KEMENTERIAN PENDIDIKAN MALAYSIA

POLITEKNIK MALAYSIA SEBERANG PERAI

DEE 6092: PROJECT 2

FINAL REPORT

ARDUINO HOME AUTOMATION

Diploma in Electronic Engineering

Submitted by:

SITI NUR HAZIRAH BINTI ASMADI

10DEP15F1010

FATHIN NAADIAH BINTI MOHD RAZIF

10DEP15F1034

Supervisor:

TN. HJ. MOHD. SHOHIMI BIN MAT ISA

Abstract

This report presents implementation of cost effective Arduino Home Automation with Bluetooth control. This framework is intended to help and give help to satisfy the needs of the elderly and the handicapped at houses. Additionally, the idea of Arduino home automation will improve the normal living status at houses. The fundamental control system uses a wireless Bluetooth device gives a wireless access to smart phones. The system design does not remove the existing electrical switches and gives a safer control over the switches with low voltage usage technique. The switch status is synchronized everywhere each person interface demonstrates the current existing switch status. This system is designed to control electrical devices throughout the house with ease of installing it, ease of use and cost effective design and implement.

Abstrak

Laporan ini membentangkan pelaksanaan kos efektif Arduino Home Automation dengan kawalan bluetooth. Rangka kerja ini bertujuan untuk membantu dan memberikan bantuan untuk memenuhi keperluan orang tua dan orang kurang upaya di rumah. Di samping itu, idea automatik rumah Arduino akan meningkatkan status kehidupan normal di rumah. Sistem kawalan asas menggunakan peranti Bluetooth wayarles memberikan akses tanpa wayar ke telefon pintar. Reka bentuk sistem tidak menggunakan suis elektrik yang sedia ada dan memberikan kawalan lebih selamat ke suis dengan teknik penggunaan voltan rendah. Suis disegerakkan di mana setiap antaramuka setiap orang menunjukkan status suis sedia ada. Sistem ini direka untuk mengawal penggunaan alat-alat elektrik di seluruh rumah dengan mudah memasang, memudahkan penggunaan dan reka bentuk kos efektif dan melaksanakannya.

Contents

Chapter 1: Introduction

1.1 Introduction

Home automation is automation of home, housework on household activity. In other words it refers to use of IT/ computer to control home appliances such as lighting, fans and other electronic devices. In today's IT world, home automation being popular due to easiness, flexible of controlling the appliances and other things according to users comforts and needs. The challenging part lies in simplicity and cost of installing them in home and varies with increasing number of services to be controlled. This project named "Home Automation" is idea of home automation using android.

For our project, we plan to make something easy to people. We decided to replace a home switch with a smart phone. Using smart phone, we can on or off the fans or lamps in our house. For this project we are using an arduino to control the switch. This project preferable to use Bluetooth because nowadays people have their smart phones with them all the time, since the smart phones have Bluetooth facility in them, thus it is better to use Bluetooth rather than using RF remotes or IR remotes.

1.2 Research Background

Arduino home automation is getting popular and widely used in a lot of houses worldwide. It has tons of advantages to users even more to the handicapped and/or elderly users in which it will make it easier for them to control their home appliances. Arduino home automation can be labeled to two medium in which how it is connected and they are either wired or wirelessly connected. The main difference between these two kinds is that home appliances are linked wirelessly a central controller if it a wireless home automation system. On the other hand, the appliances are connected to a central controller if the medium use wired communication method. Wireless system had been introduced in order to dispose of wired communication among home appliances. Arduino based, Bluetooth based home automation will be applied.

Nowadays, everyone cannot be separated from their smartphones. a number of five thousands individuals from USA, UK, South Korea, India, China, South Africa, Indonesia and Brazil took a survey regarding which was done by Time magazine. The result proved most of them is inseparable from their smartphones, eighty four percent allegedly claimed that survive without their smartphones.

Another study shows that seventy five percent of the market share is Android and a total of one hundred and six million android smartphone were shipped in the second half of 2012. Android smartphone became the top operating system in the market in the present time worldwide and it became the most popular operating system known to student.

1.3 Problem Statement

The reasons why we are doing this project because we want to solve some of the problem. The problem is some people having a difficulty to switch on or off the current. Next, people sometimes lazy to move around and want to control things by sitting at one place using smartphone. Lately, electric is very dangerous and many people been die due to electric shock so to reduce the occurance of electric shock we are doing this project.

In the present day home automation is becoming essential for the purpose of improving our life condition. Convenience and ease of using home appliances is what home automation is offering. Home automation offers a futuristic way of life in which an individual gets to control his entire house using a smart phone, from turning on a TV to locking/unlocking doors; it also offers an efficient use of energy.

But to get or acquire such system installed will cost a lot of money and that is the major reason of why home automation has not received much demand and attention, adding to that also the complexity of installing it and configuring it. Thus it is

essential to make it cost effective and easy to configure, if this is granted to people then they will be willing to acquire it in their homes, offices and schools. In other words, a system modification for the home automation is required in order to lower the price of applying it to houses. Also home automation offers ease of mind and body to handicapped and/or elders in their houses by just one click to do what they want as stated above.

1.4 Objective of The Study

Objective of this project is to reduces the physical efforts and integrates the control for any number of appliances in to a single control unit. Next, using android phone as a remote control of different electrical appliances to turning them on or off. In addition, this project can manage electrical appliances without any physical contact with the switch. Lastly, we are replacing the switch with a smartphone.

- To construct a wireless home automation system controlled by a smartphone specifically an android device.
- To design and implement cost effective home automation system yet an efficient one.
- To design a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped.

1.5 Research Question

This study will answer the following research questions:

i. How far the Bluetooth can be detected by smartphone?

ii. How many switch can be on or off using a smartphone?

1.6 Scope of Study

For the scope of this project, we are planned to test it at home. We are using a house with 2 bedrooms with only six lamps and two fans. We are testing a lamp and a fan only for the beginner. Besides, it became more easier than using the remote control.

In order to fulfill the stated objectives several steps must be taken. These steps involve both software programming and hardware implementation. These steps are as follows:

- Establish a wireless network communication between the android and the Arduino home automation, using a microcontroller.
- Create a simple yet reliable home automation system using Arduino-Uno as a microcontroller that will be the medium between the android and the home appliances.
- To find a suitable app that will work efficiently with the Arduino-Uno board in order to control the home appliances.
- Program the Arduino-Uno board in a way that will let it interact with the android app.

1.7 Benefit of Study

Each project has their own benefit. If not, there is no use to do the project. The main important of this home automation is to help people to on or off switch at home without having to move. Besides, it is very useful for disable people where they do not need to walk at switch to on or off a lamp or fan. They just need a smartphone on them. Besides, people only need a smartphone to control the switch without need to go to switch.

- Less risk to face the electric shock
- very save and do not harm the user

This study will be undertaken to create a home automation system at low cost and easy to create, this will benefit both the manufacturer and the client. It will help the manufacturer by making it easy and cheaper to apply it, and it will also benefit the clients by making it cost effective and the most important advantage is that it will make the house a much more convenient place for the clients especially for the elders and the handicapped.

1.8 Operation

Nowadays, people have smartphones with them all the time. So it makes sense to use these to control home appliances. Presented here is a home automation system using a simple Android app, which you can use to control electrical appliances with clicks or voice command. Commands are sent via Bluetooth to Arduino Uno. So you need not get up to switch on or switch off the device while watching a movie or doing some work.

1.9 Conclusion

This system consists of an Arduino-Uno board, a Bluetooth Module, an Android phone, power sockets, home appliances and an android Application (ArduDroid). It is user friendly and it is cost effective. Also it can be concluded that the objectives of this project are as follows:

- Constructed a wireless home automation system controlled by a smartphone specifically an android device.
- Designed and implement cost effective home automation system yet an efficient one.
- Designed a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped.

Chapter 2:

Literature Review

2.1 Introduction

This chapter will describe anything related to home automation, android and its operation system, android development tools, Bluetooth technology, Bluetooth module, Arduino and it will contain some examples to home automation projects.

2.2 Theory

Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touch screen mobile devices such as smartphones and tablets. Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input. In addition to touchscreen devices, Google has further developed Android TV for televisions, Android Auto for cars and Android Wear for wrist watches, each with a specialized user interface. Variants of Android are also used on notebooks, game consoles, digital cameras, and other electronics.

Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License(GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some

models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

Power the Arduino board, turn on Bluetooth on the Android phone and search for Bluetooth devices nearby: the JY-MCU module will present itself as HC-06, the pairing password is 1234.

The key component of the Bluetooth Arduino Connection App is the Bluetooth Client while the Arduino board will act as Server: this means that the app will always initiate the connection. When you power the Arduino board, the Bluetooth module red LED starts blinking; push the app "Connect to Device" button and select your module from the list: the red LED light becomes solid and the connection status will change to "Connected".

2.3 Previous Research

The key component of the Bluetooth Arduino Connection App is the Bluetooth Client while the Arduino board will act as Server: this means that the app will always initiate the connection. When you power the Arduino board, the Bluetooth module red LED starts blinking; push the app "Connect to Device" button and select your module from the list the red LED light becomes solid and the connection status will change to "Connected".

Bluetooth is a standard utilized as a part of connections of radio of short extension, bound to substitute connections which use wires between electronic gadgets like personal digital assistants (PDA), cell phones, personal computers (PC), Laptops, and numerous different gadgets.

Bluetooth technology can be utilized at homes, offices, schools, hospitals and in cars. Users can get instantaneous connections with several kinds of devices through this technology continuously.

The method for transmission utilized guarantees security against external interference and well-being in sending out data. Between the essential qualities, these must be mentioned; the strength, low cost, small consume of energy low complexity and the ease of use. The Bluetooth is a little microchip that works in a band of accessible recurrence all through the world. Correspondences can acknowledge point to point and point to multipoint.

How Bluetooth Work

A Bluetooth® device uses radio waves instead of wires or cables to connect to a phone or computer. A Bluetooth product, like a headset or watch, contains a tiny computer chip with a Bluetooth radio and software that makes it easy to connect. When two Bluetooth devices want to talk to each other, they need to pair. Communication between Bluetooth devices happens over short-range, ad hoc networks known as piconets. A piconet is a network of devices connected using Bluetooth technology. When a network is established, one device takes the role of the

master while all the other devices act as slaves. Piconets are established dynamically and automatically as Bluetooth devices enter and leave radio proximity.

Bluetooth allows high quality streaing

One of the most popular applications for Bluetooth historically has been wireless audio—headsets and hands-free connectivity in cars to wireless speakers and headphones that stream music from your phone or tablet. This uses a version of Bluetooth called BR/EDR (basic rate/enhanced data rate) that is optimized for sending a steady stream of high quality data (i.e. music) in a power efficient way.

Bluetooth allows creation of smaller sensors

With the advent of Bluetooth with low energy functionality (Bluetooth Smart or BLE), developers are now able to create small sensors that run off tiny coin-cell batteries for months, and in some cases, years. Many of these Bluetooth sensors use so little energy that developers are starting to find ways to use scavenged energy, like solar and kinetic, to power them—a potentially unlimited life from a power perspective. This allows you to find Bluetooth technology in billions of devices today, everything from phones to headsets to basketballs and socks—the use cases are limited only by a developer's imagination.

BR/EDR and Bluetooth with low energy are fundamentally different. Bluetooth with the low energy functionality is built on an entirely new development framework using Generic Attributes, or GATT. GATT is extremely flexible from a developer's perspective and can be used for just about any scenario. As a result, Bluetooth not only connects devices together in an ultra-power efficient way, but also directly connects devices to applications on your smartphone, PC or tablet. It's the low energy and GATT features which are at the heart of the current IoT boom. They are also at the heart of Bluetooth, making it the perfect fit for the IoT.

Bluetooth opens doors to a new generation of "connectionless" devices

On 6 December 2016, Bluetooth took a massive leap forward to deliver advanced beacon and location-based capabilities in home, enterprise and industrial environments. Bluetooth 5 quadruples the range, doubles the speed, and boosts broadcast messaging capacity by 800%—the key to enabling robust, reliable Internet of Things (IoT) connections that make full-home and building and outdoor use cases a reality.

What Bluetooth Used For

Bluetooth remote innovation is designed into billions of devices, from cars and cell phones to medical gadgets and computers/Laptops and even headset and toothbrushes. Bluetooth innovation permits the user to impart voice, texts, music, pictures, and other data remotely between combined gadgets.

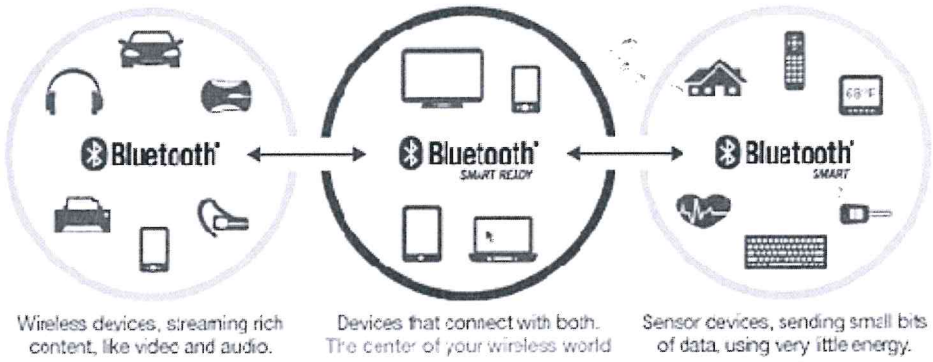

Figure 2.3.1: Uses of Bluetooth

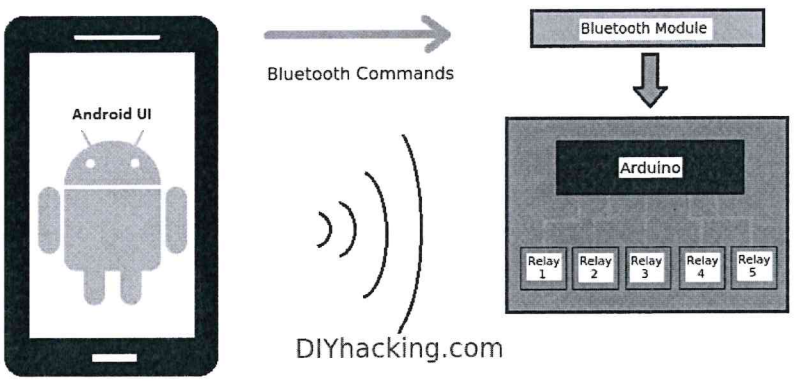

Figure 2.3.2: Bluetooth gesture.

2.4 Conclusion

This system consists of an Arduino-Uno board, a Bluetooth Module, an Android phone, power sockets, home appliances and an android Application (ArduDroid). It is user friendly and it is cost effective. Also it can be concluded that the objectives of this project are as follows:

- Constructed a wireless home automation system controlled by a smartphone specifically an android device.
- Designed and implement cost effective home automation system yet an efficient one.
- Designed a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped.

Chapter 3:

Methodology

Research

3.1 Introduction

This project mainly aims in designing completely automated switch board with the help of Bluetooth module to control the house hold appliances and also provide a user friendly environment of the user to operate the devices effectively. Using Bluetooth in mobile phone, the switch will turn on/ off without reaching the plug. Moreover this system will help the user especially the elderly to control their own home appliances. As an example they just need Bluetooth in their mobile phone which all mobile phone have it.

3.2 Research Design