WIRELESS HOME ELECTRICAL APPLIANCES MONITORING AND CONTROL USING ZIGBEE

RAZLIN BINTI RAHMAT

This Report Is Submitted In Partial Fulfillment of Requirement for the Bachelor Degree of Electronic Engineering (Wireless Communication)

Faculty of Electronics and Computer Engineering
Universiti Teknikal Malaysia Melaka

June 2015

UNIVERSTI TEKNIKAL MALAYSIA MELAKA

FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN

PROJEK SARJANA MUDA II

Tajuk Projek : WIRELESS HOME ELECTRICAL APPLIANCES MONITORING AND CONTROL USING ZIGBEE

Sesi Pengajian : SESI 2104/2015

Saya RAZLIN BINTI RAHMAT mengaku membenarkan laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (√) :

☐ **SULIT** *(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

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

☑ **TIDAK TERHAD**

Disahkan oleh:

(TANDATANGAN PENULIS)

Alamat : No A7 Rumah Rakyat,
Batu 13 Labu Hilir,
71900, Labu,
Negeri Sembila

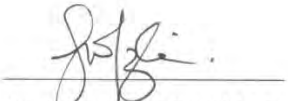
Tarikh: 11/6/2015

(COP & TANDATANGAN PENYELIA)

Dr. Mohd Sa'ari Bin Mohamad Isa
Pensyarah Kanan
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)
Hang Tuah Jaya
76100 Durian Tunggal, Melaka

Tarikh: 11/6/2015

"I hereby declare that this is the results of my own paper except for quotes as cited in the references."

Signature : 

Author : RAZLIN BINTI RAHMAT

Date : 8 JUNE 2015

"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award of Bachelor Degree of Electronic and Computer Engineering (Wireless Communication) with Honours."

Signature : _____

Supervisor's Name : DR. MOHD. SAA'RI BIN MOHAMAD ISA

Date : 8 JUNE 2015

This project and research work is dedicated to my beloved parents, for their devoted caring throughout my life, my beloved brothers and sisters, who give the inspiration to me and also my friends for their encouragement. Without their support this report may not have been done.

ACKNOWLEGDEMENT

Alhamdulillah, first and foremost, thank to Allah the Almighty for blessing me to complete my Project Sarjana Muda. I would like to enlarge my appreciation to Dr Mohd Saaʺri Bin Mohamad Isa because of the kindness heart to accept me as one of the student under his supervision. Special thanks also dedicated to his for all comments, idea, and a guideline begin from the first day I start this project.

This appreciation also goes to my friend that gives support, opinion, and advices for me to complete this report especially my friends under Dr Mohd Saaʺri Bin Mohamad Isa supervision, Nur Naimah Binti Zainal.

To my beloved parents, Rahmat Bin Ahmad and Zainun Binti Yusof, a million of thanks to them who has spending their time, money and advices that never end. Last but not least, thanks to my friends especially from BENW who have been such wonderful friends to me and also to everyone involved in the complete of this project. I would like to thank them for all support and encouragement to me which have given me the courage and wisdom to fulfill my final year project.

THANK YOU

ABSTRACT

This project is about to design and develop a Wireless Home Appliances Monitoring and Control Using Zigbee. This design will able to control electrical devices in the home. This design will use a personal computer to communicate with controlling box through the parallel port that interface to devices and allow the user to manage these devices manually or automatically. Manual operation will be through a graphical user interface on a computer that will allow the user to select a device and then change its state whether on or off. Automatic operation will allow actions to be performed based on user required entered into software on the computer. Relay module board will be used to interface between electrical device and Visual Studio and the output from Visual Studio will transmitted via Zigbee to relay. The relay will connect the electrical device to an extension cord. So it will save time and energy for user flexible to make it user friendly and the graphics are more interesting. The significant of this project will help user to control electrical appliances automatically.

ABSTRAK

Projek ini merupakan suatu projek mencipta dan membangunkan sebuah sistem Mengawal Alatan Elektrik di Rumah Secara Tanpa Wayar dengan Menggunakan Zigbee. Projek ini membolehkan alatan rumah dikawal tanpa melibatkan wayar. Projek ini menggunakan satu komputer untuk berkomunikasi dengan kotak pengawal dan membenarkan pengguna mengawalnya secara manual atau automatik. Pengguna boleh mengawal sistem ini secara manual dengan menggunakan antara muka di komputer dan tukar keadaan alatan elektrik samada buka atau tutup. Sistem ini juga boleh dikawal secara automatik dimana pengguna perlu mengawalnya secara terus di dalam perisian. Modul relay digunakan untuk disambung kepada alatan elektrik dan isyarat dihantar daripada komputer terus kepada relay dengan menggunakan teknologi Zigbee. Perisian Visual Studio merupakan suatu perisian yang lebih mesra pengguna dan mempunyai grafik yang menarik. Kepentingan projek ini dijalankan adalah untuk membantu pengguna mengawal peralatan elektrik rumah secara automatik tanpa menggunakan wayar.

CONTENTS

LIST OF TABLE

LIST OF FIGURES

LIST OF ABBREVIATIONS

APP	-	Application
GUI	-	Graphical User Interface
IDE	-	Integrated Development Environment

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Project Background

Modern homes with an emphasis on comfort and convenience are being increasingly equipped with programmable installation technology that has already become a matter of course in functional buildings. Different technologies are available to control different things through PC. There are various technologies that are useable depending what devices needs to be controlled and how long away they are from PC.

The impact of home automation on domestic lifestyle will be as far ranging as was that of factory automation on industry and its benefits will be available to all sectors of society. Home automation will be achieved not with the household robot but with embedded computing power and memory within dozens of pieces of domestic equipment, each will communicate with the user and with other equipment. PC-Based control is a new way of control related to industrial equipment. Its importance has been increasing remarkably in the last few years because industry‟s need to find new solution for increasing productivity and replacing the traditional control equipment with newer solutions that can take advantage of the latest technologies.

Some of the benefits that PC Control is bringing compared to the traditional systems are lower overall costs, independence from proprietary control systems, easiness to integrate logic, motion, process control and fieldbus systems, and the integration of control and HMI in a single hardware platform.

1.2 Overview

Wireless home system is a 1-ways communication system that can transmit data from the PC to the electrical appliances. The data can be transmitted and received by using a network, X-Bee. The X-Bee will be connected to the PC and be as a master or main point. The electrical appliances also will be attached to the X-Bee and be as slaves.

X-Bee is a set of wireless protocols used for data transfer. It involves network operations and technologies, including mid-sized networks and local networks. X-Bee is designed to provide highly efficient connectivity between small packet devices. Due to its low power output, X-Bee devices can sustain themselves on a small battery for many months, or even years, making them ideal for install-and-forget purposes, such as most small household systems.

In this project, the PC as a master will show the status of the electrical appliances. With that, user will be able to monitor the status for each appliance. User may switch off the unnecessary appliances by clicking the button on the screen. As the PC is attached to the X-Bee, data is send through the data communication with the X-Bee at the slaves.

The microcontroller at the slaves which connect between the X-Bee and the appliances will received the command and send it to the corresponding appliance. Then, the appliance will follow the command from the master either to send back the power of the appliance or to change the status.

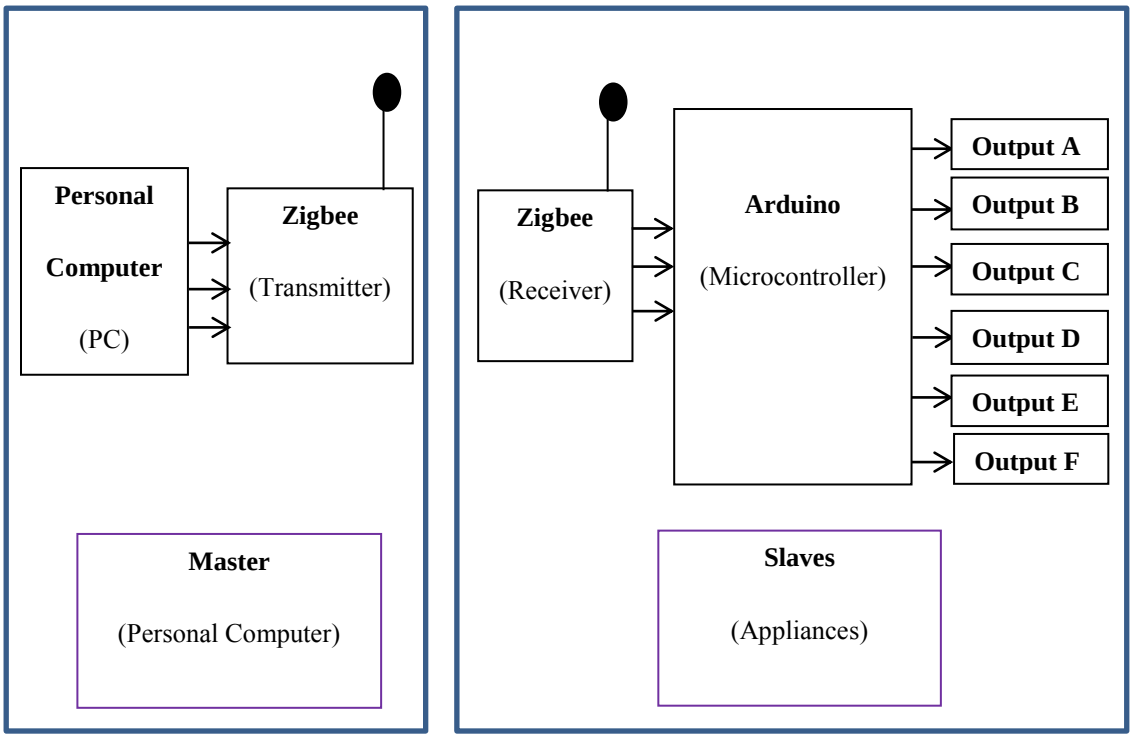


Figure 1.1 Overview on overall of this system

1.3 Problem Statement

The consumption habits of modern consumer lifesyles are causing a huge worldwide waste problem. At present, the overused of power become a big issue. As the switch on, a lot of electrical appliances either at the house, working place or anywhere, usually contributed to the released of carbon dioxide which is one of the harmful gases to the environment. This gas will cause to the greenhouse effect.

The consumption of electricity in Malaysia rises rapidly every year, with an average of 2,533 GWh per year. The electricity consumption, for instance, in 1971 was 3,464 GWh and 94,278 GWh in 2008. By 2020, Malaysia‟s electricity consumption is expected to increase by about 30% from its present value to 124,677 GWh.

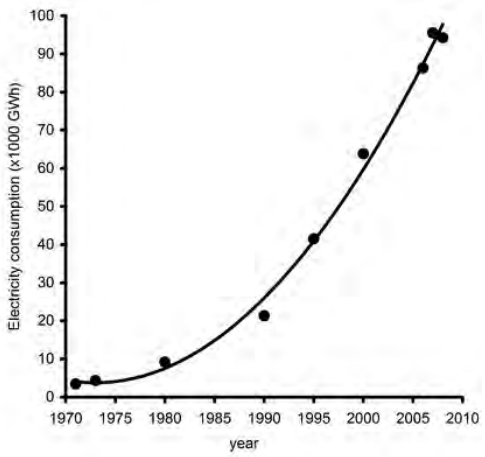


Figure 1.2 Malaysia's electricity consumption (1971-2008)

These power consumption issues become worst due to human attitudes itself. Many consumer refuse to switch off home appliance when the switch is far from them. The only time a consumer can interact with these devices is when he or she is near it. A