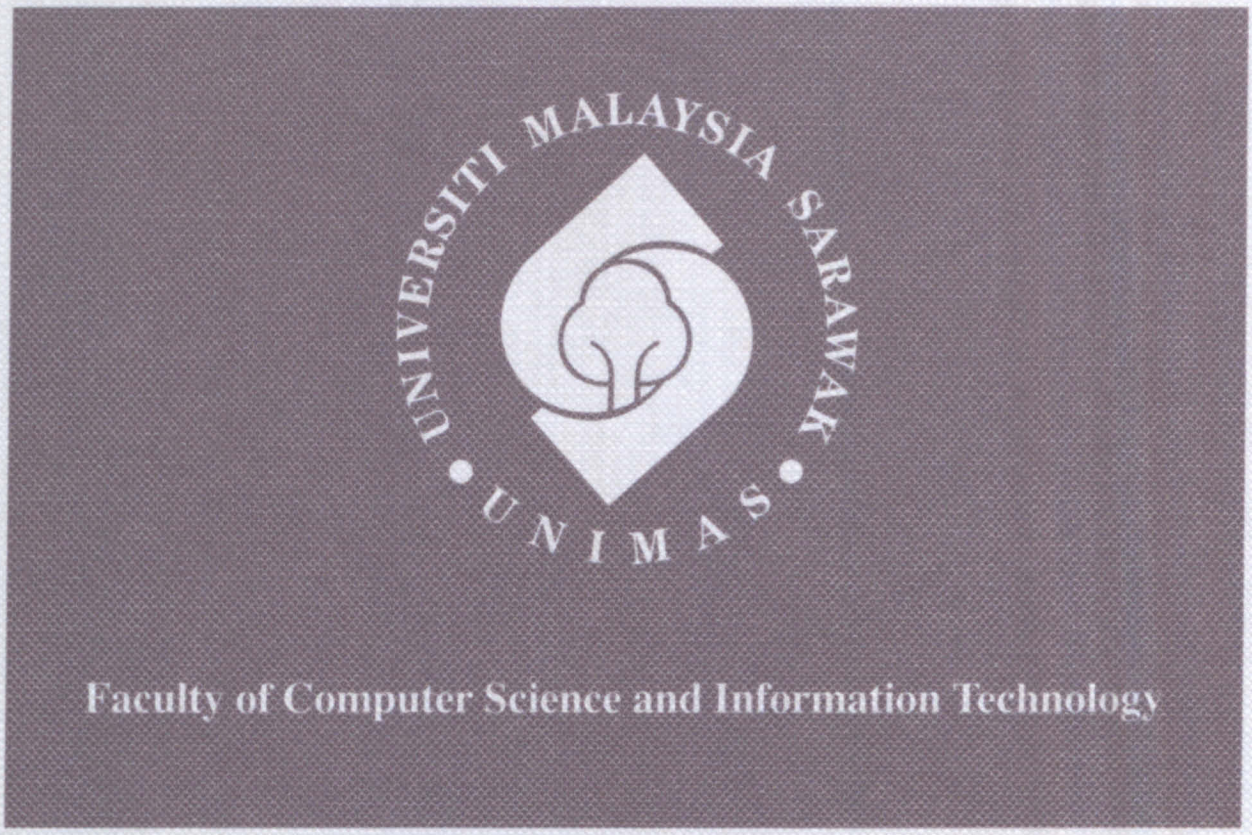

HOME AUTOMATION SYSTEM WITH ARDUINO WIRELESS SENSOR NETWORK

Azizul Lau

Bachelor of Computer Science with Honours (Network Computing)
2015

Faculty of Computer Science and Information Technology

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AZIZUL LAU

This project is submitted in partial fulfillment of the requirements for the degree of

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(Network Computing)

Faculty Computer Science and Information Technology

UNIVERSITY MALAYSIA SARAWAK

2014/2015

DECLARATION

I hereby declare that this project is my original work. I have not copied from any other student's work or from any other sources except where due reference or acknowledgement is not made explicitly in the text, nor has any part had been written for me by another person.

(AZIZUL LAU)

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ABSTRACT

Home automation is the control of any or all electrical devices in our home, whether we are there or away. Home automation is one of the most exciting developments in technology for the home that has come along in decades. There are hundreds of products available today that allow us control over the devices automatically, either by remote control, smartphones or even by voice command. Nowadays, traditional home system requires human working force to operate. Which mean it still need human intervention to turn certain home appliances like lighting, air conditioning, fan and other. In term of performing tasks, human physical performance is slow compared to the automation system. In addition when we used human force there are possibility error or accident may occur due to our awareness and reaction. For disabled peoples, is hard for them to operate the home appliances without human or tools assist. Certain home appliances is also dangerous for them and need more careful behaviour while using it, plus with wet hands. Moreover, the traditional home system also consumes more electrical energy, when remain unattended for couple of hours. The Home Automation System with Arduino Wireless Sensor Network is focus on improving living home standard where the user can control their home lighting and home appliance with their smartphones and also using their Personal Computer (PC). User can turn on or off their home appliance using their PC. This system is link with each other by using WiFi router. We use Arduino platform hardware especially for the microcontroller and WiFi Shield. We also used contactless temperature sensor to measure human body temperature and Pyroelectric Infrared Sensor to detect motion. In addition, this system integrated with Cloud server to perform notification where a notification email will be sent to the user which can be view in smartphone or PC .

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CHAPTER ONE

INTRODUCTION

1.1 Background Study

Imagine your lighting system turn off itself when you're away from home. This is what home automation concept and there is no end to its application. In fact, sophisticated home automation systems are now being developed that can maintain an inventory of household items, record their usage through an RFID (Radio Frequency Identification) tag, and prepare a shopping list or automatically order replacements.

Home automation has made it possible to have what is often referred to as a 'smart home', a home that can detect and identify you, automatically adjust the lighting to your predefined taste, open doors automatically, play your favourite music, water your flowers in the morning, switch on the security lights at night and switch them off in the morning, heat water for bathe and tea, stream to you anywhere in the world via the internet a live video of what is happening in and around your house. It makes possible to link lighting, entertainment, security, telecommunications, heating, and air conditioning into one centrally controlled system. This allows you to make your house an active partner in managing your busy life.

Nowadays, you can hardly find a house without a home automation system which can range from the remote for the television, burglar alarm and hi-tech security gates, to an automated air conditioning system that maintains the temperature at a predefined value.

1.1.1. Automation

Automation is a various control system that used to control equipment, industrial machinery and processes, reducing the need for human intervention. In the scope of industrialization, automation is a step beyond mechanization. Mechanization provided human operators with machinery to assist them with the physical requirements of work while automation greatly reduces the need for human sensory and mental requirements as well.

Automation plays an increasingly important role in the global economy and in daily experience. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities. Many roles for humans in industrial processes presently lie beyond the scope of automation. Human-level pattern recognition, language recognition, and language production ability are well beyond the capabilities of modern mechanical and computer systems. Tasks requiring subjective assessment or synthesis of complex sensory data, such as scents and sounds, as well as high-level tasks such as strategic planning, currently require human expertise.

Automation has had a notable impact in a wide range of highly visible industries beyond manufacturing. The ubiquitous telephone operators have been replaced largely by automated telephone switchboards and answering machines. Medical processes such as primary screening in electrocardiograph or radiography and laboratory analysis of human genes, blood plasmas, cells, and tissues are carried out at much greater speed and accuracy by automated systems. Automated teller machines have reduced the need for bank visits to obtain cash and carry out transactions. In general, automation has been responsible for the shift in the world economy from agrarian to industrial in the 19th century and from industrial to services in the 20th century.

1.1.2 Home Automation

Home automation is a system that capable to control of any or all electrical devices in our home, whether we are there or away. Home automation is one of the most exciting developments in technology for the home that has come along in decades. There are hundreds of products available today that allow us control over the devices automatically, either by remote control, smartphones or even by voice command.

Home automation may designate an emerging practice of increased automation of household appliances and features in residential dwellings, particularly through electronic means that allow for things impracticable, overly expensive or simply not possible in recent decades. Home automation includes all that a building automation provides like climate controls, door and window controls, and in addition control of multimedia home theatres, pet

feeding, plant watering and so on. But there exists a difference in that home automation emphasizes more on comforts through ergonomics and ease of operation.

Typically, a new home is outfitted for home automation during construction, due to the accessibility of the walls, outlets, and storage rooms, and the ability to make design changes specifically to accommodate certain technologies. Wireless system is commonly installed when outfitting a pre-existing house, as they reduce wiring changes. These communicate through the existing power wiring, radio, or infrared signals with a central controller. Network sockets may be installed in every room like AC power receptacles.

Although automated homes of the future have been staple exhibits for World's Fairs and popular backgrounds in science fiction, complexity between vendors, multiple incompatible standards and the resulting expense have limited the penetration of home automation to homes of the wealthy or ambitious hobbyists.

1.2 Project Aim

The aim of this project, to design a Home Automation System that enables user to remotely control the home lighting that connected to the Arduino microcontroller using smartphones or personal computer.

1.3 Problem Statement

Nowadays, traditional home system requires human working force to operate. Which mean it still need human intervention to turn certain home appliances like lighting, air conditioning, fan and other. In term of performing tasks, human physical performance is slow compared to the automation system. In addition when we used human force there are possibility error or accident may occur due to our awareness and reaction. For disabled peoples, is hard for them to operate the home appliances without human or tools assist. Certain home appliances is also dangerous for them and need more careful behaviour while using it, plus with wet hands. Moreover, the traditional home system also consumes more electrical energy, when remain unattended for couple of hours. So we proposed a system, an automated system with cloud enhancement allow home appliance to be controlled automatically without human intervention. By proposed this system as solution, electrical wastage can reduced and provided remotely control function to the users which is important to elderly peoples.

1.4 Project Objective

- To design a Home Automation System (HAS) that provides centralized control of home lighting using Arduino Microcontroller.
- To integrate the system with Cloud Server and Smartphone.
- To verify the functionality of the system

1.5 Project Scope And Limitation

This project functions is limited to control the home lighting system remotely either by personal computer or Android Based Smartphone to turn on or off the lighting. The system is not implementing to detect any lighting failure.

1.6 Report Layout

The entire project is composed of five chapters, each covering a section of the work as summarized below:

- Chapter one gives an introduction to automation especially home automation.

- Chapter two covers an extensive literature review of previous works on home automation systems, the different established standards and protocols, and the platforms over which home automation can be implemented.

- Chapter three highlights the project methodology, giving reasons for choice of specific platforms and components, and also, comprehensive details on both hardware components and communication services used.

- Chapter four is on the project design and implementation with clear practical details of the project design, construction, testing, microcontroller coding and debugging. Special emphasis is also made on the flexibility and scalability of the project work with real life illustration.

- Chapter five is on the conclusion and recommendations based on the project work with emphasis on the reliability, maintainability and flexibility of the design. Also, recommendations based on the challenges encountered and further possible development of the project work are enumerated.

CHAPTER TWO

LITERATURE REVIEWS

2.1 History of Home Automation

Home automation has been around since the World War 1 (1914), in fact, the television remote (a simple home automation system) was patented in 1893. Since then different home automation systems have evolved with a sharp rise after the Second World War It's growth has been through various informal research and designs by technology enthusiasts who want a better way of getting things done at home without much effort on their part. The systems evolved from one that can automatically do routine chores like switch on and off security lights, to more sophisticated ones that can adjust lighting, put the television channel to favourite station and control doors.

2.2 Home Automation

Home Automation or called "domotique" in term of France and Belgium or "domotica" in Netherland. Home Automation is one of latest technology invention where it has capable to convert traditional household to an Automation Household. It also called extension of building automation. Home Automation is used to centralized control of home lighting and also for household power line and house security [1]. Not just that, it`s provide improve convenience, comfort and energy efficiency. In addition, it can improve life quality for elderly or disabled persons who might otherwise require caregivers or institutional care.

2.2.1 Remotely with Bluetooth Control System

Bluetooth is an open wireless protocol for exchanging data over short distances from fixed and mobile devices, creating personal area networks (PANs). It was originally conceived as a wireless alternative to RS232 data cables. It can connect several devices, overcoming problems of synchronization. It is a standard and a communications protocol primarily designed for low power consumption, with a short range (power-class-dependent: 1 meter, 10 meters, 100 meters) based on low-cost transceiver microchips in each device [3]. Bluetooth makes it possible for devices to communicate with each other when they are in range. Because the devices use a radio (broadcast) communications system, they do not have to be in line of sight of each other.

Bluetooth Home Automation System that available earlier in the market with it low price. Bluetooth is chosen at the beginning with it suitable capability. Bluetooth have available global frequencies of 2400Hz and able to pair up with other Bluetooth devices with distance at most 100 meters. In addition, Bluetooth main device also can connect up to 7 devices in the piconet. Nowadays, most the devices now have Bluetooth capabilities like notebook, smartphones, tablets and others. That is why mostly first batch of Home Automation System is implemented with Bluetooth technology because it is suitable more than enough. In addition, it will indirectly reduce the cost of the Home Automation System.