

WEB-BASED ROOM APPLIANCES CONTROLLER SYSTEM

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To my beloved mom and dad.

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ABSTRACT

This project mainly focuses on the controlling of home appliances remotely. The system monitors and gets the status of the appliances either in switched ON or OFF when user is away from home. This is web-based systems which use to send the data through serial port (RS232) to microcontroller. The microcontroller will receive the data, process it and trigger the corresponding appliances through driver circuit. This system can be access anywhere whether in Local Area Networking (LAN) or Internet and also designed to be accessible via mobile web. This system provides log in user access system where access only granted for permitted user only. This system is cost-effective and produces an alternative to the problem faced by users in daily life.

ABSTRAK

Projek ini memberi fokus kepada sistem pengawalan peralatan-peralatan elektrik di dalam rumah secara kawalan jauh. Sistem ini akan mendapatkan status peralatan-peralatan tersebut; samada ianya sedang beroperasi ataupun tidak semasa pengguna berada di luar rumah. Ia merupakan sistem berasaskan web di mana ianya digunakan untuk menghantar data melalui liang sesiri (RS232) ke mikropengawal. Mikropengawal akan menerima dan memproses data tersebut dan seterusnya memicu peralatan-peralatan elektrik melalui litar pengawal. Sistem ini boleh diakses di mana-mana sahaja selagi terdapatnya sambungan rangkaian (LAN) atau internet dan ianya juga direka supaya dapat diakses melalui web di telefon bimbit. Sistem ini juga dilengkapi dengan ciri-ciri keselamatan dimana akses hanya akan diberikan kepada pengguna-pengguna yang dibenarkan sahaja dengan menggunakan system daftar masuk. Sistem ini merupakan system yang kos efektif dan alternatif terbaik kepada masalah yang dihadapi oleh pengguna dalam kehidupan seharian.

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LIST OF ABBREVIATIONS

DTE	-	Data Terminal Equipment
DCE	-	Data Circuit-termination Equipment
GUI	-	Graphical User Interface
HTTP	-	Hypertext Transfer Protocol
IP	-	Internet Protocol
ISP	-	Internet Service Provider
I/O	-	Input / Output
JSP	-	Java Server Pages
LAN	-	Local Area Network
MAN	-	Metropolitan Area Network
PAN	-	Personal Area Network
PCB	-	Printed Circuit Board
PHP	-	Personal Home Page
PIC	-	Programmable Integrated Circuit
RAD	-	Rapid Application Development
RDBMS	-	Relational Database Management System
SQL	-	Structured Query Language
WAN	-	Wide Area Network
WebRACS	-	Web-based Room Appliances Controller System

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CHAPTER I

INTRODUCTION

1.1 OVERVIEW

This project mainly focuses on the controlling of home appliances remotely. The system monitors and gets the status of the appliances either in switched ON or OFF when user is away from home. This is web-based systems which use to send the data through serial port (RS232) to microcontroller. The microcontroller will receive the data, process it and trigger the corresponding appliances through driver circuit. This system can be access anywhere whether in Local Area Networking (LAN) or Internet and also designed to be accessible via mobile web. This system provides log in user access system where access only granted for permitted user only. This system is cost-effective and produces an alternative to the problem faced by users in daily life.

1.2 PROBLEM STATEMENT

Current technology of home appliances control system uses main switch for each appliances and requires human to control the appliances directly. Sometimes we usually forget whether we had switched ON or OFF the appliances such as lamp or fan when we are away from home. This would cause wastage of the electricity and money. Nowadays, computer technology has become more advance as well as

internet. Internet has become a medium to be used in remote control system, which provides efficient use of energy in a long distance range. However, present remote control system is not flexible and need high cost in installation and maintenance. Therefore, Web-based Room Appliances Controller System (WebRACS) is developed to control the appliances remotely, prevent the wastage of electricity continuously and definitely saves money.

1.3 OBJECTIVES

The main objectives for this project are:

- i) To develop a low cost system that can control the appliances remotely via web-based platform.
- ii) To develop a system that can monitor and get the status of the appliances and control it regarding user's need.
- iii) To develop a system that can be accessed anywhere whether in private network such as local area network (LAN) or internet.
- iv) To develop a system that can reduce household energy consumption, save money and help the environment.

1.4 SCOPE OF WORKS

The main scope of this project divided into two parts, which is hardware and software:

Hardware:

- i) Microcontroller system – Microcontroller system used to receive signals through communication device which is serial port (RS232), process it and trigger the corresponding appliances driver circuit. The microcontroller used for this system is PIC16F877A microcontroller.
- ii) Driver circuit – Driver circuit used to receive signals from microcontroller circuit and trigger appliances. It uses a Darlington Pair

transistor circuit to amplify the voltage to trigger the relay; which used as a switch to control the appliances.

Software:

- i) Microcontroller program code – Program code for the microcontroller to communicate with serial port (RS232). Program written in C# using PIC Compiler.
- ii) Web-based management system – This system will be written in PHP language and develop using Adobe Dreamweaver. This system will communicate with serial port (RS232) by transmitting the corresponding data to microcontroller system.

1.5 REPORT STRUCTURE

This paper of Web-based Room Appliances Controller System (WebRACS) consists of 5 Chapters. First part of this paper which is Chapter I discusses the basic features of a typical current control system, the factors that initiate this project to be developed, its objectives and project scope of works.

Chapter II describes the literature review that has been done in completion of WebRACS. This chapter also cover the research of previous project that has been made to get ideas in completing the project.

Chapter III covers the methodology, design and development of Web-based Room Appliances Controller System (WebRACS).

Chapter IV consists of the results and discussion of WebRACS. This chapter cover the hardware simulation and design, and software design and development. User management web page also covered in this chapter.

Finally, the last chapter concludes the overall development process and the system as well. Recommendation for this project also included in this chapter.

CHAPTER II

LITERATURE REVIEW

2.1 OVERVIEW

This chapter will explain and discuss about the source and reference that related and relevance to the project.

2.2 RESEARCH PROJECTS

Due to fastest development in computer and network technology, the internet has become an alternative as a communication medium to enhance the current smart home technology which makes the system more efficient, effective and comfort. However, smart home has not yet received broad acceptance and attention due to its complexity, high cost in installation and maintenance, lack of security and not flexible.

Fei-Yue Wang proposed an internet application that allows local and remote monitoring and control of a home [1]. The application implemented on a single chip system with network interface, although the system embedded TCP/IP protocol and can be accessed and controlled over the Internet, due to the hardware limitation of the single chip system, the system is less flexible and scalable.

AR Al-Ali and M. AL-Rousan built a home automation system [2]. Although the system are able to control, monitor, and interact with the home appliances over the Internet, the system require a static IP address for the home Web server and the communication between the home web server and the embedded system board is done by the parallel port. However, the Internet service provider (ISP) usually allocates available IP addresses to subscribers in a dynamic way to use the limited number of IP addresses efficiently, a subscriber who wants to use a static IP address means to pay more than a subscriber who uses a dynamic IP address and requiring a static IP address is impossible in some case, the communication via parallel port has many disadvantages for home use, such as more wires and shorter communication distance.

Neng presented architecture for home automation [3]. The architecture showed the home appliances controlled by an integrated system. However, the proposed system has only tested in dedicated network and never been tested on the internet.

In this report, Web-based Room Appliances Controller System (WebRACS) is developed as a solution for smart home technology system and cost-effective. The microcontroller communicates with PC based web server to monitor and control the appliances. The microcontroller will receive the data, process it and trigger the corresponding appliances through driver circuit. Designed to be accessible via mobile web with log in authentication makes this system more flexible and scalable.

2.3 WEB-BASED MANAGEMENT SYSTEM

2.3.1 Overview

Web-based management system plays a role as web-based controller system in which it will communicate with serial port RS232 by transmitting and receiving the corresponding data to microcontroller system regarding user's needs.

2.3.2 Web Server

A web server is a computers application that delivers content, such as web pages to web users using the client/server model and hypertext transfer protocol (HTTP). The term web server can also refer to the computer or virtual machine running the program [4].

The main purpose of a web server is to delivers web pages such as HTML documents and related content such as images, style sheets and JavaScript to clients. A client, usually a web browser or web crawler, makes a request for a specific resource using HTTP and the server responds with the content of the corresponding resource. The resource is normally a real file on the server's secondary memory, but this is not necessarily the case and depends on how the web server is implemented [4].



Figure 2.1: Client Server Diagram

While the main purpose of web server is to serve content, a full implementation of HTTP also includes a way of receiving content from

clients. This feature is used for submitting web forms, including uploading of files.

Many generic web servers also support server-side scripting such as Apache HTTP Server. This means that a script can be executed by the server when a client requests it. Usually, this functionality is used to create HTML documents on-the-fly as opposed to return fixed documents. This is referred to as dynamic and static content respectively [4].

For this project, a web server used to store the WebRACS data files. It will deliver the content of system web pages to client and execute the request from client either switches ON or OFF the appliances. The web server tested and used for this project is a computer with Vista Operating System and WampServer installed.

2.3.3 PHP

PHP originally stood as Personal Home Page. PHP is a general-purpose scripting language that is especially suited for web development. PHP generally runs on a web server [5]. Any PHP code in a requested file is executed by the PHP runtime, usually to create dynamic web page content (MySQL). It can also be used for command-line scripting and client-side GUI applications. PHP can be deployed on most web servers, many operating systems and platforms, and can be used with many relational database management systems. It is available free of charge, and the PHP Group provides the complete source code for users to build, customize and extend for their own use [5].

Originally designed to create dynamic web pages, PHP now focuses mainly on server-side scripting, and it is similar to other server-side scripting languages that provide dynamic content from a web server to a client, such as Microsoft's Active Server Pages, Sun Microsystems' JavaServer Pages, and mod_perl. PHP has also attracted the development of many frameworks that

provide building blocks and a design structure to promote rapid application development (RAD). Some of these include CakePHP, Symfony, CodeIgniter, and Zend Framework, offering features similar to other web application frameworks [5].

2.3.4 MySQL Database

MySQL is a relational database management system (RDBMS). MySQL stands for "My Structured Query Language". The program runs as a server providing multi-user access to a number of databases [6].

Basically, a MySQL database allows you to create a relational database structure on a web-server somewhere in order to store data or automate procedures. MySQL holds all of the tables, PHP acts as queries among other things, and the forms are basically web pages with fields in them. With all of this combined, truly spectacular projects on the web can be created [6].

The project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements [6].

2.4 COMMUNICATION MEDIUM

2.4.1 Overview

Communication is a process whereby information is enclosed in a package and is channelled and imparted by a sender to a receiver via some medium. The receiver then decodes the message and gives the sender a feedback. All forms of communication require a sender, a message, and a receiver. Communication requires that all parties have an area of communicative commonality [7].

Each communication medium has its advantages and disadvantages. Each also has considerations that can be advantages or disadvantages, depending on the communication problem you have been hired to solve. This part discussed each type of communication medium which can be used in this project.

2.4.2 Serial Port RS-232



Figure 2.2: Serial Port RS-232

RS-232 stands for Recommended Standard 232. RS-232 is a standard for serial binary data signals connecting between a Data Terminal Equipment (DTE) and a Data Circuit-terminating Equipment (DCE). It is commonly used in computer serial ports [8].