would like to thank ALLAH S.W.T for HIS blessings to me. A very thanks to my parents, Mr Abd Halim Bin Md Nor and Mrs Ruslinda Binti Wan Chik for their support and inspiration for me to complete this Bachelor Degree Project 1 (BDP1). Finally, I am able to complete my BDP1 with this thesis within allocated time.

I would extend to thank my supervisor, Mrs Intan Mastura Binti Saadon for all the information and guidance that she had given to me. She had given her best to guide me to finish this thesis with all her knowledge, experience and skills. It had been a very hard and difficult time for you to guide me. I am sorry for my mistakes to you and thank you very much.

I would to extend my appreciation to all my colleagues, especially Nik Nazirul Amin who was involved and helped in completing this thesis. A special thanks to all my housemates who gave support and help. Thank you very much.

TABLE OF CONTENTS

DECLARATION	iii
APPROVAL.....	iv
ABSTRACT.....	v
ABSTRAK	vi
DEDICATIONS.....	vii
ACKNOWLEDGMENTS	viii
TABLE OF CONTENTS.....	ix
LIST OF FIGURES	xiv
LIST OF TABLE	xvi
LIST OF SYMBOLS AND ABBREVIATIONS	xvii
CHAPTER 1	18
1.0 Background	18
1.1 Problem Statement	18
1.2 Objective	19
1.3 Project Scope	19
1.4 Project Significance.....	20
1.5 Thesis Outlines	20
1.6 Expected Result.....	21
CHAPTER 2	22

2.0	Introduction	22
2.1	Related Work.....	22
2.1.1	Smart Home Security by Sending SMS via GSM Modem.....	22
2.1.2	GSM Based Security System	23
2.1.3	Design and Implementation of Modular Home Security System with (SMS).....	23
2.2	GSM Modem.....	24
2.2.1	Basic Specification in GSM.....	24
2.2.2	AT Command for GSM Modules	25
2.2.3	Services Offered By GSM	25
2.2.4	GSM Architecture	26
2.2.4.1	Switching System	27
2.2.4.2	Base Station System.....	28
2.2.4.3	Mobile Station.....	28
2.3	Microcontroller.....	29
2.3.1	Pin Configuration PIC16F877A.....	29
2.4	Mobile Phones	31
2.5	Short Messaging Service (SMS)	31
2.6	Sensor	32
2.6.1	Magnetic Switch.....	32
2.6.2	Fire Sensor	32
2.6.3	Gas Sensor.....	33
2.7	Software Specification	33

2.7.1	Proteus 8.0 Professional	34
2.7.2	MicroC Compiler	34
2.7.3	PICkit2	35
2.8	Flowchart of Project	35
2.8.1	Flowchart Description	36
CHAPTER 3		37
3.0	Introduction	37
3.1	Block Diagram	37
3.2	Flowchart of Project Development.....	38
3.2.1	Flowchart Description	38
3.3	Project Methodology	39
3.4	Hardware Development.....	39
3.4.1	PIC Microcontroller	40
3.4.2	Regulated Power Supply Circuit.....	40
3.4.3	Interfacing Circuit	41
3.4.4	Magnetic Switch.....	42
3.4.5	LM35	43
3.4.5.1	Pin Configuration.....	43
3.4.6	Gas Sensor.....	44
3.4.7	Liquid Crystal Display (LCD)	45
3.4.8	Light Emitting Diode (LED).....	45
3.4.9	Buzzer	46

3.5	Preliminary Result	46
3.5.1	Regulated Power Supply	46
3.5.2	Magnetic Switch.....	47
3.5.3	LM35.....	47
3.6	Overall Project Development	48
3.6.1	GSM SIM900A	48
3.6.2	SK40C	49
3.6.3	Control Circuit	49
3.6.3.1	Magnetic Switch	50
3.6.3.2	LM35	50
3.6.3.3	MQ5	51
CHAPTER 4	52
4.0	Introduction	52
4.1	Project Overview	52
4.2	Simulation Analysis	53
4.3	Hardware Analysis	53
4.4	Result Overall Project	55
4.4.1	Result for LM35	55
4.4.2	Result for Magnetic Switch.....	56
4.4.3	Result for MQ5	58
4.5	Sensor Trigger Analysis	59
4.6	SMS Duration Analysis.....	61

4.7	Overall Project Analysis and Discussion	63
4.8	Overall Project Cost	64
CHAPTER 5		65
5.0	Introduction	65
5.1	Conclusion.....	65
5.2	Recommendation.....	66
REFERENCES.....		71

LIST OF FIGURES

Figure 2.1: GSM Architecture	26
Figure 2.2: PIC16F877A	31
Figure 2.3: Magnetic Switch Design.....	32
Figure 2.4: Gas Sensor Design.....	33
Figure 2.5: Proteus 8 Professional Software	34
Figure 2.6: Project Flowchart.....	35
Figure 3.1: Block Diagram.....	37
Figure 3.2: Flowchart of Project Development.....	38
Figure 3.3: Pin Diagram of PIC16F877A	40
Figure 3.4: Circuit Diagram of Regulated Power Supply	41
Figure 3.5: GSM and PIC Interface	42
Figure 3.6: Circuit Diagram of Magnetic Switch.....	42
Figure 3.7: LM35 Pin Diagram	43
Figure 3.8: LM35 Circuit Diagram	44
Figure 3.9: Circuit Diagram of MQ5	44
Figure 3.10: Liquid Crystal Display (LCD)	45
Figure 3.11: Light Emitting Diode (LED)	46
Figure 3.12: Design of Buzzer	46
Figure 3.13: Output of Regulated Power Supply	47
Figure 3.14: Output of Magnetic Switch	47
Figure 3.15: Output of LM35	48
Figure 3.16: GSM SIM900A	48
Figure 3.17: SK40C	49
Figure 3.18:Control Circuit.....	50
Figure 3.19: Magnetic Switch	50
Figure 3.20: LM35	51
Figure 3.21: MQ5	51
Figure 4.1: Overall Project.....	53
Figure 4.2: Simulation Circuit.....	54
Figure 4.3: Hardware Circuit	54
Figure 4.4: LCD Display.....	56
Figure 4.5: SMS Received by User.....	56
Figure 4.6: LCD Display.....	57
Figure 4.7: SMS Received by User.....	57
Figure 4.8: LCD Display.....	58
Figure 4.9: SMS Received by User.....	59
Figure 4.10: Data 1 of Time Taken to Sensor Trigger.....	60
Figure 4.11: Data 2 of Time Taken to Sensor Trigger.....	60

Figure 4.12: Data 3 of Time Taken to Sensor Trigger.....	61
Figure 4.13: Data 1 of Time Taken to Send SMS.....	62
Figure 4.14: Data 2 of Time Taken to Send SMS.....	62
Figure 4.15: Data 3 of Time Taken to Send SMS.....	63

LIST OF TABLE

Table 1: Basic Specification in GSM.....	24
Table 2: AT Command for GSM Modules	25
Table 3 : Pin Configuration PIC16F877A	29
Table 4: Pin Configuration LM35	43
Table 5 : Data Obtained for LM35	55
Table 6 : Data Obtained for Magnetic Switch	57
Table 7 : Data Obtained for MQ5	58
Table 8: Total Project Cost	64

LIST OF SYMBOLS AND ABBREVIATIONS

ARFCN	=	Absolute Radio-Frequency Channel Number
ASCII	=	American Standard Code for Information Interchange
AUC	=	Authentication Centre
BBS	=	Base Station System
BSC	=	Base Station Controllers
BTS	=	Base Transceiver Station
EEPROM	=	Electrically Erasable Programmable Read Only Memory
EIR	=	Equipment Identity Register
GSM	=	Global System for Mobile Communication
HLR	=	Home Location Register
IMSI	=	International Mobile Subscriber Identity
ISIS	=	Intelligent Schematic Input System
LCD	=	Liquid Crystal Display
LED	=	Light Emitting Diode
MS	=	Mobile Station
MSC	=	Mobile Switching Centre
PIC	=	Programmable Interface Controller
PIR	=	Passive Infrared
SIM	=	Subscriber Identity Module
SMS	=	Short Messaging Service
SS	=	Switching System
UART	=	Universal Asynchronous Receiver/ Transmitter
VLR	=	Visitor Location Register

CHAPTER 1

INTRODUCTION

1.0 Background

Home – security, fire, gas using GSM modules are a security alert system that triggers, user when there is an occurrence of trespassing, fire or gas leakage in the house. This project aims to design a home system by sending short message service (SMS) via GSM modem to invent the security system for homeowners. GSM controller is integrated in order to operate security doors and windows access, fire and gas leakage in this project. Besides that, hardware and software development are two vital development in this project. The software development consists of the development of the PIC controller code and GSM message command. The hardware development includes the PIC interfacing circuit, magnetic sensor, smoke sensor, gas sensor and buzzer. One of the important features of this project is that it can ensure the security and safety of their houses vicinity regardless of time. Whenever the intrusion or fire and gas leakage occur in the house, the controller will automatically trigger the alarm and send an SMS alert to the user. The reason why this project uses GSM module as a main part is to alert the user with the best way. As we know, the buzzer has a limited distance range. The users cannot hear the alarm or buzzer if they are not within the range but with the GSM module, the user will get the SMS as an alert.

1.1 Problem Statement

The reason why this project needs to be developed is to solve residents' problems about the safety of their premises or houses. Statistics of crime, especially robbery in Malaysia increases year by year. In December 2nd at Pasir Puteh, two thieves broke into a house. This incident has caused Tema, the owner and her two daughters,

Shafiqah and Shafatini a traumatic experience. Tema suffered injuries below her right eye and cuts on her left cheek, while Shafiqah suffered cuts on her face. This case happened due to the victims do not install home security system in their home. So far, there is no safety system using a GSM module like in overseas. They have safety systems that secure the safety of owner if there is any bad incidents which includes intruders, fire and gas. Nowadays, Malaysian people have lack of time to take serious caution of their houses and properties security matter due to their busy working schedule. Any houses or properties that do not have any kind of home security system seem like giving opportunity to burglary, fire and gas leakage. A home security system that is installed in houses or properties can keep away from any burglary attempt and secure the house from fire and gas leakage.

1.2 Objective

The aim of the project is:

- a) To design and develop the system that will alarming the user when have any intrusion, fire and gas leakage by SMS via GSM module.

- b) To deliver a warning SMS to the users instantly when intrusion or fire and gas leakage occurs. .

1.3 Project Scope

This project is divided into three major activities which is studying about GSM module, develop hardware and software. Whenever the system detects any intruders' attempt, it will send an SMS alert to the homeowners via GSM Modules. When the magnetic switch detects any intruders, the PIC will send a signal to GSM to send SMS to the user. PIC controller and GSM message command are two programs that are involved in software development. While, the interface between the PIC and the

circuit, magnetic switch, smoke sensor and gas sensor and buzzer are consisted in hardware development.

1.4 Project Significance

This project will be a significant endeavour in promoting good system of home security that makes life greater and better. This project will likewise be beneficial to the proprietor of a home where the proprietor will be aware whether their houses are in safe condition or not from intruders, gas leakage or fire.

1.5 Thesis Outlines

There are three chapter in this thesis include of introduction of the project, literature review which is the works of others that related with this project and lastly the method that used to implement the knowledge into project.

Chapter I: This part briefly discusses on the general idea of this project including of introduction, problem statement, the target of this project, the scope of project, project significant and thesis outlines.

Chapter II: This part focuses more to study the literature review which is previous work that related with this project. It is important in order to obtain the some knowledge or concept of Home security. Then, the explanation in general of software development, hardware development and also the information about the main component GSM and PIC interfacing are also deliberated.

Chapter III: The brief clarification of methodology are discussed in this part. It consists of flowchart of whole project and the description of component that will be used to solve the problem statement.

1.6 Expected Result

This project will achieve the objective of the project, which is to design and develop a security system for house owner that is capable of monitoring any intruders and other emergency situation by alarming the house owners via GSM module. Besides, this project can reduce crime statistic in Malaysia, especially house robbery and also can avoid gas leakage and fire accident

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter will include all related information and study in order to achieve the project aims. It involves the research and information around the project on various important concepts of security home system, engineering science and instruments utilized in the field. A study regarding all required components must be done in order to design the overall circuit. One of the method to gather information is by studying previous researches that has been done and related to this project. It is important to understand on how software and hardware were used in GSM Module system.

2.1 Related Work

There are sample journals that are relevant with Home – Security Alert System for Intruders, Fire and Gas using GSM Modules. These journals use the component similar with Home- Security System. These journal are used as a reference to complete this project.

2.1.1 Smart Home Security by Sending SMS via GSM Modem

Alia Hassan (2011) had designed “Smart Home Security by Sending SMS via GSM Modem”. This paper presented a smart home security by sending short message services (SMS) through GSM module to visualize the security plan for householders. The idea of shrewd home is a developing issue of the cutting edge innovation subordinate society. Controlling family unit machines through the PC can likewise be a conceivable arrangement. Be that as it may, it cannot satisfy the current interest,

which is to manipulate them from distant spots. The preferences of cell interchanges like GSM innovation are a possible solution for such remote controlling exercises. GSM modem was utilized for getting SMS from users' mobile phone that naturally empower the controller to make any further move, for example, to switch ON and OFF the home machines, for example, light, ventilation system, and fan. The system was coordinated with microcontroller and GSM system interface utilizes low level computing construct. The system is initiated when user sends the SMS to controller at home. After accepting the SMS charge, the microcontroller unit then consequently controls the electrical home machines by exchanging ON or OFF the gadget as indicated by the client's request. By other means, whenever the message is read from the mobile phones, the devices will send the data that the message has been received and read by the user. The model has been effectively created and it could give a successful component in using the security home.

2.1.2 GSM Based Security System

Aman Singh, Abhishek Yadav, H. P. Singh, S. K. Dubey (2014), had designed "GSM Based Security System". The purpose of this project is to develop a home security system by utilising GSM and microcontroller interface. The aims of this project is to provide a good security system by using sensors, cameras, trapping system that has been installed at home.

2.1.3 Design and Implementation of Modular Home Security System with (SMS)

Santoso Budijono, Jeffri Andrianto, Muhammad Axis Novradin Noor (2014), had designed "Design and Implementation of Modular Home Security System with Short Messaging System (SMS)". The aim of this project is to develop a security system using GSM. It can deliver and alert SMS to the user. Besides that, it also enable the user to activate or deactivate system via SMS. Among the component that is used in this project is Passive Infrared (PIR) sensor and microcontroller AT Mega 328. PIR sensor is utilized as the main sensor for motion, camera for capture the image, sending

and delivering SMS using GSM modules and buzzer as an alarm device. This system are able to monitor home area that are included PIR sensing the field and it will send the SMS, capture the area image and scare the intruders when the buzzer is on.

2.2 GSM Modem

Omorogiuwa Eseosa and Elechi Promise (2014) describe GSM modem is a specialized type of modem which accepts SIM card, and operates over a subscription to mobile. The features of the GSM Modem are used for transmitting and receiving SMS messages and allow data connection. This device are compactable with almost all mobile phones that contain GSM modules. To transmit and receive SMS messages, GSM modem needs to utilize an “extended AT command set” that can carry out the operations of mobile phones. Besides, it is implanted with other organizations due to the GSM modem is able to interface with others.

2.2.1 Basic Specification in GSM

The Table 2 shows the basic specification in GSM.

Table 1: Basic Specification in GSM

Bil	Parameter	Specification
1	Frequency of Reverse Channel	890-915 MHz
2	Frequency of Forward Channel	935-960 MHz
3	Frequency Spacing of Tx/Rx	45 MHz
4	Time Slot Spacing of Tx/Rx	3 Time Slots
5	Modulation Data Rate	270.8333333kbps
6	Frame Period	4.615ms
7	Users per Frame	8
8	Time Slot Period	576.9microsec
9	Bit Period	3.692 microsecond
10	Modulation	0.3 GMSK