

WIRELESS SECURITY SYSTEM

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For my beloved father and mother

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ABSTRACT

Security system has become one of user needs now days and user are keenly to pay money to buy these devices. Wireless Security system is one of the devices in the market but because the technology that is used the device is very pricey. The objective of the project is to design wireless security system that is more affordable for user. The second objective is to build a wireless and portable security system. The third objective is to design a flexible and easier installation device for user. The wireless security system has three main parts that is the sensor system, the wireless system and the alarm system. The sensor system includes door sensor and motion sensor. Components that will be used for the door sensor is shock and magnetic sensor. While components for the motion sensor is infrared sensor and PIR sensor. Next the RF module 433MHz will be used for the wireless module. Finally the third part in hardware development is the alarm system that is consists of LCD display and a buzzer. Microcontroller 16F877A will controlled the three main parts of the wireless security system. When the sensor system is active, it will send a signal to the alarm system that will then alert the user. The communication range between the sensor system and the alarm system is up to 50 meters.

ABSTRAK

Sistem keselamatan telah menjadi satu daripada keperluan pengguna pada masa kini dan pengguna sanggup mengeluarkan wang untuk membeli peranti-peranti ini. Sistem keselamatan tanpa wayar adalah satu daripada alat-alat dalam pasaran tetapi kerana teknologi adalah yang terkini harganya amat mahal. Objektif projek adalah untuk mencipta sebuah sistem keselamatan tanpa wayar yang mampu dibeli oleh pengguna. Matlamat kedua projek ini adalah membina satu sistem keselamatan tanpa wayar yang mudah alih. Matlamat ketiga projek ini adalah membentuk satu system keselamatan tanpa wayar yang kaedah pemasangannya yang fleksibel dan lebih mudah untuk pengguna. Sistem keselamatan tanpa wayar ini dibahagikan kepada tiga bahagian utama iaitu sistem penderia, sistem tanpa wayar dan sistem penggera atau pemantau. Sistem penderia itu termasuk penderia pintu dan penderia gerakan. Bahagian-bahagian yang akan digunakan untuk penderia pintu adalah penderia kejutan dan penderia magnetik. Manakala bahagian-bahagian untuk penderia gerakan adalah penderia inframerah dan penderia PIR. Modul RF 433MHz akan digunakan untuk modul tanpa wayar. Akhirnya bahagian ketiga dalam system ini adalah sistem penggera yang mengandungi paparan LCD dan pembaz. Mikropengawal 16F877A akan mengawal keseluruhan tiga bahagian utama bagi sistem keselamatan tanpa wayar ini. Apabila sistem penderia di aktif, ia akan menghantar satu isyarat kepada sistem penggera yang akan memberi amaran kepada pengguna. Jarak komunikasi antara sistem penderia dan sistem penggera adalah sehingga 50 buah meter.

TABLE OF CONTENTS

| CONTENT | PAGE |
|---|-------------|
| PROJECT TITLE | i |
| RECOMMENDATORY | ii |
| DEDICATION | v |
| ACKNOWLEDGEMENT | vi |
| ABSTRACT | vii |
| ABSTRAK | viii |
| TABLE OF CONTENT | ix |
| LIST OF TABLE | xii |
| LIST OF FIGURE | xiii |
| LIST OF ABBREVIATION | xv |
| CHAPTER 1: INTRODUCTION | |
| 1.1 Introduction to project | 1 |
| 1.2 Objective of project | 2 |
| 1.3 Problem statement | 2 |
| 1.4 Scope of project | 3 |
| 1.4.1 Hardware development | 3 |
| 1.4.2 Software development | 3 |
| 1.4.3 Limitation of project | 4 |
| 1.5 Overview of remaining chapters | 4 |
| CHAPTER 2: LITERATURE REVIEW | |
| 2.1 Introduction | 6 |
| 2.2 Previous project | 6 |

| | | |
|---------|----------------------------------|----|
| 2.3 | Wireless | 8 |
| 2.4 | Wireless security system | 8 |
| 2.5 | Sensor | 9 |
| 2.5.1 | Door sensor | 9 |
| 2.5.1.1 | Magnetic reed switch ‘contacts’ | 9 |
| 2.5.1.2 | Infrared (IR) sensor | 10 |
| 2.5.2 | Motion sensor | 11 |
| 2.5.2.1 | Ultrasonic motion sensor | 11 |
| 2.5.2.2 | Passive Infrared sensor (PIR) | 12 |
| 2.5.2.3 | Microwave motion sensor | 13 |
| 2.6 | Wireless | 14 |
| 2.6.1 | Radio frequency module 315MHz | 14 |
| 2.6.2 | XBee High Radio Frequency Module | 15 |
| 2.6.3 | Bluetooth Radio module | 16 |
| 2.7 | Microcontroller 16F877A | 17 |
| 2.8 | Encoder and Decoder | 18 |
| 2.8.1 | Encoder | 18 |
| 2.8.2 | Decoder | 19 |
| 2.9 | Liquid Crystal Display (LCD) | 20 |
| 2.10 | Speaker and Buzzer | 21 |
| 2.11 | Charging Circuit | 22 |

CHAPTER 3: METODOLOGY

| | | |
|-------|--------------------|----|
| 3.1 | Overview of system | 24 |
| 3.2 | Hardware | 25 |
| 3.2.1 | Sensor system | 25 |
| 3.2.2 | Wireless system | 27 |
| 3.2.3 | Alarm system | 28 |
| 3.2.4 | Charging circuit | 29 |
| 3.3 | Software | 30 |

| | | |
|-------|---|----|
| 3.3.1 | CCS Compiler | 30 |
| 3.3.2 | Proteus Virtual System Modeling (VSM) Schematics Simulation | 31 |
| 3.3.3 | WinPic Programmer | 32 |

CHAPTER 4: RESULT AND DISCUSSION

| | | | |
|-----|--------------------------------|--|----|
| 4.1 | 4.1 | Introduction | 33 |
| 4.2 | Software and simulation result | | 34 |
| | 4.2.1 | Simulation result | 34 |
| | 4.2.2 | Source code result | 36 |
| 4.3 | Hardware result | | 39 |
| | 4.3.1 | Board design and board etching | 39 |
| | 4.3.2 | The model design | 40 |
| | 4.3.3 | Sensor design | 41 |
| | 4.3.4 | Range of transmitter and receiver result | 42 |
| | 4.3.5 | Output of decoder | 43 |
| | 4.3.6 | Signal output of antenna | 44 |
| | 4.3.7 | Sensor result | 45 |
| | 4.3.7.1 | IR sensor | 45 |
| | 4.3.7.2 | Magnetic sensor | 46 |
| | 4.3.7.3 | Shock sensor | 46 |
| | 4.3.8 | Wireless length Result | 47 |

CHAPTER 5: CONCLUSION AND SUGGESTIONS

| | | |
|-----|--------------|----|
| 5.1 | Introduction | 48 |
| 5.2 | Conclusion | 48 |
| 5.3 | Suggestion | 49 |

| | |
|------------------|----|
| REFERENCE | 50 |
|------------------|----|

| | |
|-----------------|----|
| APPENDIX | 51 |
|-----------------|----|

LIST OF TABLE

| NO | TITLE | PAGE |
|-----------|---------------------------------|-------------|
| 4.1 | Result on bread board | 42 |
| 4.2 | Result on etching board | 42 |
| 4.3 | IR range result | 45 |
| 4.4 | Magnetic sensor position result | 46 |
| 4.5 | Shock sensor result | 45 |

LIST OF FIGURE

| NO | TITLE | PAGE |
|------|---|------|
| 2.1 | Overview of project | 7 |
| 2.2 | Reed switch | 9 |
| 2.3 | Reed switch | 9 |
| 2.4 | IR sensor transmitter and receiver | 10 |
| 2.5 | Circuit diagram | 10 |
| 2.6 | Ultrasonic motion detection | 11 |
| 2.7 | Ultrasonic motion detection in a covered case | 11 |
| 2.8 | PIR sensor | 12 |
| 2.9 | PIR sensor in closed case | 12 |
| 2.10 | Inside a microwave sensor | 13 |
| 2.11 | Transmitter | 14 |
| 2.12 | Receiver | 14 |
| 2.13 | Xbee model | 15 |
| 2.14 | Bluetooth radio module | 16 |
| 2.15 | Microcontroller 16F877A | 17 |
| 2.16 | Encoder model HT12E | 18 |
| 2.17 | decoder model HT12D | 19 |
| 2.18 | 2 x 16 Characters LCD Display | 20 |
| 2.19 | 2 x 16 Characters Graphic LCD Display | 20 |
| 2.20 | Speaker | 21 |
| 2.21 | Buzzer | 21 |
| 2.22 | LM3647 | 22 |
| 3.1 | Overview of the system | 24 |
| 3.2 | Magnetic and shock sensor circuit | 25 |

| | | |
|------|---|----|
| 3.3 | IR sensor circuit | 26 |
| 3.4 | Wireless system | 27 |
| 3.5 | Alarm system circuit | 28 |
| 3.6 | Charging circuit | 29 |
| 3.7 | Screenshot of CCS Compiler | 30 |
| 3.8 | Screenshot of Proteus | 31 |
| 3.9 | Screenshot of WinPic Programmer | 32 |
| 4.1 | Simulation result | 35 |
| 4.2 | Source Code for microcontroller at alarm system | 36 |
| 4.3 | Output 1 | 37 |
| 4.4 | Output 2 | 37 |
| 4.5 | Output 3 | 37 |
| 4.6 | Output 4 | 37 |
| 4.7 | Output 5 | 37 |
| 4.8 | Output 6 | 37 |
| 4.9 | Source Code for sensor 1 | 38 |
| 4.10 | Source Code for sensor 2 | 38 |
| 4.11 | After etching process | 39 |
| 4.12 | Monitoring system design | 40 |
| 4.13 | Alarm system 1 design | 40 |
| 4.14 | Alarm system 2 design | 40 |
| 4.15 | IR sensor design | 41 |
| 4.16 | Magnetic sensor design | 41 |
| 4.17 | Shock sensor design | 41 |
| 4.18 | Output of decoder | 43 |
| 4.19 | Output of antenna | 44 |
| 4.20 | IR sensor position 1 | 45 |
| 4.21 | IR sensor position 2 | 45 |

LIST OF ABBREVIATION

| | | |
|--------|---|---|
| RF | - | Radio Frequency |
| LCD | - | Liquid Crystal Display |
| PIC | - | Peripheral Interface Controller |
| PC | - | Personal Computer |
| UART | - | Universal Asynchronous Receiver Transmitter |
| USB | - | Universal Serial Bus |
| GUI | - | Graphical User Interface |
| IR | - | Infrared |
| PIR | - | Passive Infrared Sensor |
| FHSS | - | Frequency Hopping Spread Spectrum |
| CPU | - | Central Processing Unit |
| RAM | - | Random Access Memory |
| HEX | - | Hexadecimal |
| USART | - | Universal Synchronous Asynchronous Transmitter Receiver |
| IC | - | Integrated circuit |
| CMOS | - | Complementary metal–oxide–semiconductor |
| Li-Ion | - | Lithium-Ion |
| Ni-MH | - | Nickel-Metal Hydride |
| NI-Cd | - | Nickel-Cadmium |
| ADC | - | Analog to digital converter |
| CLR | - | Clear |
| LED | - | Light emitting diode |

CHAPTER 1

INTRODUCTION

1.1 Introduction to project

It has always been a necessary, in one way or another to guard and protect our homes and property. Referring to Vivian Capel [1], today, with modern consumer society churning out new technology goods at frightening pace, the range of stolen items grows ever larger. Many people have suffered the trauma of crime in their neighborhoods and at top of the list is burglary. This lost bring a sense of instability and uncertainty into the lives of those most affected.

To counter this growing social problem, various means of protection have been devices over the years. However, the simple mechanical and electrical devices such as five-lever locks, door chains, optical spy holes and basic alarms have given way to a bewildering array of highly sophisticated electronic system referring to Brown [2] . Security system technology has developed in one big the industry because of the society needs. The two most basic security systems connection are wired security system and wireless security system. Both security systems may have the same type of sensor

system in a way but the method of connecting the alarm system is slightly different. The wireless security system gives a new dimension to security system development [3].

The security alarm is wireless equipment in the true sense. Its installation does not require you to dig holes in the walls or do drilling as it does not need any set of wires for data communication totally relies on radio frequency (RF) waves for data transfer. This wireless character not only makes its installation easy but also increases the efficiency of working. As it has been observed that whenever a criminal burgles in he tries to trace the wires and find out if any security alarm is installed so that he can destroy or damage it before committing any crime. Since your wireless security alarm does not require any wires, it only eases its handling and installation but allows you to hide or camouflage it in dummy boxes as this way it would be highly difficult for criminals to locate alarm[4][5].

1.2 Objective of project

This project consists of several objectives that to accomplish at the end of this project. The objectives are:

- i. Create a security system that is more affordable for users.
- ii. Create a wireless and portable security system.
- iii. Flexible and easier installation device.

1.3 Problem Statement

Wireless Security system has become one of the main needs for users now days and surprising the number of users tends to buy expensive wireless security system has rise up. This is because the technology that is used makes it very pricey. That is why some customers opted to by common wired base security system that is cheaper.

So the main objective of the project is to create a security system that is more affordable for users at any level in the society. The important part is to create a wireless and portable security system for users to benefit. To add more value to the project, it is design so it can be flexible and easier installation for user usage.

1.4 Scope of project

The scope of project is done so the objective of the project can be archive. The wireless security system is consisting of two parts that is software development and hardware development.

1.4.1 Hardware development

The hardware development is consists components that will be used to build the design the project. There are 3 parts main part in this system that is the sensor system, the wireless system and the alarm system. The sensor system includes door sensor and motion sensor. Components that will be used for the door sensor is shock and magnetic sensor. While components for the motion sensor is infrared sensor and PIR sensor. Next the RF module 433MHz will be used for the wireless module. Finally the third part in hardware development is the alarm system that is consists of LCD display and a buzzer.

1.4.2 Software development

The software development is needed because of the use of Microcontroller that controlled the system 3 main parts in the hardware development. The Microcontroller will be control with a series of source codes that will be developed using PIC C compiler software. This is the part of hardware and software integration. To test the source code that is develop using PIC C compiler the Proteus software will be used to simulate the circuit of the security system. Finally the WinPIC programmer software will be used to burn the source code to the Microcontroller.

1.4.3 Limitation of project

There is some limitation that has been recognized to the project. Firstly the range of the security devices is only up to 50 meter. Next the device only can use for house usage and small office purpose because of the range limitation.

1.5 Overview of Remaining Chapters

This report consists of five chapters: the chapter respectively is Introduction, Literature Review, Methodology, result and analysis, conclusion and discussion.

In chapter 1 Introduction, it will be discussed about project objective, project background, problem statement, scope of work, and overview of remaining chapters.

In chapter 2 Literature Review, it will be discussed on reviews of some references from previous project, journal, article, books and datasheet. All the materials were useful to ensure the success of this project.

In chapter 3 Methodology, it will be discussed on the flow of this project started and how it will be functional. There are several flow chart of the program of project to explain the process of the circuit within combining hardware and software until project archive the project objectives.

In chapter 4 Result and Discussion, it will be discussed on the result of the project. Beside that there is also result regarding the device sensor system, wireless system and also alarm system. This also includes result on how reliable the sensors in the sensor system can work and how far the wireless system can go. This chapter also discuss on problem that occur during the process of constructing the system.

In chapter 5 Conclusion and suggestion, this is the final and closing chapter that will discuss on the conclusion for the whole project. This result will be compared back to the objective that was stated in the first chapter. Comparison will be made to see if the objective of the project is achieves or not. Finally some suggestion is also stated for the project so more improvement can be done to the project for the future development.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reasons to review and discuss some of references from previous projects, journals, books and datasheet. All this information was collected from the different sources such as library, internet and product manual. The useful data of this project will be discussed on this chapter.

2.2 Previous Project

They were a lot of project done by individuals that can be found on the internet on the wireless security system. Below is one of the project that is used as a reference entitle simple wireless security system [7]. This project uses a Zigbee wireless module as the wireless system, reed switches and magnets for the sensor system and a personal computer (PC) interface for the monitoring medium.

The reed switches and magnets are used as a door sensor and are connected near the garage doors, and it detects the open/closed. The Atmel Attiny45 microcontroller fits in nicely with design because of its small size, low pin count and low cost. This controller has a powerful serial interface feature that can be set up as a UART and requires interface for the Zigbee wireless module. When a door opens or closes, the Attiny45 sends a message wirelessly to the PC interface.

The PC interface consists of a standard Windows XP PC and a USB adapter that includes a Zigbee wireless transceiver. The PC runs an application that receives messages from the door sensor and graphically shows the state of the security system by changing its icon in the system tray. Using the PC's clock, an alert sound is played if the door is open during the middle of the night. The application runs in the "background" while the PC is used for other purposes.

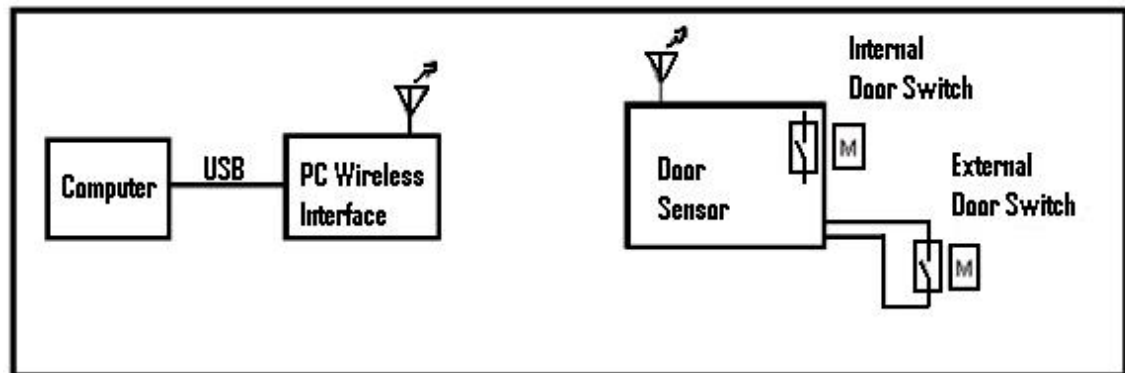


Figure 2.1 Overview of project

There are two pieces of hardware, the Door Sensor and the PC Wireless Interface. In the Door Sensor, an Atmel ATtiny45 monitors the reed switches and sends the switch status through a Zigbee wireless transceiver to the PC Wireless Interface. The PC Wireless interface passes the message up to a GUI application running on the PC. Figure 2.1 shows the overview of the project.

2.3 Wireless

Wireless communication is transferring sets of information over a distance without the use of electrical conductors or wires [8]. The distances involved may be short like a few meters as in television remote control or very long like thousands or even millions of kilometers for radio communications. When the context is clear the term is often simply shortened to "wireless". Wireless communications is generally considered to be a branch of telecommunications. Wireless operations permits services, such as long range communications, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications systems like Radio Frequency that will be used as a medium of connection between components in the wireless security system.

2.4 Wireless security system

The built in of security systems nowadays are all electronics because of the development on of technologies that has rapidly increase. The most commonly security system used now days are wireless security system. Users opted to uses this type of system because it is more economical and quicker install compared to the wired ones. Some systems serve a single purpose of burglary or fire protection. Combination systems provide both fire and intrusion protection. Sophistication ranges from small, self-contained noisemakers, to complicated, multi-zoned systems with color-coded computer monitor outputs. Many of these concepts also apply to portable alarms for protecting cars, trucks or other vehicles and their contents. So the basic of building a wireless security system a sensor, a wireless module, a alarm or monitoring system and a power supply [9].

2.5 Sensor

At the forefront of any security system is a sensor that has been specifically chosen to detect the presence or the passage of an intruder. These devices work on various principles and it is important to which sensor is chosen at each point the sensor is installed.

2.5.1 Door Sensor

One of the most important parts of a building is the door. The door is the main the main access for us to go in and out of a building. The door is also one an access for intruder to brake in. That is why sensors must be installed to the door. There are certain sensors that are suitable to use as door sensor depending on user needs and requirements. Below are some of the sensors suitable for the door.

2.5.1.1 Magnetic reed switch ‘contacts’

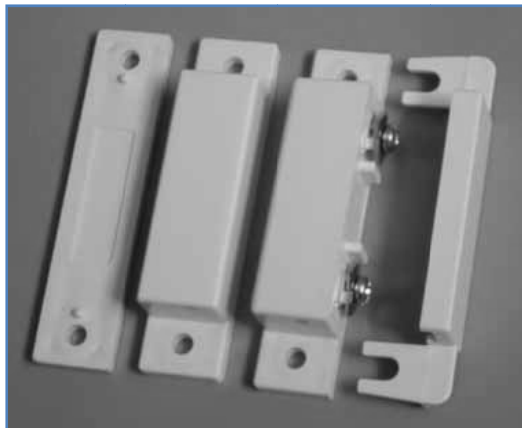


Figure 2.2 Reed switch

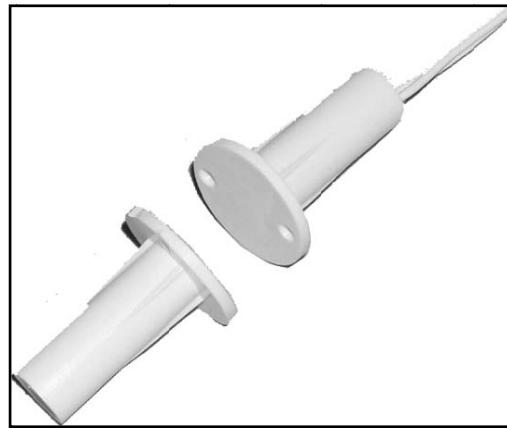


Figure 2.3 Reed switch

The most commonest and simple sensor of all is the humble reed switch. The reed switch is an electrical switch operated by an applied magnetic field. It consists of a pair of matching permanent magnet, fitted mainly to doors and sometimes the opening