HOME AUTOMATIC SYSTEM

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JUNE 2016

SESI JUN 2016

RESEARCH ABOUT HOME AUTOMATION SYSTEM USING ARDUINO AND BLUETOOTH

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This report is submitted to the Department of Electrical Engineering at the Polytechnic Seberang Perai in fulfillment of the requirements for the Diploma Kejuruteraan Elektronik (Komunikasi).

DECLARATION FOR FINAL PROJECT

A report entitled Home Automation System Using Android.

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DECLARATION

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Dedicated to our beloved MOTHER, our beloved FATHER, our beloved SIBLINGS and to our SUPERVISOR for whom after all mighty ALLAH We owe our success, always praying for us, encouraging us and always being there for us. From the bottom of our heart we say THANK YOU.

ACKNOLEDGEMENT

The most sincere thanks and gratitude to the Al-Mighty Allah who has eased the difficulty and cleared the ambiguity for us to fulfill this achievement which is our final year project.

First of all,we would like to say that it has been us honor to be a student of Puan Hanani and Encik Muhammad Majdi Bin Saad and also we would like to thank them for final year project supervisor, who was guidance, support and encouragement they provided to us throughout the entire duration while us was doing and preparing our biggest project yet which is our final year project (FYP).

We also would like to take a moment thank our academic supervisor, Puan Nurlizah for the support and guidance she showed us thought our three years as an Electronics Engineering Communication student whenever we needed him.

Last but definitely not least, we would like to thank our both Mother ,Father, family member and friends for the constant encouragement and constant support they showed us throughout our entire period as a polytechnic student which helped both of us to keep going and never give up.

From the bottom of heart THANK you all very much.

Abstract

This paper presents implementation of cost effective Home Automation System with and remote 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 home automation system 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 switches status is synchronized every where 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

Kertas kerja ini membentangkan satupembikinan sistem Automasi Kediaman kos rendah dengan kos minimum dan kawalan jauh. Rangka kerja ini bertujuan untuk membantu dan memberi bantuan untuk memenuhi keperluan warga tua dan orang kurang upaya di rumah. Selain itu, idea sistem automasi rumah akan meningkatkan taraf hidup normal di rumah. Sistem kawalan asas menggunakan peranti Bluetooth wayarles memberikan akses wayarles kepada telefon pintar. Reka bentuk sistem tidak membuang suis elektrik yang sedia ada dan memberi kawalan yang lebih selamat sepanjang suis dengan teknik penggunaan voltan rendah. Status suis disegerakkan dalam setiap mana setiap muka orang menunjukkan status suis sedia ada semasa. Sistem ini direka untuk mengawal alat-alat elektrik di seluruh rumah dengan mudah memasang ia, kemudahan penggunaan dan kos rendah untuk mereka bentuk dan melaksanakan.

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Chapter 1

INTRODUCTION

1.1 Research background

Home automation system 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. Home automation systems 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 man.

1.2 Problem statement

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.

1.3 Objective of the study

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

1.4 Scope of study

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:

Establishing a wireless network communication between the android and the home automation system, 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.

1.5 Significance of the study

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.

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 Home Automation System

Home automation is computerization of the home, housework or household action. Home automation may incorporate a control unit for controlling of lighting, HVAC (warming, ventilation and aerating and cooling), machines, and different frameworks, to give enhanced accommodation, solace, better energy saving ,productivity and security. The idea of home Automation has been around for quite a while and items have been available for a considerable number of years, however nobody's arrangement has gotten through to the standard yet. Home computerization for the elderly and debilitated can give expanded personal satisfaction to persons who may generally need parental figures or institutional consideration. It can likewise give a remote interface to home apparatuses or the automation system itself, through phone line, remote transmission or the web, to give control and observe and monitor by means of an smart phones or a web explorer program.

Figure 5 – Home Automation System example 1

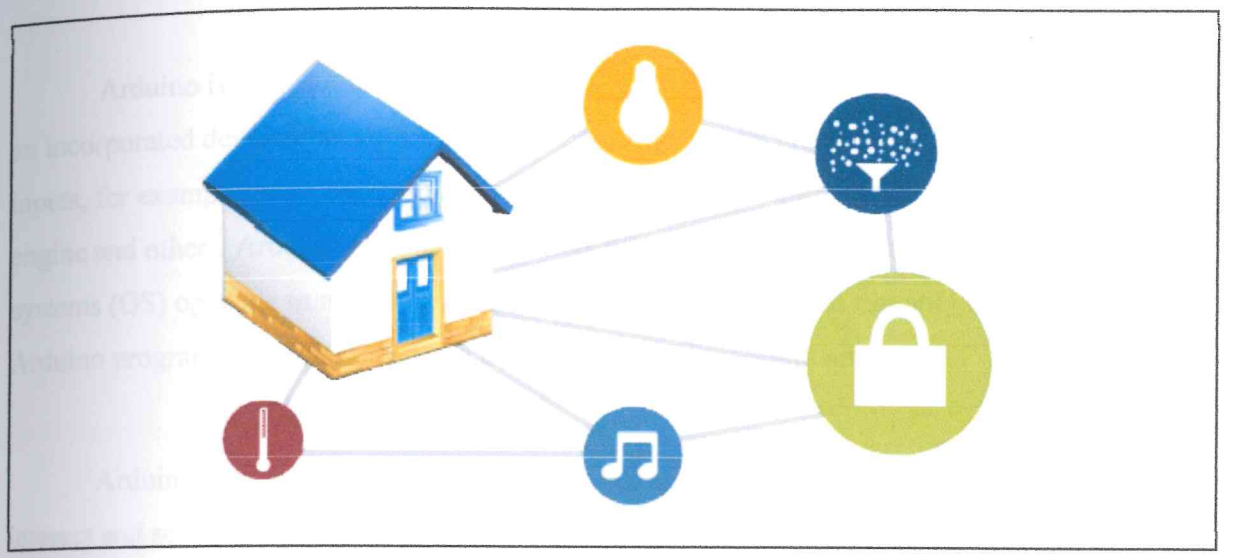
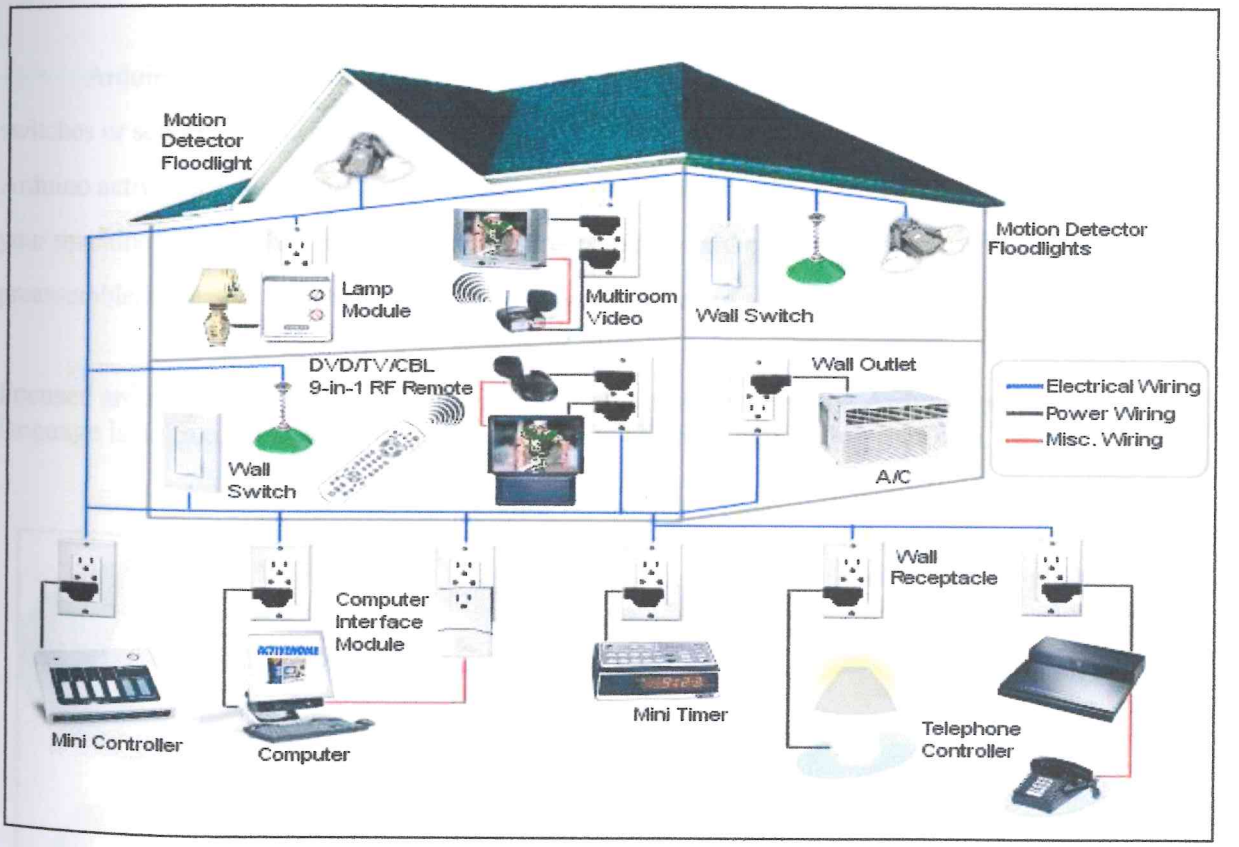


Figure 6 - Home Automation System example 2



2.3 Arduino

Arduino is open source physical processing which is base on a microcontroller board and an incorporated development environment for the board to be programmed. Arduino gains a few inputs, for example, switches or sensors and control a few multiple outputs, for example, lights, engine and others. Arduino program can run on Windows, Macintosh and Linux operating systems (OS) opposite to most microcontrollers' frameworks which run only on Windows. Arduino programming is easy to learn and apply to beginners and amateurs.

Arduino is an instrument used to build a better version of a computer which can control, interact and sense more than a normal desktop computer. It's an open-source physical processing stage focused around a straightforward microcontroller board, and an environment for composing programs for the board.

Arduino can be utilized to create interactive items, taking inputs from a diverse collection of switches or sensors, and controlling an assortment of lights, engines, and other physical outputs. Arduino activities can be remaining solitary, or they can be associated with programs running on your machine (e.g. Flash, Processing and Maxmsp.) The board can be amassed by hand or bought preassembled; the open-source IDE can be downloaded free of charge.

Focused around the Processing media programming environment, the Arduino programming language is an execution of Wiring, a comparative physical computing platform.

Figure 7- Arduino's Logo

2.3.1 Why choosing Arduino

There are numerous different microcontrollers and microcontroller platforms accessible for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and numerous others offer comparative usefulness. These apparatuses take the chaotic subtle elements of microcontroller programming and wrap it up in a simple to-utilize bundle. Arduino additionally rearranges the methodology of working with microcontrollers; moreover it offers some advantages for instructors, students, and intrigued individuals:

• Inexpensive - Arduino boards are moderately cheap compared with other microcontroller boards. The cheapest version of the Arduino module can be amassed by hand, and even the preassembled Arduino modules cost short of what $50.

• Cross-platform - The Arduino programming runs multiple operating systems Windows, Macintosh OSX, and Linux working frameworks. So we conclude that Arduino has an advantage as most microcontroller frameworks are constrained to Windows.

• Straightforward, clear programming method - The Arduino programming environment is easy to use for novices, yet sufficiently versatile for cutting edge customers to adventure as well. For educators, its favorably engaged around the Processing programming environment, so understudies finding ways to understand how to program in that environment will be familiar with the nature of Arduino.

• Open source and extensible programming. The Arduino program language is available as open source, available for development by experienced engineers. The lingo can be reached out through C++ libraries, and people expecting to understand the specific purposes of different interests can make the leap from Arduino to the AVR C programming language on which it is based. Basically, you can incorporate AVR-C code clearly into your Arduino programs if you have to.

• Open source and extensible hardware - The Arduino is concentrated around Atmel's Atmega8 and Atmega168 microcontrollers. The plans for the modules are circulated under a Creative Commons license, so experienced circuit designers can make their own particular interpretation of the module, extending it and improving it. slightly inexperienced customers can build the breadboard variation of the module remembering the finished objective to perceive how it capacities and save money.

2.4 Bluetooth

2.4.1 Bluetooth Technology

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.

2.4.2 How Bluetooth work

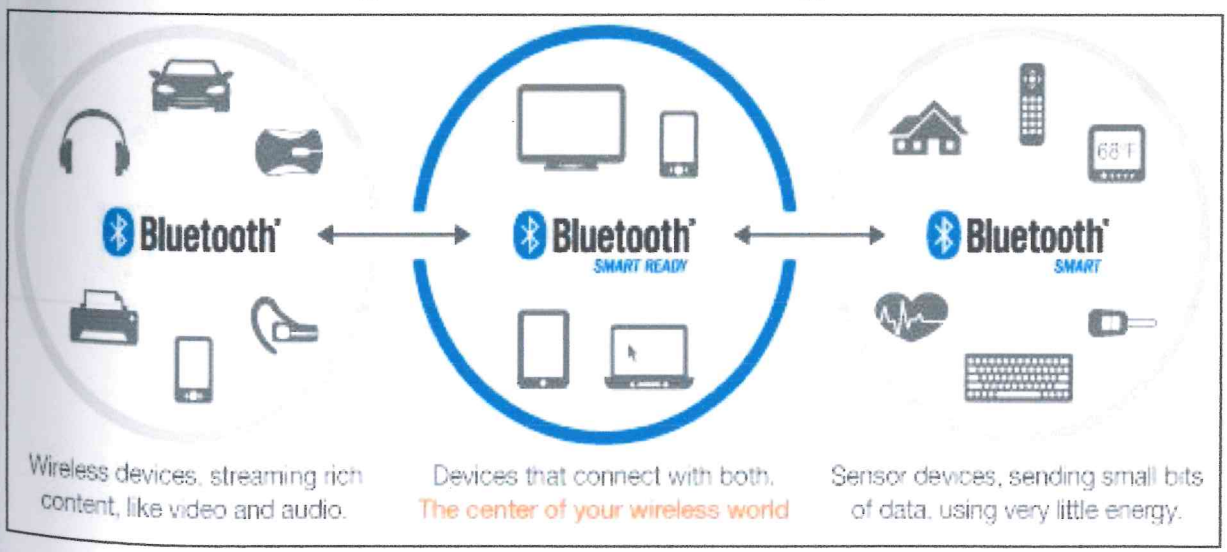
Each gadget must have a microchip installed in it that receive and transmits the frequency of 2.4 GHz that is accessible throughout the whole world (with a few varieties of transmission Bandwidth in diverse nations).

Other than the data, three channels of voice are accessible. The data can be traded to speeds of up to 1 megabit per second (2 megabits for second in the Second Generation of this Technology). A plan of "frequency hop" (hops of frequencies) permits to the gadgets to get connected comprehensive in territories where an incredible electromagnetic interference exists. Other than that is given plans of encryption and check.

2.4.3 What it is used for

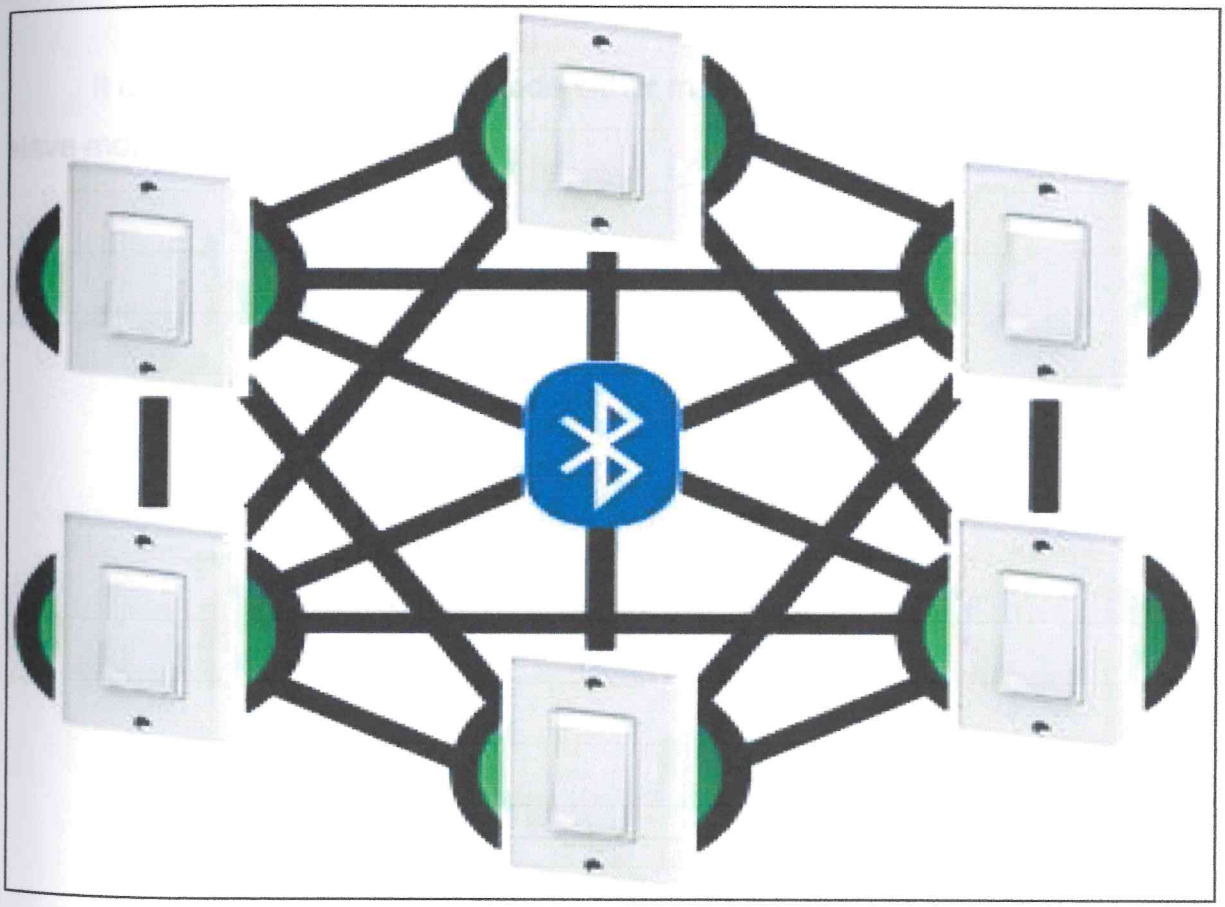
Bluetooth remote innovation is designed into billions of devices, from cars and cell phones to medical gadgets and computers/Laptops and even headset and toothbrushes. Bluetooth innovation permits the user to impart voice, texts, music, pictures, and other data remotely between combined gadgets.

Figure 8-Uses of Bluetooth Technology



2.4.4 Its importance to create a home automation system

Bluetooth technology has been one of the critical innovations to home automation system or Smart Living. It is a remote technology created to take the place of wired devices to wireless one which links gadgets like cell phones and PCs (Laptops/desktops). Albeit "link substitution" could make a point-to-point connection, Bluetooth permits remote gadgets to have the ability to connect with one another inside reach. The system of a set of Bluetooth gadgets is called "piconet", which is anideal technology to system a brilliant advanced home.

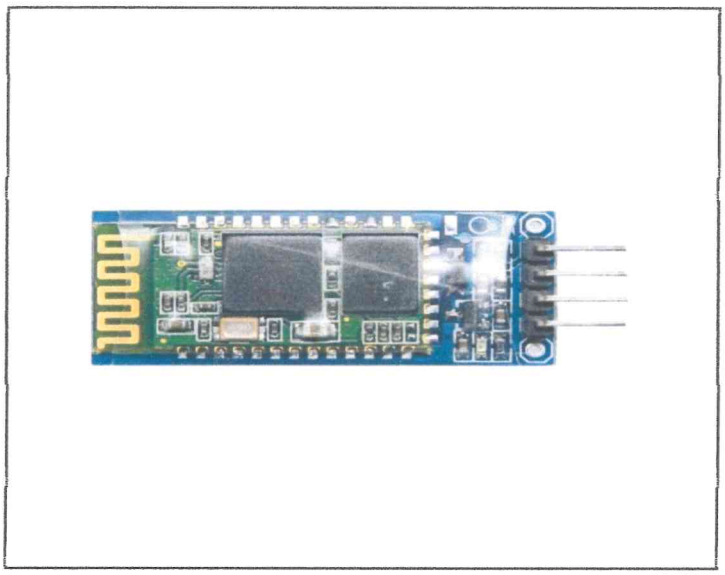


2.4.5 Bluetooth Module

Arduino-Uno board doesn't support Bluetooth connection on its own, which makes the idea of connecting it wirelessly to an Android device impossible. So a medium between the Arduino-Uno board and android device is needed and in this project it is a Bluetooth module specifically the HC-06 Bluetooth module.

The HC-06 is a user friendly need only basic knowledge and it is programmable using the AT commands.

It comes only in one fixed mode either master or slave. In this project the slave module was used.



2.5 Android

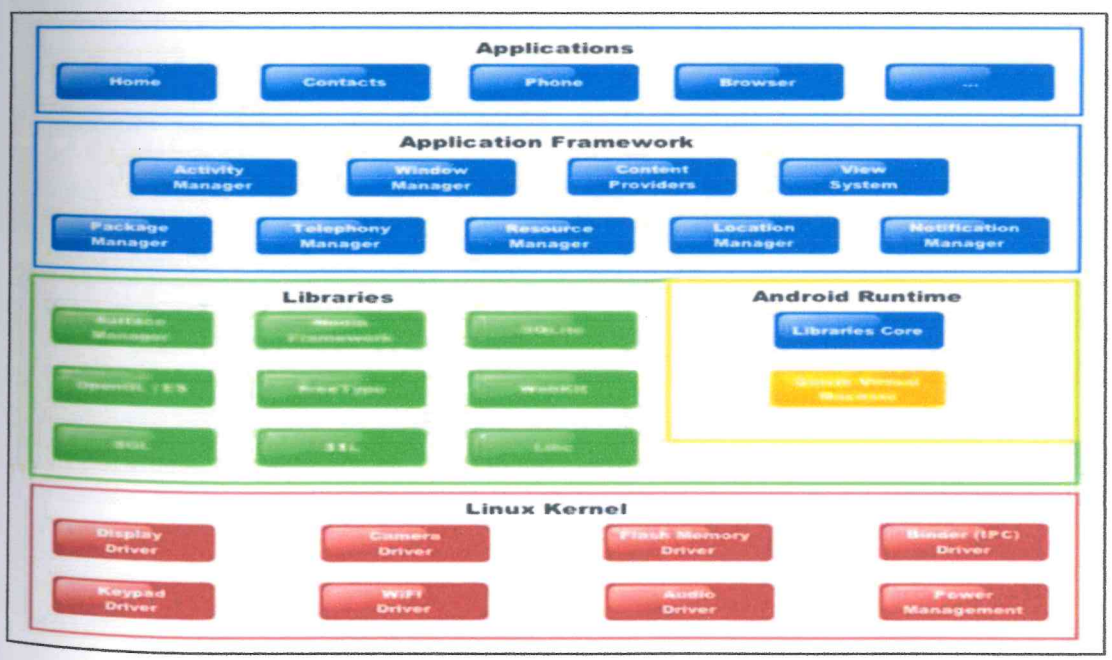
2.5.1 Introduction to android

Android operating system is open source focused around Linux kernel with Java programming interface planned fundamentally for touch screen contraptions. The Android telephone was in the business sector since October 2008. Gadget producers, remote transporters and fan engineers are permitted to adjust and distribute the product under the Apache License.

Google Play is Android essential application store. There were roughly 700,000 applications accessible for Android in October 2012 and created by a vast group of Android application designer.

Android building design comprises of a few layers as demonstrated in Figure 2.1. The applications need to go layer by layer to get to the hardware. A few libraries are accessible. ARM architecture is the principle equipment platform for Android.

Figure 9-Android Architecture



2.6 Examples of Home Automation in the real world

The Brown Box

This home, which was rebuilt on a 1960's old foundation in 2008 is a sweet sight for eyes, both inside and out . This house which is only a ten minutes walk to the town center is home to a detached family, the owner was displeased with the first KNX installation and so , everything in the house was redesigned and replaced in 2011 with state of the art technology Loxone has to offer.

The Retro Fit

The Raab family purchased a home in 2007, right in the heart of Bluegrass in Lexington, Kentucky. By 2013 the owner decided changes must be made, changes that would allow him to convert his house into a Smart home. The retrofitted Loxone is an installation focused on achieving smart home status that will allow the Raab family to experience a better kind of comfort and convenience that the Loxone system offers.

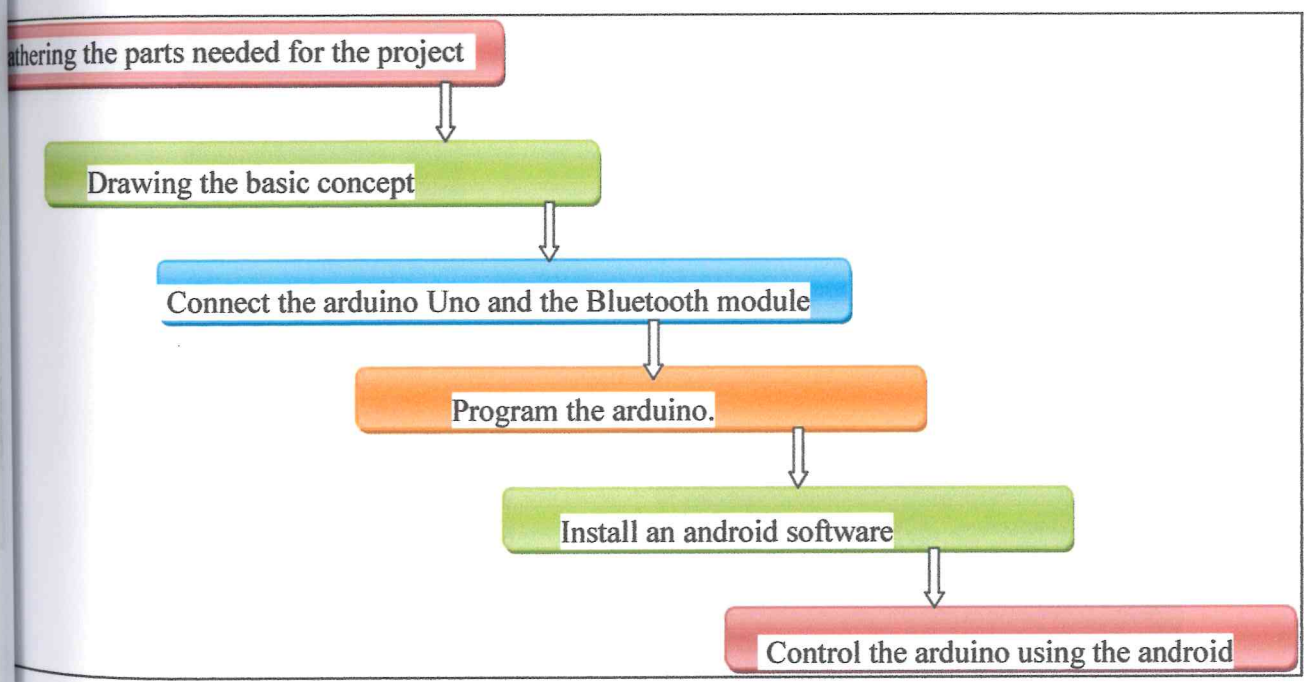
Chapter 3

METHODOLOGY

3.1 Introduction

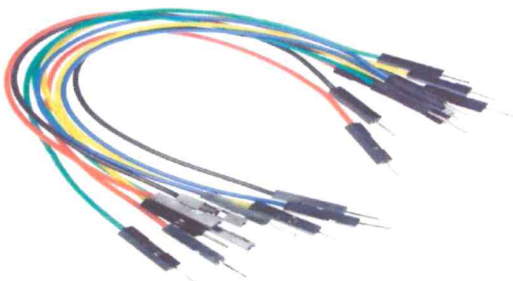
This part will explain the path needed to undertake in order to achieve the goal of the project.

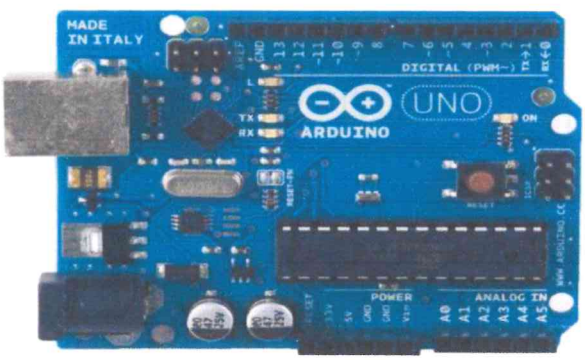
3.2 Project Flow



3.3 Gathering the parts needed for the project

- Arduino Uno.
- Android phone.
- Bluetooth module (HC-06).
- Android application. (to control the arduino via Bluetooth)
- Jumping Wires.
- Relays Modules.
- Wiring Board with MCB.
- Power Supply (output 5v,9v,12v)



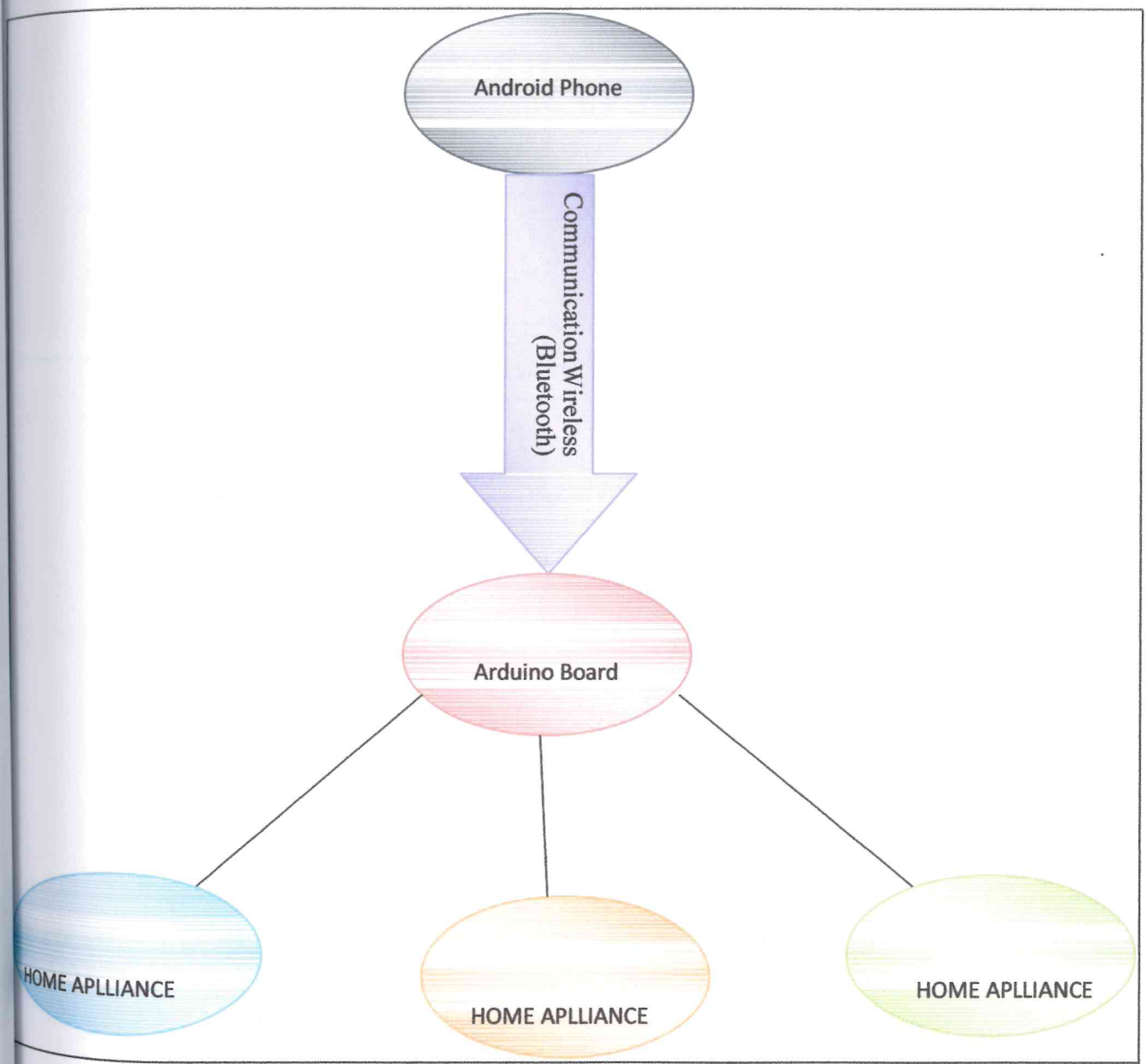



JY-MCU
LEVEL:3.3V
Power:3.6V—6V
BT_BOARD V1.2pro
STATE
RXD
TXD
GND
VCC
EN

3.4 System Design

Figure 3.4 shows the system breakdown of this project. In this project two types of communication is used, first one is wireless (Via Bluetooth) and the second one is wired (appliances connected to the controller). HC-06 is a Bluetooth module that will enable the android phone to wirelessly connect with the controller.

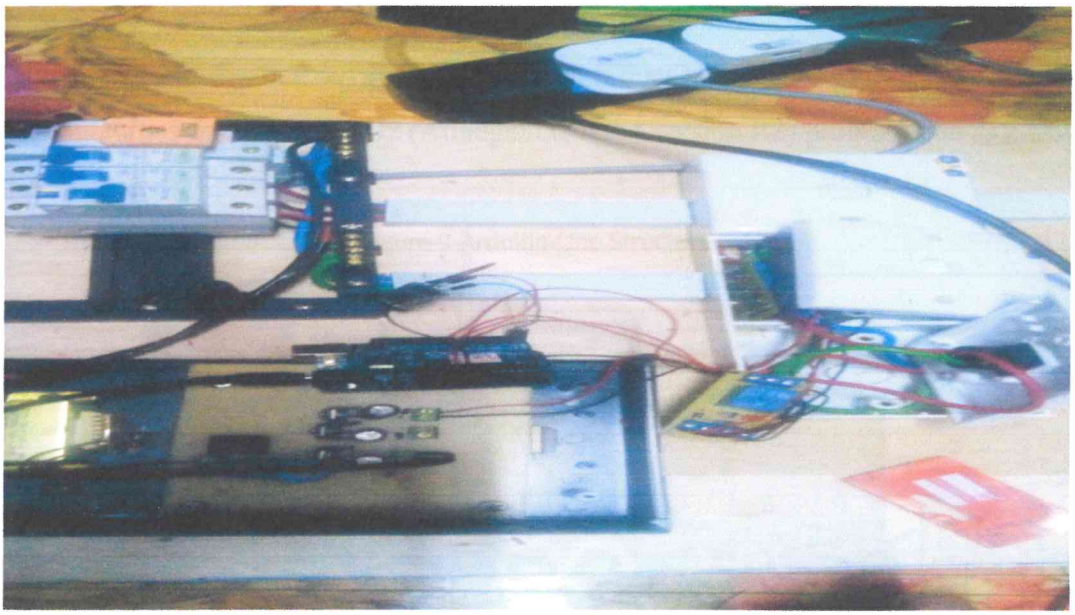
Figure 7-SystemDesign



3.5 Hardware Implementation

This part describes the implementation of the whole system, from arduino-uno board to the appliances. This system is integrated using Arduino-Uno board, a HC-06 Bluetooth module, relays modules, an android device, an android app to control the arduino board, and other electronics components. Figure 3.5 shows the important part in the design.

Figure 8-Hardware implementation



3.5.1 Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has a 16 MHz ceramic resonator, 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a USB connection, a power jack, an ICSP header, and a reset button. This board is very simple and can be easily used, everything you need to support the microcontroller is in this board, just plug it in a computer via USB cable and power using an AC-to-DC adapter or battery to get started.

The difference seen in the Arduino Uno is that it does not use the FTDI USB-to-serial driver chip but, it has the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Figure 9-Arduino-Uno Structure

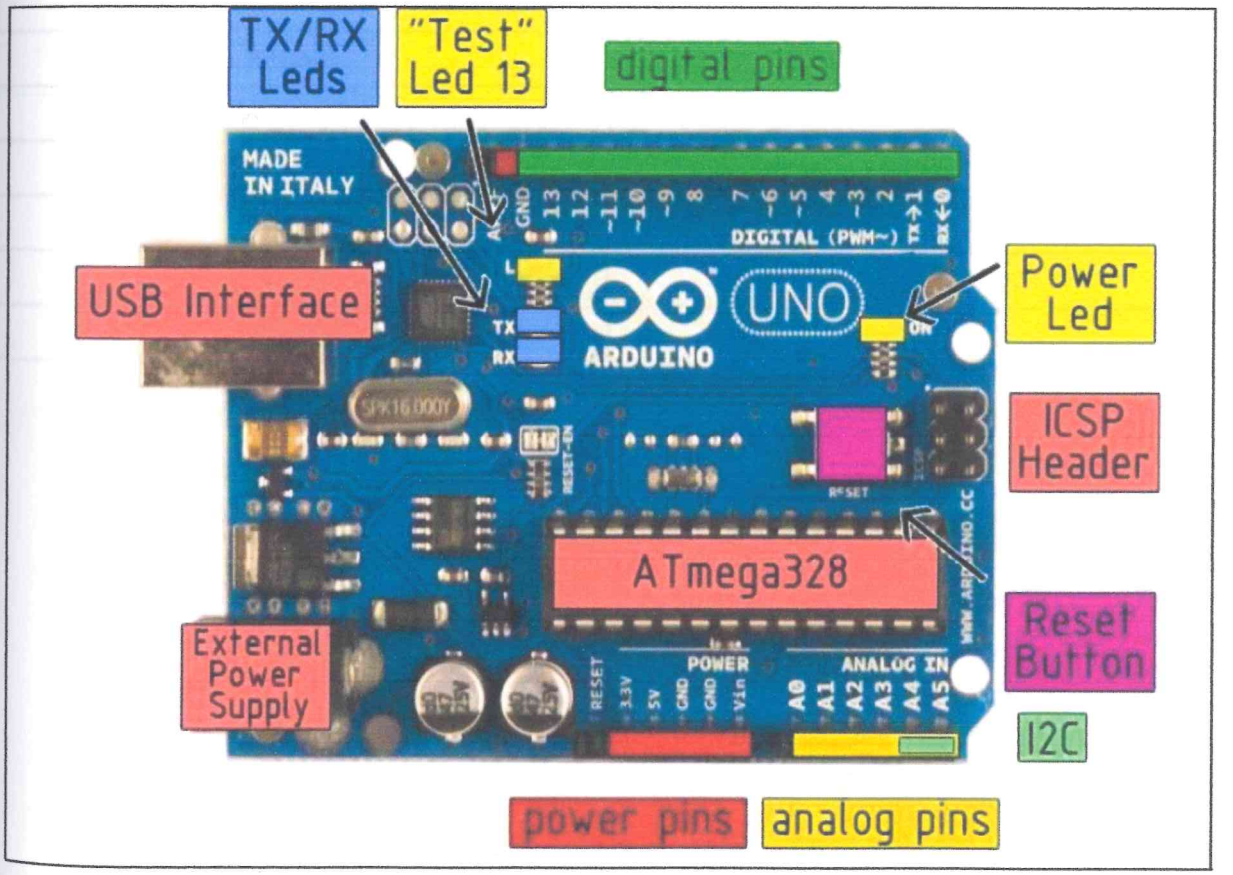


Table: Arduino-Uno specifications

Microcontroller	ATmega328
Operating-Voltage(OV)	5Volts
Recommended input voltage	7 to 12 Volts
Limits of inputs voltage	6 to 20 Volts
Digital I/O Pins	14 (of which 6 provides PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Table 1 – Arduino-Uno Specification

3.5.2 HC-06 Bluetooth Module (slave)

HC-06 is a Bluetooth module as shown in the picture below. It is a slave module which means the connection has to be initiated by a master module; in this case the master module is the android device. It is small in size and its voltage is 3.3V that makes it compatible with any kind of microcontroller with the power of 3.3V. it's baud rate can be set using the AT commands.

Figure 10-HC-06 Bluetooth Module

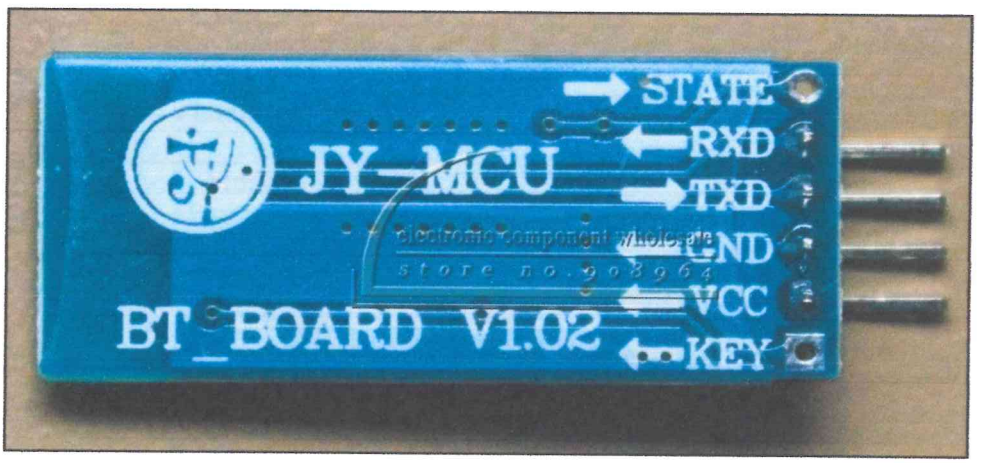


Table 3.5.2: HC-06(slave) Bluetooth module specifications

Bluetooth protocol	Bluetooth Specification v2.0+EDR
Frequenc y	2.4GHz ISM band
Modulation	GFSK(Gaussian Frequency Shift Keying
Emission power	≤4dBm, Class 2
Sensitivit y	≤-84dBm at 0.1% BER
Speed	2.1Mbps(Max) / 160 kbps, Synchronous: 1Mbps/1Mbps
Security	Authentication and encryption
Profiles	Bluetooth serial port
Power supply	+3.3VDC 50mA
Working temperature	-20 ~ +75 Centigrade
dimension	26.9mm x 13mm x 2.2 mm
Mode	Slave
Baud rate (default)	9600 baud rate
Pin code (default)	1234

Table 2 – HC-06 specifications

3.5.3 Relay Module

A relay is a device that operates on electricity. It has a control and controlled systems. It is mostly used to control circuit automatically. Basically, it is an automatic switch to control using a low-current signal a high-current circuit.

3.5.3.1 Ordering information

SRD	XX VDC	S	L	C
Model of relay	Nominal coil voltage	Structure	Coil sensitivity	Contact form
SRD	03,05,06,09,12,24,48VDC	S:Sealed type	L:0.36W	A:1 form A
				B:1 form B
		F:Flux free type	D:0.45W	C:1 form C

Table 3 – Ordering information

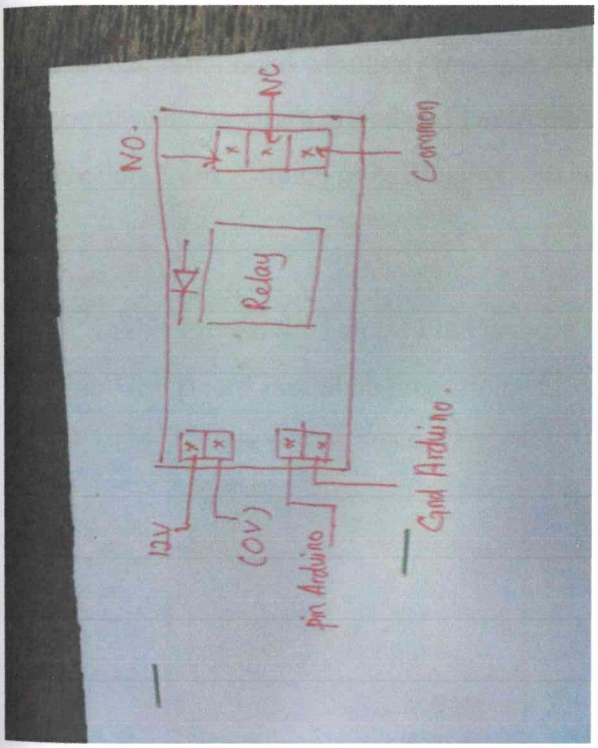
3.5.3.2 Coil Data Chart (At 20 celsius)

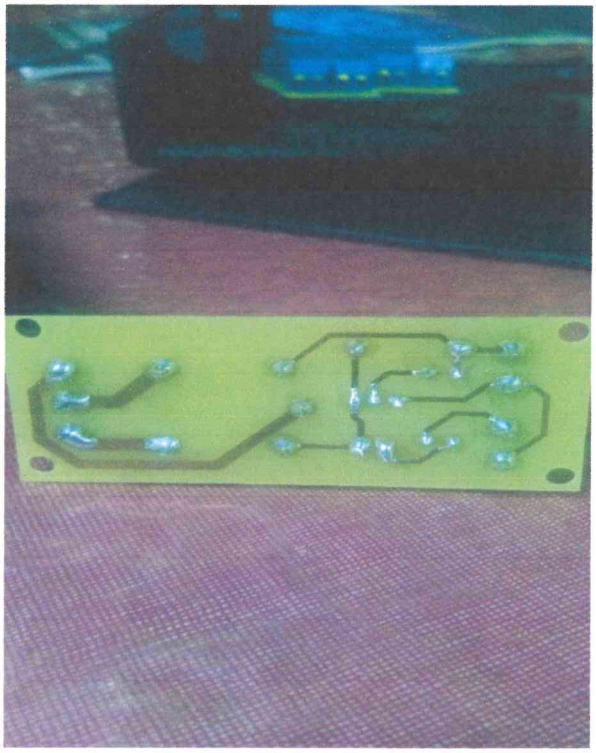
Coil Sensitivity	Coil Voltage Code	Nominal Voltage (VDC)	Nominal Current (mA)	Coil Resistance (Ω) ±10%	Power Consumption (W)	Pull-In Voltage (VDC)	Drop-Out Voltage (VDC)	Max-Allowable Voltage (VDC)
SRD (High Sensitivity)	03	03	120	25	abt. 0.36W	75%Max.	10% Min.	120%
	05	05	71.4	70				
	06	06	60	100				
	09	09	40	225				
	12	12	30	400				
	24	24	15	1600				
	48	48	7.5	6400				
SRD (Standard)	03	03	150	20	abt. 0.45W	75% Max.	10% Min.	110%
	05	05	89.3	55				
	06	06	75	80				
	09	09	50	180				
	12	12	37.5	320				
	24	24	18.7	1280				
	48	48	10	4500	abt. 0.51W			

Table 4 – Coil Data Chart

3.5.3.3 Method of using the relay module

By connection the power source to the In Port and the wanted appliance to the normally open Pin (NO) if you want it to be active high otherwise connect it to the normally connected Pin (NC).



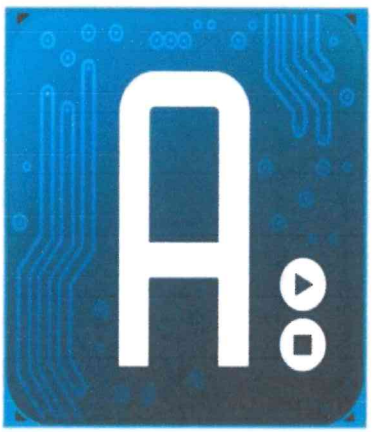


3.6 Android Phone + Android App

In this Project and android phone (Samsung Galaxy S Advance) is used as the remote control for the user alongside with an App Called ArduDroid.

ArduDroid is a simple Android app that will make controlling the pins of Arduino-Uno from an Android phone wirelessly possible. ArduDroid employs a simple Android user interface to control Arduino Uno's digital and PWM pins, send text commands to Arduino-Uno and receive data from Arduino over Bluetooth serial module.

In this Project the Digital Pin Function is only required to make the system work, so the Arduino-Uno Board should be programmed to only support that feature.

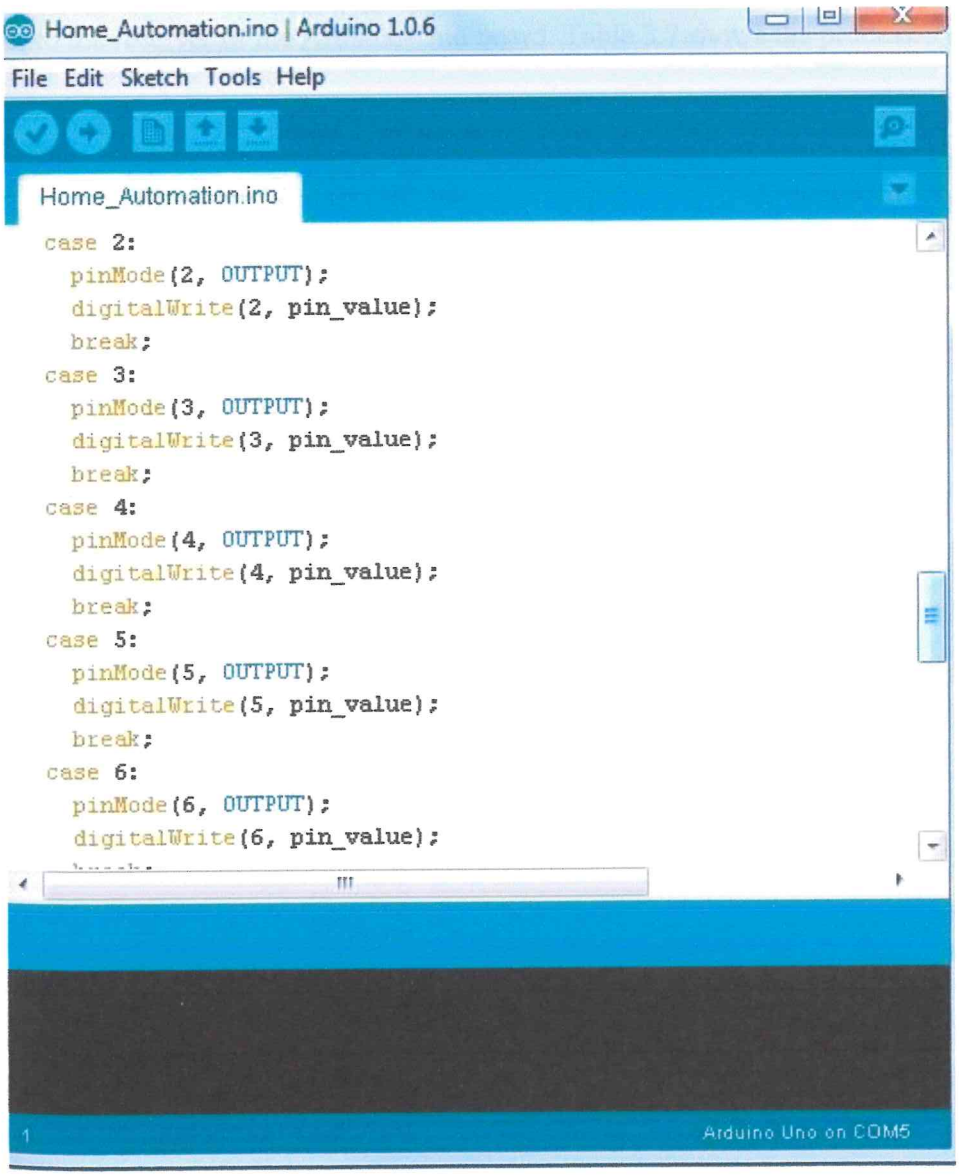


3.7 Programming the Arduino-Uno

In order for the Arduino-Uno board to be able to interact with the application used in this project certain program (code) needs to be uploaded to the Arduino-Uno.

Arduino Company provides user friendly software which allows writing any code for any function wanted to be performed by the Arduino-Uno and upload it to the board.

Refer to appendix A for the full source code of the Arduino-Uno board.



3.8 Connecting the Arduino-Uno board to the Bluetooth module

A connection between the Arduino-Uno and the Bluetooth module is required in order to enable the android to control the Arduino-Uno.

First we need to connect the VCC pin of the Bluetooth module to the VCC port in the Arduino-Uno board. Second we need to connect the GND pin of the Bluetooth module to the GND port in the Arduino-Uno board. Lastly we need to connect the receiver of the Bluetooth module to the transmitter of the Arduino-Uno board and the transmitter of the Bluetooth module to the receiver of the Arduino-Uno board. Table 3.7 shows the process.

Bluetooth Module (HC-06)	Arduino-Uno Board
VCC pin	VCC port
GND pin	GND port
TX pin	RX port
RX pin	TX port

Table 5 – Bluetooth module/Arduino connection

3.9 Testing the connection

After installing the app on the phone and connecting the Arduino-Uno board with the Bluetooth module a test to make sure that the phone is interacting with arduino via the Bluetooth module is needed.

Open the app in the android device.

Search for Bluetooth devices via the app.

Connect to the Bluetooth module.

If the light in the Bluetooth module stopped blinking then everything is working fine otherwise the wiring need to be checked.

3.10 Connecting the Appliances to the Arduino Board

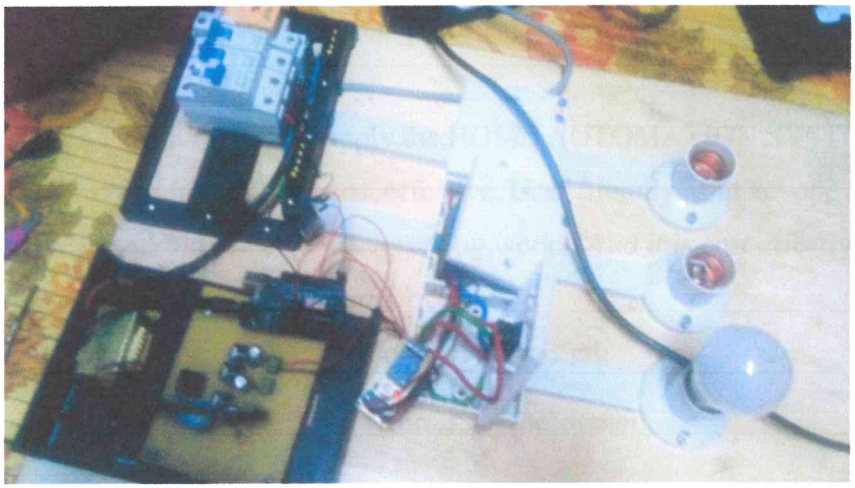
After everything is set and ready (android phone is connected to the Arduino) connecting the Arduino to the home appliances is needed.

Using wires and connector blocks connect the positive end of the home appliance (eg. Portable fan) to the normally open (in this project we want to make the output active high) port in the relay module and the negative end of the appliance to a power source. Then connect the IN port of the same relay module to the wanted Arduino-Uno port.

Apply the same for the other appliances only use different relays and different Arduino-Uno Ports.

Connect the android phone with the Bluetooth module and now all the connected appliances can be controlled wirelessly using the android device.

Figure 12 – Final design



CHAPTER 4

RESULTS AND DISCUSSION

This chapter discusses the results and any limitation and/or problems encountered during the period of the project.

4.1 Results

Managed to successfully apply the HOME AUTOMATION SYSTEM USING ARDUINO and it was user friendly and cost effective. User friendly as in anyone can use just a click of a button on an android screen and everything works. And it is cost effective as in it will cost exactly as the project requires (optimum price).

Figure 4.1 shows the prototype of the system

Figure 13 – Final design

4.2 Limitations and Problems Encountered

Some problems and issues were encountered during this project. Bluetooth connection between the android phone and the Arduino-Uno board was unsuccessful in the early stages of this project. This problem was encountered when the xbee Bluetooth module was meant to be used for this project. This problem has been tackled by online search on the matter and finally replacing the xbee module with the HC-06 Bluetooth module.

Another issue it was using the relay modules and connecting them. At first normal relays were intentioned to be used in the project however soldering them into a breadboard was troublesome because of the whole not matching the relay pins and the breadboard needed specific modification, not to mention connecting everything using soldering iron is not the ideal way if several tests and wiring and unwiring is in order. This problem was tackled by using relay modules.

Chapter 5

CONCLUSION AND FUTURE WORKS

This chapter confers on the conclusion of Bluetooth Based Home Automation System Using Android Phone and discusses some future recommendation.

5.1 Conclusion

It can be concluded that HOME AUTOMATION SYSTEM USING ARDUINO was a success. 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 has been successfully met and they 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.

5.2 Future Recommendations

There are some recommendations for Future works. Some of them are:

1. Better to use relay modules and connect it directly than using normal relays with breadboard.
2. Try to find a way to amplify the Bluetooth module signal to work in greater distance.
3. Test each and every component before using them especially the relays for safety purposes.

PROJECT MANAGEMENT

This chapter shows the planning and management that has been done in order to achieve the objectives of the project on the right time. Also, this chapter discusses the period taken in each step in order to complete the tasks for the project. Last but not least, the cost of the project has been estimated in this chapter.

Table 6 shows the CHART for the first part of the final year project

GANTT CHART

BIL	KEMAJUAN PROJEK	TEMPOH	TARIKH MULA	TARIKH AKHIR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	RESEARCH PROJECT	3 MINGGU	18/12/2015	8/1/2016																	
2	INITIAL PROPOSAL	8 MINGGU	15/1/2016	19/2/2016																	
3	DESIGN POWER SUPPLY	2 MINGGU	19/2/2016	26/2/2016																	
4	DESIGN REMOTE CONTROLLER	4 MINGGU	19/2/2016	4/3/2016																	
5	FABRICATE CIRCUIT	4 MINGGU	19/2/2016	11/3/2016																	
6	TESTING CIRCUIT	2 MINGGU	11/3/2016	18/3/2016																	
7	PROPOSAL	6 MINGGU	1/3/2016	25/3/2016																	
8	PRESENT PROPOSAL AND PRELIMINARY RESULT	1 MINGGU	25/3/2016	1/4/2016																	

Table 6 – FYP1 GRANTT CHART

Table 7 shows the CHART for the second part of the final year project

Kemajuan Projek	Tempoh	Tarikh Mula	Tarikh Akhir	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Perbincangan dengan penyelia	2 minggu	26/6/16	1/7/16														
Membuat kajian dan membeli kompenen	2 minggu	15/7/16	22/7/16														
Melakar litar	4 minggu	1/8/16	25/8/16														
Melukis litar dalam software	2 minggu	2/9/16	9/9/16														
Etching Menebuk lubang Pematerian	2 minggu	14/9/16	23/9/16														
Ujian dan menyelesaikan masalah	1 minggu	30/9/16															
Selesaikan litar dan mencubanya	1 minggu	7/10/16															
Report akhir	14 minggu	26/6/16	7/10/16														

Table 7 – FYP2 GANTT CHART

Table 8 shows the cost of the project

Part number	Quantity	Description	Material Cost
1	1	Arduino-Uno Board	RM72
2	1	Arduino-PC cable	RM3
3	3	Two coil cables	RM4
4	2	60W light bulbs	RM5
5	2	2-Channel relay modules	RM60
6	2	Bulb holder	RM7
7	1	Power Supply	RM90.00
Total	RM241		

Table 8 – Project cost

REFERENCES

- Deepali Javale, Mohd. Mohsin, Shreerang Nandanwar and Mayur Shingate. International Journal of Electronics Communication and Computer Technology (IJECCT) Volume 3 Issue 2 (March 2013).
- The official Arduino Website: http://arduino.cc/en/Guide/Introduction
- Inigo Puy, Bluetooth, 2008.
- The official Bluetooth Website: http://www.bluetooth.com/Pages/Fast-Facts.aspx
- Ming Yan and Hao Shi, SMART LIVING USING BLUETOOTHBASED ANDROID SMARTPHONE, 2013.
- HC-06 Bluetooth module instructional manual.
- LIU, J. Research on Development of Android Applications. Fourth International Conference on Intelligent Networks and Intelligent Systems. 2011
- HANSON, D. C. Android Application Development and Implementation 3 Dimensional Tic-Tac-Toe. 2010.
- LOXONE Miniserver based Smart Homes. 2015

Appendix A

Source code for Arduino

```
#define START_CMD_CHAR '*'
#define END_CMD_CHAR '#'
#define DIV_CMD_CHAR '|' #define
CMD_DIGITALWRITE 10
#define CMD_READ_ARDUDROID 13
#define MAX_COMMAND 20
#define MIN_COMMAND 10
#define IN_STRING_LENGHT 40
#define MAX_ANALOGWRITE 255
#define PIN_HIGH 3
#define PIN_LOW 2

String inText;

void setup() {
 Serial.begin(9600);
 Serial.println("ArduDroid 0.12");
 Serial.flush();
}
void loop()
{
 Serial.flush();
```

```
  int ard_command = 0;
  int pin_num = 0;
  int pin_value = 0;
  char get_char = ' ';
  if (Serial.available() < 1) return;
  get_char = Serial.read();
  if (get_char != START_CMD_CHAR) return;
  ard_command = Serial.parseInt();
  pin_num = Serial.parseInt();
  pin_value = Serial.parseInt();

  //Digital Data buttons from ArduDroid
  if (ard_command == CMD_DIGITALWRITE){
   if (pin_value == PIN_LOW) pin_value = LOW;
   else if (pin_value == PIN_HIGH) pin_value = HIGH;
   else return;
   set_digitalwrite( pin_num, pin_value);
   return;
  }
}

void set_digitalwrite(int pin_num, int pin_value)
{
 switch (pin_num) {
 case 2:
  pinMode(2, OUTPUT);
```

```
 digitalWrite(2,
 pin_value); break;
case 3:
 pinMode(3, OUTPUT);
 digitalWrite(3,
 pin_value); break;
case 4:
 pinMode(4, OUTPUT);
 digitalWrite(4,
 pin_value); break;
case 5:
 pinMode(5, OUTPUT);
 digitalWrite(5,
 pin_value); break;
case 6:
 pinMode(6, OUTPUT);
 digitalWrite(6,
 pin_value); break;
case 7:
 pinMode(7, OUTPUT);
 digitalWrite(7,
 pin_value); break;
case 8:
 pinMode(8, OUTPUT);
 digitalWrite(8,
 pin_value); break;
```

```
case 9:
 pinMode(9, OUTPUT);
 digitalWrite(9,
 pin_value); break;
case 10:
 pinMode(10, OUTPUT);
 digitalWrite(10, pin_value);
 break;
case 11:
 pinMode(11, OUTPUT);
 digitalWrite(11, pin_value);
 break;
case 12:
 pinMode(12, OUTPUT);
 digitalWrite(12, pin_value);
 break;
case 13:
 pinMode(13, OUTPUT);
 digitalWrite(13, pin_value);
 break;
}
      }
```