



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AN I_o-T BASED HOME APPLIANCE AUTOMATION SYSTEM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Electronic Engineering Technology (Telecommunication) with Honours

by

SALEEKIT A/L VERAK

B071310252

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TAJUK: **An Io-T Based Home Appliance Automation System**

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SALEEKIT A/L VERAK

PN. NORAIN BINTI RAHIM

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DECLARATION

I hereby, declared this report entitled “An Io-T Based Home Appliance Automation System” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electronic Engineering (Telecommunication) with Honours. The member of the supervisory is as follow:

.....
PN. NORAIN BINTI RAHIM
(Project Supervisor)

ABSTRAK

Fokus projek ini adalah menghasilkan satu sistem yang dapat mengawal dan mengawasi peralatan elektrik di dalam sesebuah prasarana tanpa wayar melalui internet dengan menggunakan telefon pintar atau komputer. Masalah seperti terlupa untuk mematikan perkakasan dalam prasarana sering kali berlaku. Bagi sesetengah orang kurang upaya yang sepanjang masa berada diatas kerusi roda, ianya menjadi satu kesukaran untuk mereka membuka atau menutup suis pada dinding atas faktor ketinggian yang tidak tercapai. Objektif projek ini adalah untuk memudahkan pengguna untuk melakukan pensuisan pada peralatan elektrik dengan secara tanpa wayar. Projek ini dapat disambungkan dan berhubung melalui internet dengan menggunakan Nodemcu. Di dalam projek ini juga, Nodemcu akan dianalisa oleh dua parameter. Parameter yang pertama untuk analisa adalah dari segi kelajuan internet yang disambungkan dengan masa yang diambil untuk menyempurnakan proses pensuisan. Parameter yang kedua pula adalah menganalisa jarak sumber internet yang disambungkan pada Nodemcu. Analisa ini untuk melihat sejauh manakah Nodemcu ini dapat berhubung dengan sumber internet. Akhir sekali, projek ini telah berjaya berfungsi seperti yang dinyatakan dalam objektif projek ini. Pensuisan peralatan elektrik di dalam prasarana dapat dilakukan dengan secara tanpa wayar iaitu dengan hanya menggunakan telefon pintar ataupun komputer.

ABSTRACT

The focus of this project is to implement a system that can control and monitor the appliance in the residence with wirelessly through the internet network connection by using a smartphone or a computer. The problem statement such as forget to switch off the home appliances is happened oftenly. Moreover, for some of disable person that just sitting on the wheelchair, this will make them difficult to switch on or off the appliances on the wall due to the fact of the height to be reach. The objective of the project is to ease the user to perform the appliances switching by wirelessly. This system can be connected to the internet connection by using an electronic component that is the Nodemcu. In this project also, the Nodemcu will be analyze with two parameter. For the first parameter is to determine the speed of the internet connection versus time taken to perform a successfully switching process. The second analyze parameter is to analyze the range of the internet source with the Nodemcu. The analysis is to determine how long of range the Nodemcu connected with the source. At the end, the system in this project is working successfully as stated in the objective of the project. The switching process of the home appliances can be done with wirelessly only by using smartphone or a computer.

DEDICATION

This humble effort especially dedicated to my family, lecturers and friends for their support, guidance and encouragement upon completing this projects and report.

Thank you.

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The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of the people, who made it possible, whose constant guidance and encouragement aided me in the completion of my project.

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CHAPTER 1

INTRODUCTION

In this chapter, the focus is on project background, problem statement, objective and project scope of the project. The introduction about the Smart Home Appliance Control System by using Nodemcu will be introduced in this chapter. The problem statement will state the reason why this project is implemented. Lastly, the organization of the thesis will be explained at the end of this chapter.

1.1 Project Background

This project is about the smart home appliance control by using Nodemcu is a project that based on wireless control home appliance using Nodemcu module through the Wi-Fi connection. The Nodemcu offers a complete and independent Wi-Fi networking, allowing it to either host the application or to offload all Wi-Fi network operating from another application processor. The objective of this project is to help the user to switch or monitor the appliance in an easier way. This project will use the Nodemcu module to send and receive the data in wireless form through the Wi-Fi. The Nodemcu module will be connected to the computer.

The home appliance will be connected to the relay that connects to the Nodemcu module. The relay will function as the switching. This project is focusing on applying to the residence. This reason for this project implementation is to control the appliance with an easier method.

On the other hand, this project also suitable to monitor the condition of the appliance in the residence either it is in on or off mode. For example, if the user at the first floor and wanted to turn on or off the appliance on the second floor, the user does not have to go to the second floor instead the appliance on the second floor can be monitor either on or off and can be switch on or off by using a smartphone or by a computer.

This project also allow the user to control the appliance via web browser at anywhere and anytime in the world as long as the are connected to the Wi-Fi.

1.2 Problem Statement

User normally have to manually switch the home appliance by themself. Nowadays, people are widely own a smartphone or a computer at least. So this project aim to ease the user to switch the appliance from the computer or smartphone. Moreover, this project also can solve the problem for those who always forget to switch off the appliance when they are leaving the house. So, that can lead to increasement electric bill of the house. On the other hand, there are many project implemented to switch the appliance by wirelessly for example by using Zigbee module. However, by using Zigbee module it is only can be switch from only one place range between 10 to 100 metres only.(Automation & Profile, 2012)

Other than that, the appliance control by using the bluetooth system are also has been implemented. The problem is bluetooth cannot form large and complex point because bluetooth only has norminal range about only 10 metres but with Nodemcu, the home appliance can be control at anywhere with only Wi-Fi connection. In order to overcome the problem above, by using the Nodemcu module is the best solution.

1.3 Project Objective

The objective of Smart Appliance Control System by using Nodemcu is to :

- i. To develop a system of monitoring and switching on/off of the appliance through Wi-Fi connection.
- ii. To analyse wireless data transfer system by using Nodemcu.

1.4 Scope of Project

The scopes of this project involved the development of the Nodemcu as major components. This project consists of several section such as Nodemcu module (microcontroller), home server (computer) and switching control section (relay module).

This project limitation is to monitor and control the switching of the home appliance by using computer or smartphone through the web browser via internet connection.

The Nodemcu also known as ESP8266 is a product fully integrated Wi-Fi. The Nodemcu will only access the assigned internet access as it program in the command. It has seen a wide reception as a low cost answer for IoT and WiFi-capable devices.

The Nodemcu have a huge functionality and a good price, the amount of current consumed by the chip makes battery powered solutions problematic. This modest estimated System On a Chip (SoC) incorporates a 80 MHz microcontroller with a full WiFi front-end both as client and access point.

(Edt, 2016)

Figure 1.4 below shows the block diagram of the overall project. The hardware such as relay, the Nodemcu module and device to interface by the user such as computer or smartphone will be used as shown in figure below.

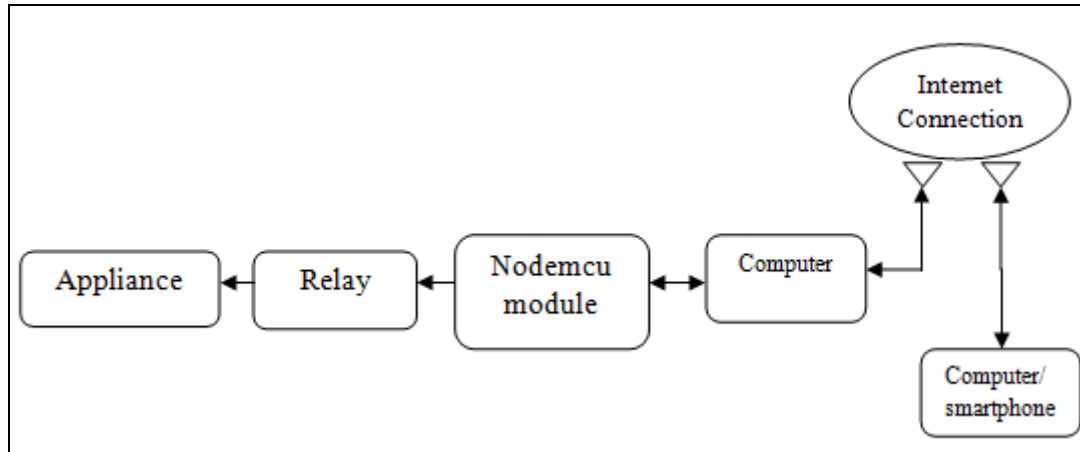


Figure 1.1Block Diagram Of The Project

1.5 Organization of Project

This thesis normally divided into 5 chapter that going to explain all the process and flow in order to implement this project. Each of the chapter will discuss on the different part related to the project. The thesis is included the introduction, literature review, research methodology, discussion, conclusion and recommendation.

In the first chapter of the thesis, it is a overview about the project to be implement. In this chapter, it is a briefing about the project from the begining untl the end of the project. The overview of the project are included introduction, problem statement, project objective and scope of the project. The objective is the aim for this project to be implement based on the studied problem statement and follow the process of the project with the methodology of the project.

In the second chapter, the focus is on the literature review that will describe all the information that have referred as a reference to implement this project. Literature review also means that it is studied each part or process, fact and the theory that include in this project based on the references. So that, in this project the literature review will cover up the explanation and knowledge about the NodeMCU module and relay module.

In the third chapter, the discussion and the steps of the methodology that include in the project will be explain. The methodology is the important aspect because it is a process in order to implement the project successfully. If the methodology are not proper organized, the problem may occur during the implementation of the project.

In the fourth chapter, the result of the project that obtained will recorded and show in this chapter. All the result of the project either success or fail will included in this chapter. This chapter only can be completed after obtain the desired result of the project. This chapter needs a lot of time to carry out completely.

Finally, in the fifth chapter is a conclusion for the project. The result and the objective of the project will be conclude and explain in detail in this chapter. Moreover, a recommendation for the project also will be include in this chapter in order to improve the deficiency of the project.

CHAPTER 2

LITERATURE REVIEW

2.1 An Io-T Based Home Appliance Automation System Overview

According to (Dicarlo, 2011), home automation are known by an assortment of names, including intelligent homes, home networking, smart home and sensor-installed houses. Home automation innovation alludes to houses introduced with monitoring frameworks such as sensors, actuators, and biomedical monitoring and extraordinary wiring to empower occupants to program, control, and work a collection of appliance and other house hold unit highlights all through the house. Home automation has been characterized as the integration of technology and services through home systems administration for a superior quality of life.

2.2 The History Of Home Automation System

According to (Zheng, 2014), the home automation innovation and smart home seemed particularly in science fiction of the 1920s. Be that as it may, nobody knows the detail date of the innovation of home automation. In light of human's smart technology enhancing process, the home automation system does not drop by quick development. It comes orderly with as it were insignificant improvement. The past step is practically same with the following step.

The first run through individuals saw the high technology in residence, they did a few associations with home automation, and it was 1960s. It was called "wired homes" at that time. It was worked by some specialist. After that, the main authority name of home automation showed up in 1984 by the American Association of House Builders. This development is the way to the present day smart homes. Individuals around then understand that a smart home is not attributable to how well it is fabricated, not how effectively it utilizes space, not because of how it is earth friendly. It is simply because of how technology advancements that it contains. Those are still helpful rules for home automation innovation today.

In the 1960s, there was less intelligent technology. Despite the fact that Stanford University researched a lot of this sort of innovation, they didn't turn out to be so successful. They conclude that up some fact that researched not succeeding because of lack of motivation to increase productivity in domestic work, less involvement of user of the technology in the design process and the physical product design is not exciting. More advanced systems are continually being developed to be more useful and more attractive in design. (Dicarlo, 2011)

2.3 The Existing Product In Market

2.3.1 Smart GSM Based Home Automation System

The smart GSM based home automation system is the system using Global System for Mobile Communication (GSM) modem to control home appliances such as light, conditional system, and security system via Short Message Service (SMS) text messages. This system is focused on the function of the GSM protocol, which allows the user to control the home appliance far from residential using the frequency bandwidths. This project is the development of the smart GSM-based home automation system by concept of serial communication and AT-commands. The microcontroller of this project is the PIC16F887 with integrated if the GSM provide the system operate with the desired baud rate of 96000 bps.

The system works by using the microcontroller as the bridge between the GSM network and sensor of the home appliance. The advantage of this system by using the GSM network is the communication between the home appliance and the user is wide coverage. So, the system is online and able to be control at almost all time. Moreover, the security infrastructure is another advantage of using GSM network for home automation because other people could not able to monitor the information sent or received by the user.

However, in this system there is little limitation for the system that is not able to control many appliances simultaneously and the home automation system could not state the current status of the appliances means that the status of the appliance could not able to monitor.(Teymourzadeh, Ahmed, Chan, & Hoong, 2013)

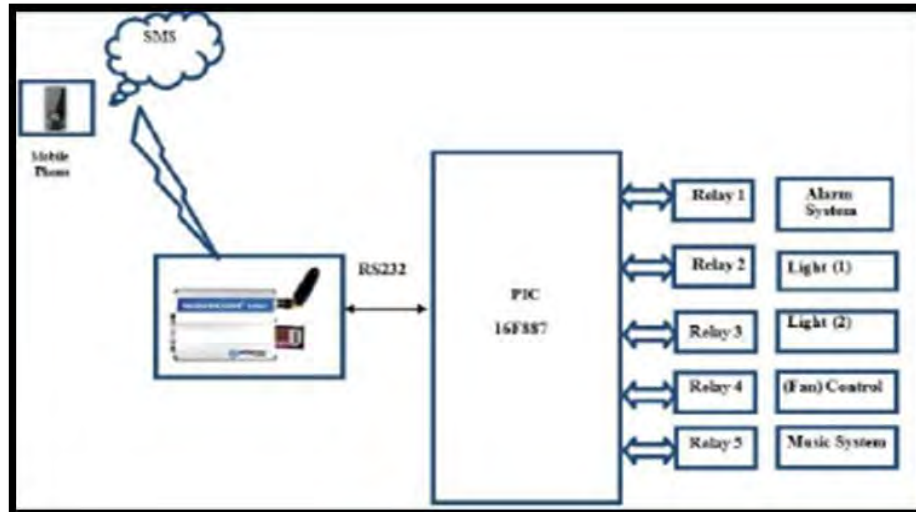


Figure 2.1 The Smart GSM Based Home Automation System

2.3.2 ZigBee Based Home Appliances Controlling

The ZigBee module is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power and it is wireless sensor networks. ZigBee is the set of specs built around the IEEE 802.15.4 wireless protocol and it is also low rate wireless networking standard. ZigBee flow or process control equipment can be place at anywhere and still can be communicate with the rest of the system because the network does not care about the physical location.

A ZigBee wireless sensor networks of star topology has been proposed for wireless intelligent home automation system as it based on low cost, easy placement and installation, easy extension, comfort benefits, and mobile device connectivity. Energy saving is one of the aim for the home automation system in order to satisfying all the user need. The proposed system is very suitable for a typical small home network. The ZigBee based home automation system is used for remote controlling and monitoring of various home appliances.(Baig, Beg, & Khan, 2013)

The objective of this system is efficient power monitoring through real time power usage indicator with the help of a PC-based GUI application. The GUI stand for Graphical User Interface meaning that user can be interface to the system with multiple menu selection functions by using software such as MATLAB or JAVA. The ZigBee based energy efficient system also has been implemented to focuses on controlling the power of electric outlets for saving energy.

The system can also measure the currents drawn by electric outlets. The system has been implemented by using an embedded board and the ZigBee technology. This proposed system has two primary parts of components namely ZigBee control module and the server module. The ZigBee control module contain of few controllable outlets, a current measurement circuit, a ZigBee transmitter, a ZigBee receiver, and a microcontroller unit. The measurement circuit measures the current drawn by the electric outlets and it sends a signal to the server module through the ZigBee transmitter. The data of the current and voltage are stored in an embedded board. The proposed system can identify any overload and can send a signal to the circuit breaker to safely turn kill or turn off the power supply. Visual Basic has been created in order to let the user interface to the system so that a user can easily operate the system.(Jadhav, Chaudhari, & Vavale, 2014)

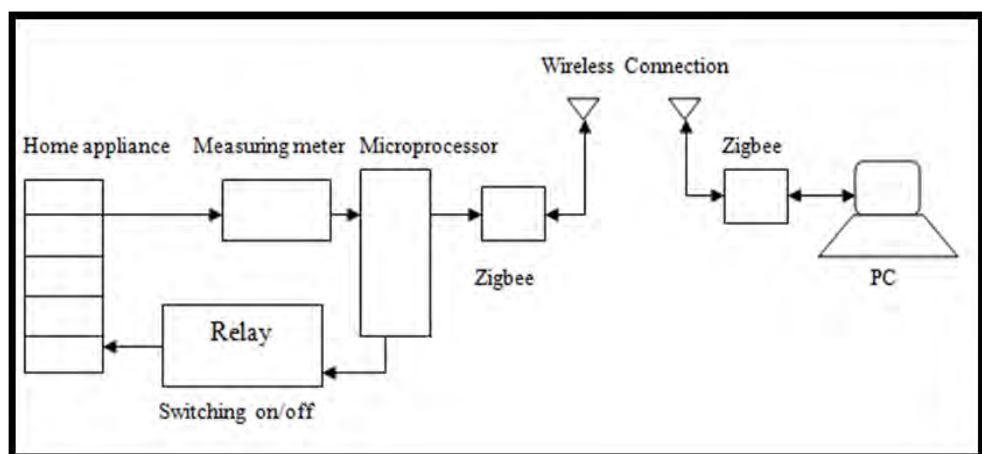


Figure 2.2 ZigBee Based Home Appliances Controlling

2.3.3 Home Automation System via Bluetooth

Bluetooth technology is used to transmitting data and voice at half-duplex rates of up to 1 Mbps without the use of any cables between portable and fixed electronic devices. Home automation is one of the systems that can use Bluetooth technology. The important technology of home automation is communicating and controlling automatically with each device and sensor in Bluetooth based on home network. By using Bluetooth wireless home network, a home network system can be implemented with a cost saving and easy. Bluetooth actually was designed as a cable replacement technology for consumer electronic devices and data communication that uses short-range radio links to operate in the 2.4 GHz.

Both point to point and point to multi-point connections can be supported by a Bluetooth module. Bluetooth network is a physical layer and a low-level communication protocol. Due to the interruption, Bluetooth network uses a quick frequency hopping, 1600 hops per second packet-switched protocol in order to filter. The device that connected with Bluetooth can be controlled both manually via the local switches and remotely through the server Bluetooth. The hardware interface is used to access a local home automation network from a standard desktop PC with attached hardware for device modules and Bluetooth module. (Lee & Choi, 2010)

The system is straightforwardly installed beside the appliance switches on the wall. Graphical user interface (GUI) on PC/laptop or smart phone without cable is needed in order to enable the system communicates of the Bluetooth wireless connection. The user can easily touch on the screen of the phone or click on the selection menu on the PC screen to control the home appliances. This project portable method is able to help the handicapped individual who have problem with movement difficulty. Based on the hardware for this system overview, the PIC Microcontroller is chosen because of its capacity to perform the both serial and USB features to set up the Bluetooth and USB connection with the GUI on the PC. (Ramlee et al., 2013)