ZIGBEE-BASED SMART HOME SYSTEM

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This report is submitted in partial fulfillment of the requirement for the Bachelor Degree in Electronic Engineering (Wireless Communication) with Honors

Faculty of Electronic and Computer Engineering
University Technical Malaysia Melaka

June 2014

UNIVERSTI TEKNIKAL MALAYSIA MELAKA

FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN

PROJEK SARJANA MUDA II

Tajuk Projek : ZIGBEE-BASED SMART HOME SYSTEM

Sesi Pengajian : 2013/2014

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DEDICATION

Dedicated to my beloved father, mother and families

ACKNOWLEDGMENT

Alhamdulillah, praise to Allah S.W.T for the guidance and blessing upon me, for without it I would not have been able to come this far.

I wish to give my appreciation to my supervisors Engr. Noor Badariah bte Asan for their advice, understanding, good guidance and help throughout this project. Without their valuable suggestions and encouragement, this project would have not been successful.

A special thanks to my family especially my parents who encouraged me in my final year here and gives me lots of inspiration. Last but not least, to all my fellow friends for their brilliant ideas, support and encouragement throughout the duration of this project. Thank you so much.

ABSTRACT

Wireless technology has already become an important application which usually integrated to a wide range of device and other technologies. The enhancements provide by the wireless technology gives the ease of control to the users. Nowadays, almost all the electronic devices are equipped with wireless technology. This fact shows the necessity and benefits provide by this technology. This project is mainly concern about home power consumption observation system with wireless capabilities. It is use the X-Bee as the wireless modules. This project uses two microcontrollers to handle the wireless communication protocol. The first microcontroller done the calculation needed and display it to the user with both hardware and software interface. The second microcontroller functions as the watch guard for the sensor circuit. The received data from sensor circuit is stored and send to the first microcontroller upon request. Moreover, the user interfaces gives ease of controls to the users. Furthermore, this system also has the interconnecting with Wireless Sensor Network (WSN) such as the IEEE802.15.4 ZigBee Protocol.

ABSTRAK

Teknologi wayarles telah menjadi aplikasi penting yang biasanya terintegrasi untuk peranti dan teknologi lain. Alat tambahan mempunyai teknologi wayarles memberikan kemudahan kawalan kepada pengguna. Kini, hampir semua peranti elektronik dilengkapi dengan teknologi wayarles. Fakta ini menunjukkan betapa pentingnya teknologi ini. Projek ini berkaitan system pengawasan, penggunaan kuasa dirumah dengan kemampuan wayarles. Sistem ini menggunakan X-Bee sebagai modul wayarles. Projek ini menggunakan dua mikropengawal untuk menangani protokol komunikasi wayarles. Mikropengawal pertama melakukan pengiraan yang diperlukan dan mempamerkannya kepada pengguna dengan antara muka peranti keras dan perisian. Fungsi mikropengawal kedua sebagai mengawasi litar pengesan. Data yang diterima daripada litar pengesan tersebut disimpan dan dihantar ke mikropengawal pertama atas permintaan. Dengan kemudahan antara muka, sistem ini memberikan kemudahan bagi pengguna untuk berkomunikasi dengan sistem ini. Selanjutnya, sistem ini juga mempunyai interaksi dengan teknologi pengesan wayarles seperti IEEE802.15.4 ZigBee Protokol.

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GSM	-	Global System for Mobile Communication
PIC	-	Peripheral Interface Controller
LCD	-	Liquid-Crystal Display
SMS	-	Short Message Service
SPICE	-	Simulation Program with Integrated Circuit Emphasis
PCB	-	Printed Circuit Board
BASIC	-	Beginner's All-purpose Symbolic Instruction Code
RFID	-	Radio-Frequency Identification
LED	-	Light-Emitting Diode
GPRS	-	General Packet Radio Service
PC	-	Personal Computer
IEEE	-	Institute of Electrical and Electronic Engineers
WSN	-	Wireless Sensor Network
WLAN	-	Wireless Local Area Network
Tx	-	Transmitter
Rx	-	Receiver
IC	-	Integrated Circuit
V	-	Voltage
IDE	-	Integrated Development Environment
RF	-	Radio Frequency

CHAPTER 1

INTRODUCTION

1.0 Overview

This chapter will cover the introduction of the project where it involve of the project background, overview of the project, problem statement, objective of project, scope of project, thesis outline, and summary of work.

1.1 Project Background

Since a few years ago, wireless sensor network technology has been developed. Many research communities give their attention on developing wireless sensor network for many purposes. The introducing of the wireless sensor network has become a new paradigm in information-gathering method. This is because wireless sensor network consists of many self-organized sensing nodes that cooperate with each other to gather information. Each node is equipped with devices which are used to monitor and collect the data, process the collected data and then transmit the data to the adjacent nodes.

1.2 Overview of Project

Security is considered a key issue when it comes to smart home system. The security system is one of the aspects to consider when building a home or residential areas. This is because the burglary case is more widespread and has taken seriously to ensure that this case can be reduced. The purpose of this security system is to ensure that homes and neighborhoods safe. Moreover, with this system the users can receive information more quickly in the event of unwanted items at home. We propose to design the project using microcontroller and magnetic sensors. Magnetic sensors are used to detect any vibration on the front door. The system has six blocks of magnetic sensors, the 555 timer circuits, the PIC 16F877A microcontroller, GSM and the ZigBee technology. The security system works when one of the houses in a residential area damaged by the robbers. Magnetic Sensors in the front door will detect vibration and send information to the sender via cable. The transmitter will send a signal to a receiver at the guardhouse by using ZigBee technology. The receiver will receive the signal and displays the number of homes that have been broken by the thief through the LCD display and an alarm will sound. In addition, the consumer or homeowner will receive SMS via GSM to tell that their home was broken into by thieves.

1.3 Problem Statement

Case of burglary is one crime that is rising these days. Because of this case, the security system is needed to help address this problem from spreading. The purpose of this system is made to ensure that the public is able to live in peace and quiet without having to worry about leaving the house in a long time. In addition, this system can help the public to act immediately in case of a burglary at their home.

1.4 Objective of Project

The aim of the project is to design and construct a control system which consists of smart security system that can be used for various purposesespecially teaching and learning and home application. The specific objectives of these projects are:

a) To design and develop smart security system using Zigbee technology.
b) To help reduce burglary cases the area of housing.
c) To monitoring of smart home remotely and providing security when user is away from the home.

1.5 Scope of Project

The scope of project is shown in Figure 1.1.The scope of this project focused into three stages, which are hardware, software and technology development. In this project, it involves two parts in order to accomplish one complete system in wireless networking. It has two boards collectively from a Zigbee network, one of which is transmitter and receiver circuit. This project also uses the GSM (Global System for Mobile Communication) to enable the user or host information when they entered the home or residence of the robbers.

For the hardware part we will use the magnetic sensor, LCD and buzzer. Magnetic sensors detect changes and disturbances in a magnetic field like flux, strength and direction. Door and window sensors come in two pieces. One fits onto the door or window itself, while its counterpart attaches to the frame. Adhesive usually keeps the sensors in place, though sensors can be screwed directly into the frame. Position the two pieces of the sensor right next to each other, because they interact. When the two pieces are separated, such as when the door or window is opened, they send a signal to the alarm panel. Liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. It is used to display the number of home security hut when ZigBee receiver receives a signal that the house was broken into by burglars. A buzzer or beeper is an audio signaling

device, which may be mechanical, electromechanical, or piezoelectric. It is used to alert security guard who was in the hut to be aware that there is a housing area home was entered robbers.

For the software part we will use the Multisim, Proteus and Visual Basic. Multisim is a circuit simulation based on SPICE (standard for circuit simulation). It contains a database of components that you can use to build a circuit and many of these components are simulatable.Proteus is software for microprocessor simulation, schematic capture, and printed circuit board (PCB) design. Visual Basic was originally created to make it easier to write programs for the Windows computer operating system. The basis of Visual Basic is an earlier programming language called BASIC.

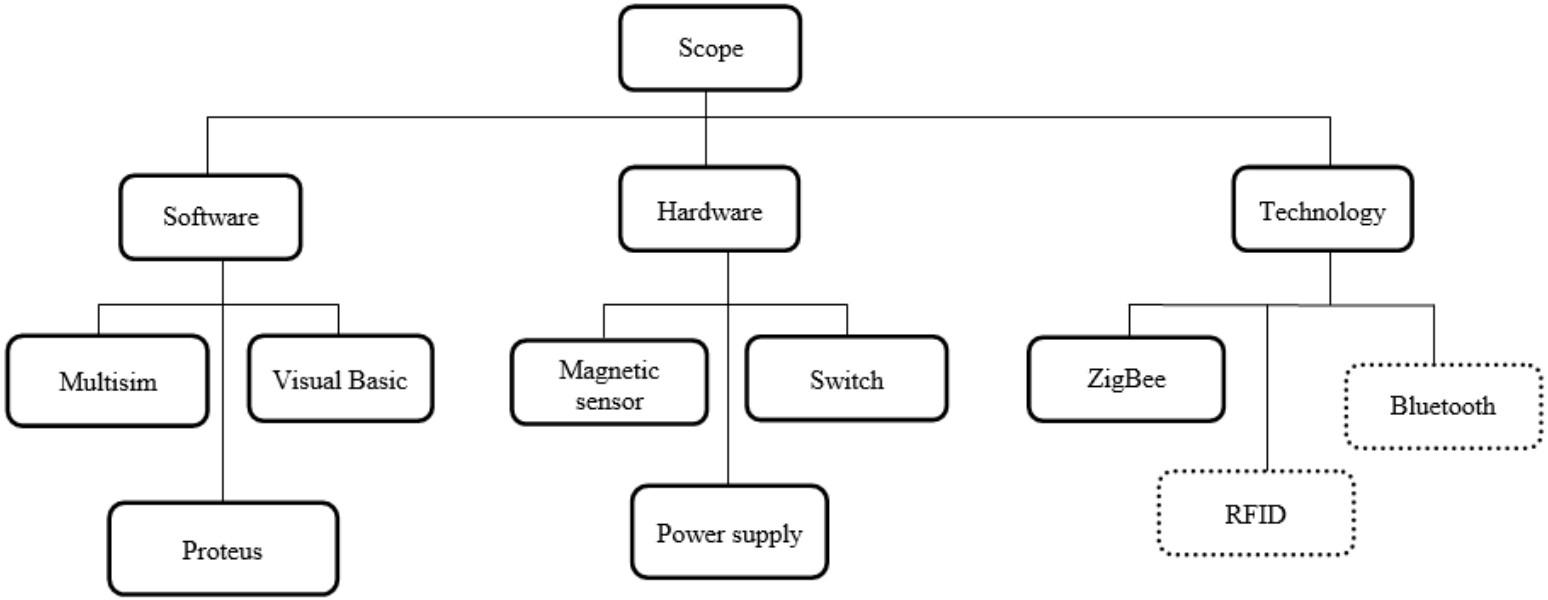

Figure 1.1: Scope of Project

1.6 Project Methodology

The block diagram of project is shown in Figure 1.2. This project focuses on wireless transmission data and the project development based on Zigbee technology. The system has function properly when sensor active and microcontroller will send the data using Zigbee module to transmit and receive the data to the equipment. The project methodology shows that the step will be taken to complete the project.

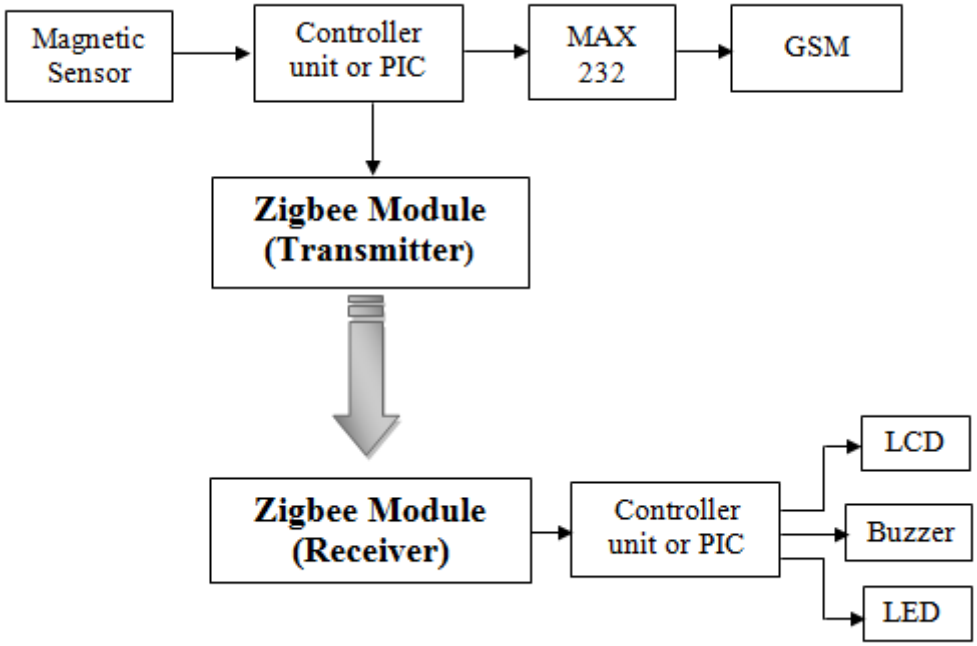

Figure 1.2: Block Diagram of Project

The methodology of project regarding the project title is divided into two parts which is Hardware and Software. In Hardware part, this project will be design the security system for the home and need to understand how the system will be functioning.As far as hardware is concerned, open hardware designs will be created for various home automation components. These could then be assembled by users.

In Software part, the software for the home system will be designed. On the software side, a stack of software would run on a single server. This software stack would include

software for interfacing with devices, software for aggregating, analyzing, and acting upon these data.

1.7 Project Structure

This report is covered by five chapters. The first chapter starts with overview of project, objective, problem statement and scope of project. The literature review is discussed in Chapter 2 and project methodology in Chapter 3. The Chapter 4 covers hardware and software implementation and the conclusions and suggestions are respectively covers in Chapter 5. For projects that have been successfully implemented, there are some places to look into. Here are the main chapters:

Chapter 1: Study about objectives and scope of project.

- The purpose of this project is to design and develop a ZigBee wireless system consisting of a sensor to detect if there is any effect of forced entry into the home.

Chapter 2: Literature review about wireless ZigBee system and sensor.

- Research, find and read relevant topics from the sources such as reference books, internet and journal let's get deeper knowledge and information for the project. Research on the system or even less in the market and know what are the characteristics and capabilities of the product will also provide more information and understanding in this project.

Chapter 3: Project methodology covers the planning, design and management of development projects.

- This chapter explains more about the project methodology used in this project. This section will explain more about the way it projects from start to finish. Every single thing that has been implemented in the project should be described step by step.

Chapter 4: Hardware and Software implementation.

- The fourth chapter should focus on hardware and software development. In this chapter also shows the testing process. Testing will be performed on each module in both hardware and software systems.

Chapter 5: Conclusion and suggestion on the project.

- In the final chapter will examine and review the project, whether the solution is done to achieve the project objectives. Discuss problems, conclusions and recommendations will be discussed for future improvements in this project.

CHAPTER 2

LITERATURE REVIEW

2.0 Chapter Overview

In this chapter will discuss the projects and paper work associated with this project. Related work was studied to produce the quality and reliability of the project. By analyzing the projects done before by other researchers, are likely to find out there are a few features about the projects done. They also recommend some future work that can be undertaken to improve the project. In addition, there are a few ideas that are used to implement this project from other projects similar. An extended literature review process from beginning to end of the project. By review the previous work, the right of action for the project can be undertaken and the features that must be enhanced to make this project reliable and marketable. In addition, there are a few findings from the internet and books used in this project. Along analysis at the beginning of the project, special features specified in this project and the components used in the project is determined. In addition it is functional and well understood concept.