



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART HOME SECURITY SYSTEM BY USING GSM

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

by

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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 Bachelor's Degree of Electronics Engineering Technology (Telecommunications) with Honours (Department of Electronic & Computer Engineering Technology). The member of the supervisory is as follow:

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(SITI ASMA BINTI CHE AZIZ)

ABSTRAK

Keselamatan rumah apabila pemilik tidak ada di rumah amat membimbangkan. Sistem keselamatan rumah yang sedia ada berasaskan sensor dapat mengesan pencerobohan dan mencetuskan penggera. Walau bagaimanapun, pemilik rumah yang tidak berada di rumah ketika itu tidak segera mendapat pemberitahuan kejadian pencerobohan berlaku. Projek ini adalah untuk mereka bentuk sistem keselamatan rumah pintar yang membolehkan system itu berfungsi apabila pemilik rumah tiada di rumah. Projek ini menggunakan GSM teknologi tanpa wayar. Sistem ini menggunakan mikro pengawal dan rangkaian GSM yang saling berhubung dengan bahasa komputer. Perisian yang digunakan adalah Arduino Software iaitu Integrated Development Environment. Sensor yang digunakan dalam sistem ini adalah IR objek Sensor dan magnet sensor. Pertama, magnet sensor itu diletakkan di pintu. Ia berfungsi apabila pintu terbuka apabila magnet ditarik jauh dari magnet sensor yang diletakkan di pintu. Buzer akan berbunyi apabila magnet itu berjauhan dan pada masa yang sama, pengguna akan menerima pesanan mengenai pencerobohan itu. Selain itu, sensor kedua adalah IR objek sensor, yang berfungsi untuk mengesan objek. Pesanan akan dihantar kepada pemilik rumah untuk memaklumkan mengenai pencerobohan. Sistem ini telah berjaya direka di mana ia berfungsi untuk mengesan pencerobohan sama ada melalui pintu atau tingkap. Tiga analisis telah dilakukan berdasarkan julat pengesanan dan liputan rangkaian teknologi GSM. Kesimpulannya, sistem keselamatan yang berasaskan teknologi GSM telah berjaya direka dan fungsinya.

ABSTRACT

The security of the house when the owner is not at home is in doubtful. Current home security system which is sensor based can detect intrusion and trigger the alarm. However, user who is away from home does not immediately get notification of the alarm incident. This project is about designing a smart home security system that can work when the house owner is not at home. This project used GSM technology as the wireless technology. This security system that based on GSM technology can save a lot of time and effort. This is because the function of GSM alerts the house owner about the intrusion becomes a comfort to take control of devices at other destination. The system is using the microcontroller and GSM network that interfaced by assembly language. The software that is used is Arduino Software, which is Integrated Development Environment. The sensors that are used in this system are IR Obstacle Sensor and Hall Sensor. Firstly, the hall sensor is placed at the door. It works when the door is open where when the magnet is pulled away from the hall sensor placed at the door. Buzzer will sound when the magnet is pulled away and at the same time, the user will get the notification about the intrusion. The other sensor is IR obstacle sensor, which works to detect objects. Notification will also be sent to the house owner to inform about the detection. This system has been successfully developed where it functioning to detect the intrusion either through the door or window as the hall sensor is placed at the door and the IR obstacle sensor is placed at the window. Both sensors are functioning which either one sensor detect the intrusion or both sensors detected at the same time. Three analyses have been done which are based on the range of detection and coverage network of the GSM technology. In conclusion, the security system that based on GSM technology has been successfully developed and tested the functionality.

DEDICATION

To my beloved parents, supervisor and all friends.

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Firstly, I would like to thank to all people who had help, support, and gave guidance and advices in completing this project until it success.

Firstly, I would like to thank my supervisor, Mrs. Siti Asma binti Che Aziz for her guidance and advices on me and my work all this while. It has been a hardship for you, sorry and thank you so much.

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TABLE OF CONTENT

DECLARATION	iii
APPROVAL	iv
ABSTRAK	v
ABSTRACT	vi
DEDICATION	vii
ACKNOWLEDGMENTS	viii
TABLE OF CONTENT	ix
LIST OF TABLES	xiii
LIST OF FIGURES	xiv
LIST OF ABBREVIATIONS	xvi
CHAPTER 1: INTRODUCTION	
1.1 Project Background	1
1.2 Problem Statement	2
1.3 Objectives of Project	2
1.4 Scope of Project	3
1.5 Project Overview	4
1.6 Thesis Outlines	5
CHAPTER 2: LITERATURE REVIEW	
2.1 Introduction	6
2.2 Related work that based on GSM technology	6
2.2.1 Remote Home Security System Based on Wireless Sensor Network	7
2.2.2 Design and Implementation of a Smart Home System	7
2.2.3 Integrated Billing System through GSM Network	8
2.2.4 Development of camera and GSM interfacing system for home security surveillance	8
2.2.5 Vehicle Speed Detection using SMS	9

2.3	Communication Protocol	9
2.3.1	Introduction on GSM	9
2.3.1.1	Bluetooth	10
2.3.1.2	Wi-Fi	10
2.3.1.3	Differences Between GSM, Bluetooth and Wi-Fi	11
2.3.2	GSM Technology	12
2.3.2.1	Service Provided by GSM	12
2.3.2.2	GSM Modem Specification	13
2.4	ARDUINO	14
2.4.1	Introduction on Arduino	14
2.4.2	Arduino Board	14
2.4.3	Arduino UNO Board Specification	15
2.4.4	ARDUINO Software	16
2.5	Microcontroller	17
2.5.1	Introduction on Microcontroller	17
2.5.2	The Characteristic of a Microcontroller	17
2.6	Sensors	19
2.6.1	Introduction on Sensor	19
2.6.2	Hall Sensor	19
2.6.2.1	A3144 Hall Sensor	20
2.6.2.2	Hall Effect Applications	20
2.6.2.2.1	Head On Detection	21
2.6.2.2.2	Sideway Detection	21
2.6.3	IR obstacle Detection	22
2.6.3.1	IR Transmitter	22
2.6.3.2	IR Receiver	23
2.6.3.3	IR Obstacle Detection Module	24
2.7	Buzzer	24

CHAPTER 3: PROJECT METHODOLOGY

3.1	Introduction of Methodology	25
3.2	Project Methodology	26
3.3	Project development flow chart	27
3.4	Project Gant Chart	29
3.5	Block Diagram	30
3.6	System Flowchart	31
3.7	Hardware Development	33
	3.7.1 Hall Sensor	33
	3.7.2 IR Obstacle Sensor	34
	3.7.3 Circuit Description	35
3.8	Software Development	36

CHAPTER 4: RESULT AND DISCUSSION

4.1	Smart Home Security System by Using GSM	37
	4.1.1 Hardware Results	38
	4.1.1.1 Smart Home Security System Prototype	38
	4.1.1.2 The Connection of Arduino UNO, GSM and Sensors	39
	4.1.1.3 The Sensors & Alarm Work	40
	4.1.2 Software Result	44
	4.1.2.1 Arduino Serial Monitor	44
4.2	Project Analysis	46
	4.2.1 Analysis on the Range of IR obstacle Detector	46
	4.2.2 Analysis on the Hall Sensor	47
	4.2.3 Coverage Network (GSM, Wi-Fi and Bluetooth)	48
4.3	Discussion	49

CHAPTER 5: CONCLUSION AND FUTURE WORK

5.1	Conclusion	52
5.2	Future Work	54

APPENDICES	55
APPENDIX A	56
APPENDIX B	58
APPENDIX C	63
APPENDIX D	67
APPENDIX E	70
REFERENCES	72

LIST OF TABLES

TABLE	TITLE	PAGE
4.1	Summarization of system work	43
4.2	Result of Analysis based on Range of IR Obstacle Sensor	46
4.3	Comparison between 3 types of wireless technology	48

LIST OF FIGURES

FIGURE	TITLE	PAGE
1.1	Block diagram of project	4
2.1	SIM900GSM MODEM	13
2.2	Arduino UNO Board	15
2.3	Arduino UNO Board Specification	16
2.4	Microcontroller ATMEGA328P-PU	17
2.5	Pin Description	18
2.6	ATMEGA328P-PU and ARDUINO Mapping	18
2.7	Head On detection	21
2.8	Sideway Detection	21
2.9	IR obstacle Detection	22
2.10	Modulating a 38 Khz carrier signal	23
2.11	IR Obstacle Detection Module Schematic	24
2.12	Magnetic Buzzer.	24
3.1	Project Development Flow Chart	27
3.2	Project Gant Chart	29
3.3	Project Block Diagram	30
3.4	System Flow Chart	31
3.5	Hall Sensor A3144	33
3.6	IR Obstacle Sensor	34
3.7	IR Obstacle Sensor and Arduino UNO Connection	34
3.8	Circuit Connection	36

4.1	Smart Home Security System Prototype	38
4.2	Circuit Connection between the Arduino UNO, buzzer, hall sensor, IR obstacle sensor and GSM module	39
4.3	IR obstacle detect object through the window	40
4.4	Notification received by the user when IR obstacle detect the obstacle	40
4.5	Hall sensor detect the opening door	41
4.6	Notification received by the user when door sensor detect the opening door	41
4.7	IR Obstacle detect obstacle through the window and hall sensor detect the opening door	42
4.8	Notification received by the user when IR obstacle detect the obstacle and the door sensor detect the opening door at the same time	42
4.9	A serial monitor state 'CLEAR' shows that there is no detection for both sensors.	44
4.10	Serial monitor shows that IR obstacle detected the obstacle.	44
4.11	Serial monitor shows that hall sensor detected the magnet moved.	45
4.12	Serial monitor shows that IR obstacle detected the obstacle and the hall sensor detected the magnet moved at the same time.	45
4.13	Graph of Sensor Output Voltage against Magnet position from Sensor	47

LIST OF ABBREVIATIONS

SMS	-	Short Message Service
GPRS	-	General Packet Radio Service
GSM	-	Global System Mobile Communication
SIM	-	Subscriber Identity Module
IR	-	Infrared
MMS	-	Multimedia Messaging Service
PIR	-	Passive Infrared Receiver
AT	-	Attention Commands
TCP/IP	-	Transmission Control Protocol/Internet Protocol
PDA	-	Personal Digital Assistant
DCS	-	Digital cellular Service
MS	-	Mobile Station
BTS	-	Base Transceiver Station
BSC	-	Base Station Controller
WI-FI	-	Wireless Fidelity
IDE	-	Integrated Development Environment
USB	-	Universal Serial Bus
CPU	-	Control Processing Unit
I/O	-	Input/Output
PWM	-	Pulse Width Modulation
ICSP	-	In-Circuit Serial Programming
TSOP	-	Thin Small Outline Package
CMOS	-	Complementary Metal Oxide Semiconductor

CHAPTER 1

INTRODUCTION

1.1 Project Background

This project is mainly focuses on the security function when the house owners are not at home. It can be used to avoid any intruder from entering the house as well as inform the owner as we used sensor to detect the intruder. Besides that, the buzzer will produce sound to scare them. The microcontroller used for this project is ATMEGA328P-PU. The microcontroller will execute specific operation based on received signal from different sensor. Second part of the project is the notification system. The microcontroller acts as a slave that receives signal from sensor. It synchronizes with GSM module in real time and sends data command. SIM 900 GSM/GPRS TTL UART Modem is used which is built with Quad Band GSM/GPRS engine. When there is input alarm signal from any sensor, data command will be processed and a notification SMS will be sent to user. Last part of this project is the alerting system. The alerting system consists of audible indication of alarm, which is indicated by buzzer or siren.

1.2 Problem Statement

This security system that based on GSM technology can save a lot of time and effort. This is because the function of GSM alert the house owner about the intrusion become a comfort to take control of devices at other destination.

The security of the house when the owner is not at home are in doubtful. Current home security system which is sensor based can detect intrusion and trigger the alarm. For example, when a door contact is illegally opened, siren is triggered. However, user who is away from home does not immediately get notification of the alarm incident. Therefore, the application of this system can send immediately the information when the owner get to know about the unsecured and intrusions into the house when they are not at their home.

Employing an alarm system monitoring company can solve the problem but it is not affordable ordinary family due to the expensive payment. For this reason, a low cost GSM based home security system is proposed to overcome the problem. This system will provide real time home monitoring by sending a notification of update home status to user via SMS through GSM network. Monitoring of the system can be done anytime and anywhere as long as there is GSM signal available.

1.3 Objectives of Project

The objectives of this project are:

1. To study about GSM based system in communication.
2. To develop an application by using Arduino and GSM technology.
3. To design a smart home security system that is capable in monitoring intruders by alarming the house owners via short message service (SMS)

1.4 Scope of Project

This system is monitoring system of home security with by using sensors with the combination with Global System for Mobile Communication (GSM) network. This project consists of three parts, which are sensing network, notification system and alerting system. The sensor network focuses on intruder detection consists of break beam sensor. Two sensors, which are Infrared (IR) sensor and door sensor, are monitored at a time. Sensor sends an alarm signal to microcontroller. The microcontroller used for this project is ATMEGA328P-PU which is an 8 bit microcontroller manufactured by ATMEL. Simply inserting in an ARDUINO UNO board can easily program it. The microcontroller will execute specific operation based on received signal from different sensor. Second part of the project is the notification system. The microcontroller acts as a slave that receives signal from sensor. It synchronizes with GSM module in real time and sends data command. SIM 900 GSM/GPRS TTL UART Modem is used which is built with Quad Band GSM/GPRS engine. The Modem is coming with selectable interfacing voltage, which allows connecting 5V & 3V3 microcontroller directly without any level conversion chips. When there is input alarm signal from any sensor, data command will be processed and a notification SMS will be sent to user. Last part of this project is the alerting system. The alerting system consists of audible indication of alarm, which is indicated by buzzer or siren.

1.5 Project Overview

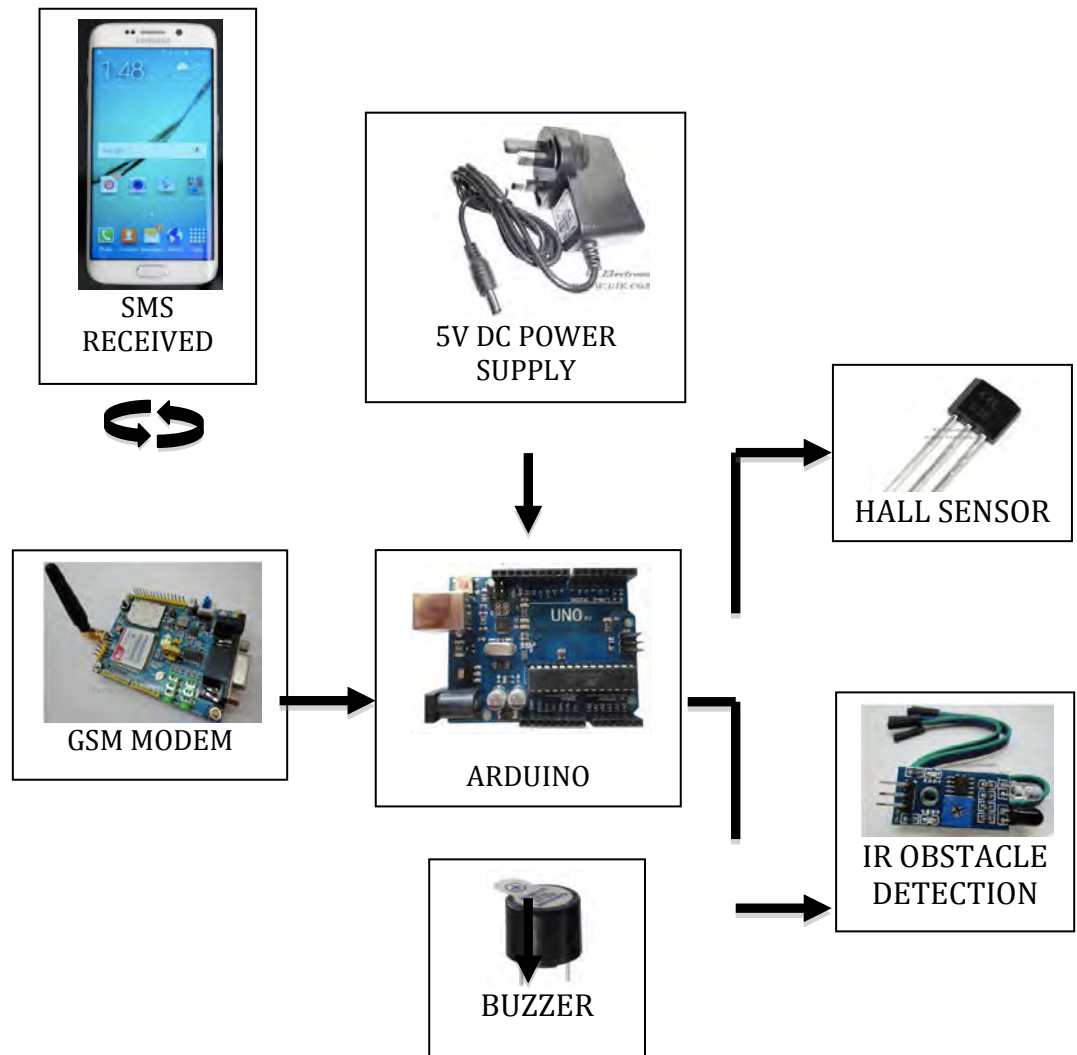


Figure 1.1 : Block diagram of project

1.6 Thesis Outlines

This report is consisting of five chapters. All these chapters are discussing the implementation of this project, which is about the Smart Home Security by using GSM.

- I. Chapter 1 will discuss about the overview of this project that include the introduction, objectives, problem statement, work scope, methodology and thesis outlines of this project.
- II. Chapter 2 will consist of previous project that have been research. The information about several components, technology and tools used. Besides that, there will also discuss about the details of software and hardware design.
- III. Chapter 3 will explain details on the methodology used in solving this project on home security problem. This has been done in order to have better results in this project.
- IV. Chapter 4 is discussing on the results from the system created which is wireless announcement board. There are also discussing on the analysis based on the system as well as overall project discussion.
- V. Chapter 5 will conclude overall project and recommendation for the project enhancement.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter contains the study on related work based on GSM technology and literature survey on the wireless technology use, which is GSM technology. The reason why this technology is chosen instead of other wireless technology is stated as well. This chapter also includes details in software and hardware devices that are used in this project.

2.2 Related work that based on GSM Technology

This part will present the study about the previous work that related to the Home Security System. Some studies have been done on the previous researches and project to gain more information to develop a new project with the technology of GSM. This study is necessary in order to know and understand at the same time how the project software and hardware development. This will gives the idea to develop a new project.

2.2.1 Remote Home Security System Based on Wireless Sensor Network

Wireless Sensor Network is a real time surveillance of home security where this monitoring system is mainly based on the combination of Zigbee and GSM technology. This system was function to send any abnormal images and warning messages either through SMS or MMS in the house as well as act as remote instruction and monitor for the household appliances (Jun Hou, 2008). Besides that, the variety of sensors and system shows that the intelligent remote control using this technology can be responsible for home security system.

2.2.2 Design and Implementation of a Smart Home System

This Smart Home System is about the implementation on controlling home appliance by remote control as well as gets an alert if there is intruder or movement to the house. The advantage of cellular communications like GSM technology is a potential solution for such remote controlling activities (Rao, B.S, 2010). The system was controlled by mobile phone through SMS where the owner will receive the alert if there is intruder inside the premise. Therefore, the system will monitor the activity around the house. The system consists of two parts, which is the combination of mobile phone and microcontroller. In this system, the mobile phone will receive a response from microcontroller where the microcontroller is reading the input from sensor. Arduino UNO board and SIM900 GPRS/GSM module are used as the microcontroller board and mobile unit respectively. The system could be installed at any place and can be controlled by any mobile phone. As the sensor network, the uses three sensors, which are used as heat detector, intrusion detector and motion detector along with a remotely managed light system.

2.2.3 Integrated Billing System through GSM Network

The Integrated Billing System is mainly about the development of Water Billing via SMS, which can only receive the SMS through the mobile phone, that is ease the consumer. The system is basically based on designing a system that can ease the water authorized in managing the water billing without needed the human services. It is design so that meter can send messages to central database. The message that contain the billing information will be processed and generate the monthly billing at the same time. Then, the system function by sends another SMS as the notification to the user or owner about the amount of water billing every month. The system was the implementation of Visual Basic and database in performing the system works by sending the SMS notification. Thus, this system gives the idea of using GSM to send notification as have been used in this project in getting the information about the intruder (Mohd Helmy Abd. Wahab, 2007).

2.2.4 Development of camera and GSM interfacing system for home security surveillance

This is a project that function to improve the home security systems that has already available in the current market. The system uses two sensors, namely ultrasonic and passive infrared receiver (PIR) where the ultrasonic sensor is used to detect movement of objects while the PIR is used to detect the changes in human temperature in infrared radiation. ATmega 32 is the type of microcontroller used in the system, where the data is sent to the computer to activate the camera. It happened when the microcontroller receives signals from the sensors. The interfacing circuit connecting the microcontroller to the computer used is MAX232. The software CodeVision AVR is used develop the control circuit because the software supports