HOME APPLIANCES MONITORING AND CONTROL USING SMARTPHONE APPLICATION

AHMAD DANIAL BIN AHMAD NAZRI

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Tajuk Projek : HOME APPLIANCES MONITORING AND CONTROL USING SMARTPHONE APPLICATION

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Every challenging work needs effort as well as guidance of elders especially those who were very close to our hearts. My humble effort I dedicated to my sweet and loving

Father & Mother,

Whose affection, love, encourages and pray of day and night made me able to get such success and honour,

Along withal hard working and respected

Brothers, Sisters & Friends

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ABSTRACT

The aim of this project is to design home appliances monitoring and control using smart phone application system. The concept of smart phone is an emerging issue to the modern technology dependent society. Remote control technologies are widely used to control household electrical appliances without having to go to the desired places. The open-source hardware development Arduino has been growing up in recent years. Arduino platform has good specifications, cheap, easy to use and wide varieties of shields may emerge with many different purposes. This project used Arduino Mega 2560 as a microcontroller, Ethernet Shield W5100 to communicate with WiFi router via LAN cable, 2-Channel Relay Module as switches, 240VAC 18Watt lamp and 240VAC exhaust fan as electrical appliances and Android smart phone. The electrical appliances can be monitor and control only by connected the smart phone to the WiFi router on the house only (Local Area Network). The Arduino microcontroller also will act as a web server. The development of the web server page required a few computer languages. On this project, it used HyperText Markup Language (HTML), Extensible Markup Language (XML), JavaScript, and Asynchronous JavaScript and XML (AJAX) in developing the web server page. The tool that was used to create the Android application is MIT App Inventor 2 where it can be programmed online by surfing the website.

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ABSTRAK

Tujuan projek ini adalah untuk mereka bentuk peralatan rumah berdasarkan pemantauan dan mengawal menggunakan sistem aplikasi telefon pintar. Konsep telefon pintar adalah satu isu baru muncul kepada masyarakat yang bergantung dengan teknologi moden.. Teknologi kawalan jauh yang digunakan secara meluas untuk mengawal peralatan elektrik rumah tanpa perlu pergi ke tempat-tempat yang dikehendaki. Pembangunan peralatan elektronik sumber terbuka seperti Arduino telah berkembang dalam tahun-tahun dikebelakangan ini. Platfom Arduino mempunyai spesifikasi yang baik, murah, jenis mudah untuk digunakan dan mempunyai pelbagai perisai untuk tujuan yang berbeza. Projek ini menggunakan Arduino Mega 2560 sebagai pengawal mikro, Ethernet Shield W5100 untuk berkomunikasi dengan router WiFi melalui kabel LAN, 2-saluran Relay Modul sebagai suis, lampu 240VAC 18Watt dan 240VAC kipas ekzos sebagai peralatan elektrik dan telefon pintar Android. Peralatan elektrik boleh dipantau dan dikawal hanya dengan menyambungkan telefon pintar kepada router wifi di rumah sahaja (Rangkaian Kawasan Setempat). Arduino pengawal mikro juga akan bertindak sebagai pelayan sesawang. Pembangunan laman sesawang memerlukan beberapa bahasa komputer. Dalam projek ini, ia menggunakan, HyperText Markup Language (HTML) Extensible Markup Language (XML), JavaScript, dan Asynchronous JavaScript dan XML (AJAX) dalam membangunkan laman sesawang pelayan. Alat yang digunakan untuk membuat applikasi Android adalah MIT App Inventor 2 di mana ia boleh diprogramkan dalam talian dengan melayari laman sesawang.

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LIST OF ABBREVIATIONS

AC	-	Alternating Current
A/D		Analogue to Digital
AJAX	-	Asynchronous JavaScript and XML
APK	-	Android Application Package
App	-	Application
DC	-	Direct Current
DDNS	-	Dynamic Domain Name System
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
GSM	-	Global System for Mobile communication
GUI	-	Graphic User Interface
HTML	-	HyperText Markup Language
HTTP	-	HyperText Transfer Protocol
ID	-	Identification
IDE	-	Integrated Development Environment
IoT	-	Internet of Things
IP	-	Internet Protocol
JSP	-	JavaServer Pages
LAN	-	Local Area Network
LCD	-	Liquid Crystal Display
MAC	-	Media Access Control
OS	-	Operating System
PC	-	Personal Computer
PIC	-	Peripheral Interface Controller
PWM	-	Pulse Width Modulation
SDK	-	Software Development Kit

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UI	-	User Interface
USB	-	Universal Serial Bus
WiFi	-	Wireless Fidelity
XML	-	Extensible Markup Language

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CHAPTER I

INTRODUCTION

This chapter gives an overview of the project including introduction, problem statement, objectives and scope of the project.

1.1 Introduction

Technologies such as sensor, network and data processing are advancing rapidly. Thanks to the evolution, many potential applications have been developed in the fields of analysis and automation. Numbers of smart phones users are increasing day by day. From the Harvard Business Review on 2013 (Anonymous, 2013), data shows that almost 68% of consumers' use happens at home. Most of the smart phones consumers are among android user.

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Nowadays, technologies of smart phone are advancing rapidly. With the application that has been created on the smart phone, people can monitor or control anything with only by click the button on the smart phone. This application can be implemented in monitoring or control electrical appliances in home by using smart phones.

People sometimes tend to switch off electrical appliances when they don't want to use it at home. Electrical energy will be wasted and the bills will also increase. This project will attempt to develop a robust system to monitor and control electrical appliances such as lamp or fan at home wirelessly using WiFi and be connected directly to the smart phone application. This project will use smart phone Android based operating system to monitor and control electrical appliances by connected to WiFi router. A microcontroller like Arduino will also be used as a controller to process the transmitted and received data from the smart phone. Figure 1.1 below shows the system block diagram. The system overview will be explained in chapter 3.

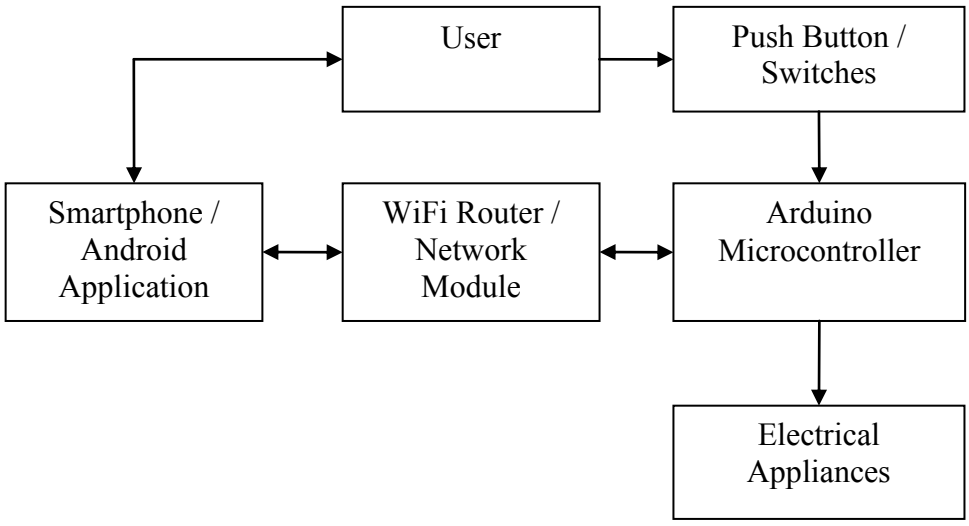

Figure 1.1 Home Appliances Monitoring and Control using Smart phones Application system block diagram

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1.2 Problem statement

People sometimes tend to switch off electrical appliances when they don't want to use it. Electrical energy will be wasted and the bills will also increases. Human characteristic like laziness is also a factor that they don't want to switch off electrical appliances. Nowadays, people always want to control anything without have to wake up and walking to desired places.

There is one previous project that has been created to monitor or control home electrical appliances using smart phone application by a senior student from Universiti Teknikal Malaysia, Melaka (UTeM). The project used Bluetooth type connection. As we all know, Bluetooth connection is not a wide range as it cannot cover a wide area. In addition, it cannot cover the whole house area because it has limited range below than 30m without obstacles. Moreover, it required the user to pair with the Bluetooth devices which it is quite complicated.

To reduce these problems, this project will use WiFi router as a wireless connection between the electrical appliances controller and the smart phone application to turn ON/OFF the electrical appliances. By connected to a single router, user can monitor and control the electrical appliances, and then surfing the internet without have to connect to other router.

1.3 Project Objectives

There are several objectives that need to be accomplished at the end of this project are listed as follows:

1) To design home monitoring and control using smart phone application
2) To program a microcontroller and android application
3) To test and evaluate the prototype of the connection between android application and the electrical appliances.

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1.4 Scope of Work

The scope of this project are:

1) This project will use a smart phone based Android operating system to monitor and control home electrical appliances
2) Application on the smart phone will act as interface and will create by using '*MIT App Inventor 2*'.
3) A WiFi router as network communication between smart phone and controller.
4) Arduino as microcontroller to process the transmitted and received data from smart phone and relay circuit as switches to turn ON/OFF the electrical appliances.
5) An Ethernet shield will be use for network communication between microcontroller and WiFi router.
6) A 240VAC bulb and 240VAC exhaust fan will be use as electrical appliances
7) The electrical appliances can be monitor and control by connected to the WiFi on the house only or in Local Area Network (LAN).

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1.5 Thesis Outline

This thesis contains five chapters that describe Home Appliances Monitoring and Control Using Smartphone Application system where the first chapter contains Introduction followed by Literature Review, Methodology, Results and Discussion and Conclusion.

Chapter I – This section describes the background of the whole project. It includes objectives, problem statement and scope of work in developing this project.

Chapter II – Literature Review consist of findings that have been done before. The content of the studies includes the information about all the components used.

Chapter III – Method or approaches that have been used for this project were describes in this chapter. For example, all the steps taken in wiring and program the microcontroller and android application.

Chapter IV – Concentrates on the results and discussions of this project. This chapter consist of the result of monitoring and control the electrical appliances via smart phone and analyze the connection between the WiFi router.

Chapter V – Conclusion consist of the summary of the project. After the project completed, recommendations are made for the betterment of the project or upgrades that might be done in the future.

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CHAPTER II

LITERATURE REVIEW

This chapter contains all of the information from previous study that are related to "Home Appliances Monitoring and Control using Smartphone Application". It was done by reviewing several related journals, article, books or other sources in order to obtain the best method in developing the display board. Table 2.1 and 2.2 shows the comparison of several sets of journal.

2.1 Introduction

Based on the main objective of this project which is to design a home appliances monitoring and control using smart phone application, some research have been done in order to understand the whole idea of this project. Several criteria need to be considered for this project such as, type of communication interface, microcontroller, Android operating device, software to create the application on the

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smart phone, relay to turn ON/OFF the electrical appliances and electronic components to monitor the state of the electrical appliances.

Home Appliances Monitoring and Control using Smart Phone Application is an enhancement project that has been made previously by one of the senior student in Universiti Teknikal Malaysia Melaka (UTeM). The previous project only control the electrical appliances by turning ON or OFF only and the type of connection was by using Bluetooth connection. The different that will be made to improve the previous project is user can monitor and control the electrical appliances and the type of connection will be use is WiFi router as it can cover the whole house area.

2.2 Smart phone

According to Kishor Khadke, with the development of technology and the continuous improvement of people's living standard, people are in pursuit of automated, intelligent and convenient home control systems. At present, the PC is used as the remote control terminal for most home control systems; however, there are some problems in the PC monitor terminal, such as its great bulk, inconvenience to carry, high cost, limited monitoring range and so on. Therefore, it’s a good choice to design a terminal based on phone. With the popularity of smart phones, particularly, the phone based on Android system is rapidly developed [2].

Figure 2.1 Few types of smart phone

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