

**GSM BASED HOME SECURITY SYSTEM**

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**PROJEK SARJANA MUDA II**

**Tajuk Projek : GSM BASED HOME SECURITY SYSTEM**

**Sesi Pengajian :**

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Date :

## DEDICATION

*Special dedicated to my beloved father, Cheng Chee Fun and  
my mother, Lee Miew Yen.*

## ACKNOWLEDGEMENT

I would like to thanks to people who has supported me and gave encouragement, guidance and advices in order to help me to complete the project successfully.

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## ABSTRACT

This report presents a design and implementation of monitoring system of home security with sensor network and Global System for Mobile Communication (GSM) network. The monitoring system of project consists of two sub-systems which are notification system and alert system. Notification system enable user to be notified any alarm incident of home condition via Short Message Service (SMS) which is done over GSM network. Alert system performs visual or audible responses. Visual response is indicated by light while audible responses are indicated by buzzer or siren. A RS 232 serial communication in this project is used to build a communication channel between microcontroller and GSM modem. The chosen microcontroller for this project is a Microchip PIC 16F family series, PIC 16F877A. GSM modem supports AT command set to send data command via SMS. Single Pole Double Throw (SPDT) relay is used as an electronic switch to control the light for on or off state. The firmware of this project enable multi sensors monitoring. Three sensors which are Infrared (IR) sensor, door sensor and Passive Infrared (PIR) sensor are monitored at a time. Liquid Crystal Display (LCD) is used for short distance monitoring while SMS is used for long distance monitoring.

## ABSTRAK

Laporan ini membentangkan reka bentuk dan aplikasi sistem pemantauan keselamatan rumah yang terdiri daripada gabungan rangkaian sensor dan Sistem Global untuk Komunikasi Mudah Alih (GSM). Sistem pemantauan projek ini terdiri daripada dua sub-sistem, iaitu sistem notifikasi dan sistem amaran. Sistem notifikasi membolehkan pengguna dimaklumkan apa-apa kejadian penggera keadaan rumah melalui aplikasi Perkhidmatan Pesanan Ringkas (SMS). Aplikasi SMS ini dilakukan melalui rangkaian GSM. Sistem amaran memberikan tindak balas visual atau audio terhadap kes penggera sistem pemantauan. Lampu merupakan tindak balas visual manakala pembaz atau siren merupakan tindak balas audio. Satu komunikasi bersiri RS 232 telah digunakan sebagai media perhubungan antara pengawal mikro dan modem GSM. Pengawal mikro yang dipilih untuk projek ini ialah Microchip PIC 16F Siri, PIC 16F877A. Modem GSM memerlukan kod isyarat kawalan *AT command* untuk arahan penghantaran SMS. *Single Pole Double Throw (SPDT)* relay digunakan sebagai suis elektronik untuk pengawalan pembukaan atau penutupan lampu. Perisian tegar projek ini menekankan pemantauan pelbagai penderia dalam satu masa yang sama. Tiga penderia terpilih yang dipantau dalam satu masa yang sama adalah *Infrared (IR) sensor*, *door sensor* dan *Pyroelectric Infrared (PIR) sensor*. *Liquid Crystal Display (LCD)* digunakan untuk tujuan pemantauan jarak dekat manakala notifikasi SMS digunakan untuk tujuan pemantauan jarak jauh.



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## LIST OF ABBREVIATIONS

AT	-	Attention Commands
GSM	-	Global System Mobile Communication
GPM	-	GSM Power Meter
HBS	-	Hardware Based System
ICSP	-	In Circuit Serial Programming
IR	-	Infrared
LCD	-	Liquid Crystal Display
PBS	-	Phone Based System
PCB	-	Printed Circuit Board
PDA	-	Personal Digital Assistant
PIC	-	Peripheral Interface Controller
PIR	-	Pyroelectric Infrared
SMS	-	Short Message Service
SPDT	-	Single Pole Double Throw
WBS	-	Web Based System
Wi-Fi	-	Wireless Fidelity
WLAN	-	Wireless Local Area Network



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## CHAPTER I

### INTRODUCTION

This chapter gives a general outline of the whole project. In this chapter, overview, objectives, problem statement, scopes of work, overview of methodology and thesis organization of this project are included.

#### 1.1 Introduction

Recent days, increasing criminal rates such as burglary and house break-in make people want to secure their life and properties against attacks, damages or losses [1]. In older times, measures such as locking the doors and windows, turning on lights when nobody is home, putting a few pairs of shoes in front of the house when away from home can prevent the house from being broken-in. However, these traditional ways are not reliable anymore. Next, close house monitoring has been introduced into the market. Its purpose is to keep an eye on or surveil people's home by employing a safeguard or home security company. People are dissatisfied with close house monitoring because of the too expensive employment fees especially for ordinary families. Besides, people feel that they lack privacy when they are under surveillance of a third party [2]. Due to the reasons mentioned above, a fast approach idea has come out to satisfy the need of people and to improve and secure life and property. In this research, an idea to design and develop a home security system with monitoring purpose for ordinary families has been proposed. In this new technology era, latest technologies have always been implanted into systems in order to produce excellent output performance. Therefore, a more reliable system consists of more sophisticated and expensive devices. A still

productive system which consists of cheaper devices or older technologies has its own limitations. Concluded from mentioned aspect, a practical low cost and reliable home security system Global System for Mobile Communication (GSM) network via Short Message Services (SMS) for real time monitoring has been designed. The system has advantages such as inform user of update home status and allow user to reset alarm when it is confirmed a false alarm. Another indirect advantage for home security system is that to prevent house becomes an easy target for burglars. A house which is obviously installed a security system can scare away burglars. Criminals take priority to house without any security system. The expected outcome for this research is a prototype of home security system for real time monitoring. A home security system focuses on intruder detection will be developed.

## **1.2 Objectives of Project**

The main objectives of this project are:

- 1) To develop a low cost and reliable home security system.
- 2) To enable home monitoring to user via Short Message Services (SMS)

## **1.3 Problem Statement**

People nowadays are busy with daily activities. Adult deals with career while children busy with academics. Only elderly people left at home or most of the time there is nobody home especially day time. Recently, the numbers of break-in and attack of these easy targets is increasing [1]. Therefore, there is a need to install a home security system which can detect illegal intrusion. 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. The problem can be solved by employing an alarm system monitoring company but it is not affordable ordinary family due to the expensive payment [2]. 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.

#### **1.4 Scope of Project**

This project consists of two subsystems which are intruder detection system (IDS), and monitoring system. For intruder detection system, sensors and alarm are connected via wired method. The monitoring system is divided into two working categories which are short distance monitoring and long distance monitoring. Short distance monitoring is displayed through liquid crystal display (LCD) while long distance monitoring is done over GSM network via SMS [3].

#### **1.5 Project Overview**

There are three parts in this project which are sensing network, notification system and alerting system. Figure 1.1 shows the overview of system architecture.

The sensor network focuses on intruder detection consists of break beam sensor, passive infrared sensor (PIR) and magnetic switch door sensor. Sensor sends an alarm signal to peripheral interface controller (PIC) microcontroller. PIC 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. When there is input alarm signal from any sensor, data command will be processed and a notification SMS will be sent to user. Besides, LCD also displays the alarm information.

Last part of this project is the alerting system. The alerting system consists of audible and visual indication of alarm. Audible alarm is indicated by buzzer or siren while visual alarm indicated by light.

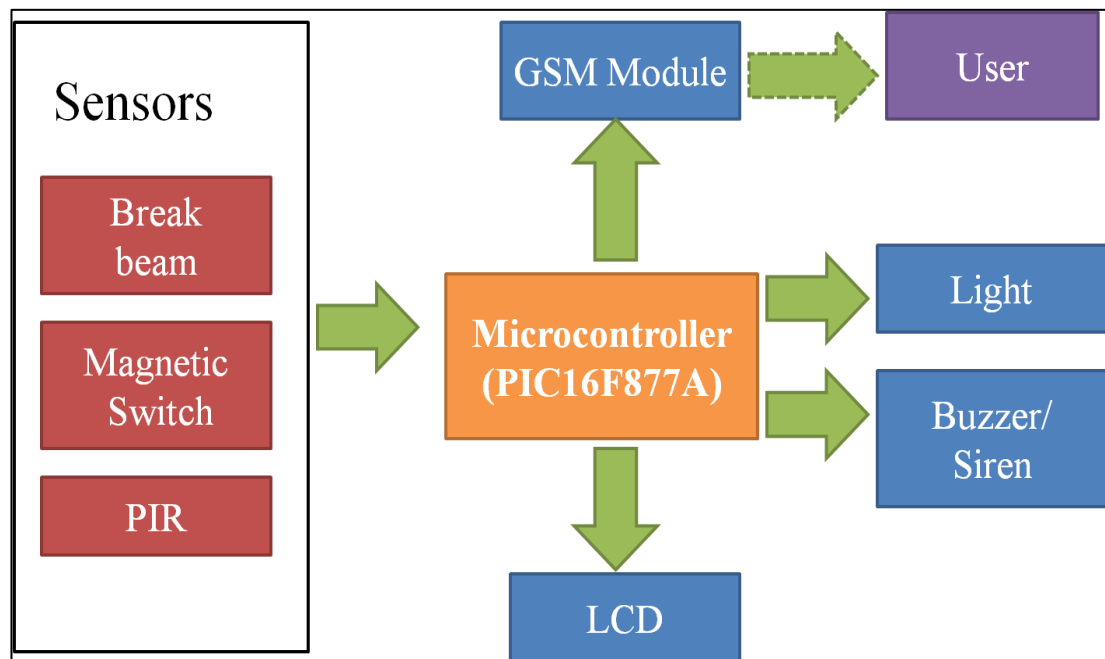


Figure 1.1 : Overview of System

## **1.6 Thesis Organization**

This report is a documentary delivering of how the idea is generated, what theories and concepts are applied, how the methodologies are carried out and the outcome of the project. This report consists of five chapters. The description of this report as below:

### **Chapter 1: Introduction**

The first chapter is to introduce the general outline of the whole project. It explains introduction of project, objectives of the project, problem statement, scopes of project, overview of project and also thesis organization.

### **Chapter 2: Literature Review**

Chapter 2 will study on the literature review of home security system and SMS based applications. It explains the concept and theory that is useful for completing this project.

### **Chapter 3: Project Methodology**

Chapter 3 will discuss all the methodology such as procedures, materials and tools used for the project. It also explains the circuit design for hardware and firmware design for embedded system.

### **Chapter 4: Result and Discussion**

Chapter 4 will show overview of the prototype and results of system functionality. It will discuss advantages, limitation, importance and impact of the system.

### **Chapter 5: Conclusion and Recommendation**

The last chapter is the conclusions of the whole project. It also discusses the future enhancement of the project.

## **CHAPTER II**

### **LITERATURE REVIEW**

This chapter introduces devices, approaches and communication technologies that have been implemented in current home security system. Beside of explaining different type of home security system, it also explains latest SMS based applications.

#### **2.1 Home Security System**

The three common types of home security system in the market are phone based system (PBS), web based system (WBS) and hardware based system (HBS). For phoned based system, monitoring and control for home is done by global system for mobile communication network. For web based system is done over internet or wireless router. For hardware based system, monitoring and control is fully done by hardware [4].

##### **2.1.1 Web based Home Security System**

Web server and home controller play the important role in the web based system. Figure 2.1 shows the web based system architecture. Web server governs the interfaced webpage that allows user to control the system. Real time monitoring of home condition is done over web browsers via laptop, personal digital assistant (PDA) or internet-enabled mobile phone. Laptop is connected to internet via wired local access network or wireless local access network (WLAN). PDA is connected to internet via WLAN. Internet- enabled mobile phone is connected to an internet

service which is provided by a mobile service company. When a sensor detects abnormal incident, an alert message is sent to user through web page. User can confirm the alarm after observing home condition for true abnormal incident through installed camera. Web based system requires high cost devices such as personal computer, laptop or PDA. Laptop and personal computer are large in size and heavy to be carried. Monthly internet service or phone service makes web based system a high cost system [4].

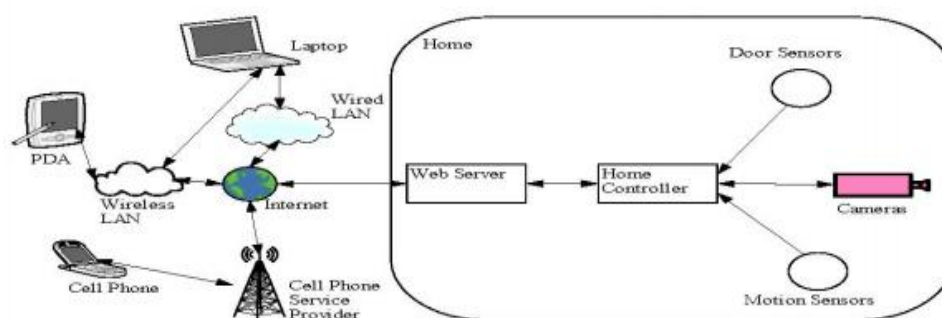


Figure 2.1 : Web Based System [4]

### 2.1.2 Phone Based Home Security System

Phone based system is a public phone system which is connected to Public Switched Telephone Network (PSTN). Figure 2.2 shows phone based system architecture. User can activate home alarm when he/she leaves the house. When one of the sensors for example door sensor is triggered, alarm is alerted through PSTN system. PSTN calls the alarm monitoring company or homeowner. To get confirmation for the alarm incident, a physical visit is required [4].

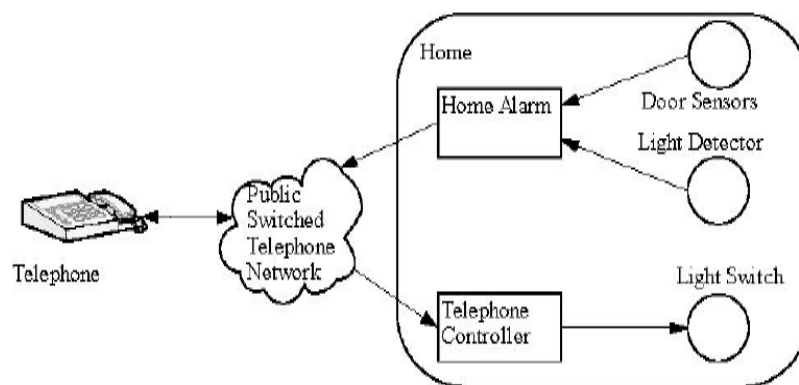


Figure 2.2 : Phone Based System[4]