VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELAGAVI - 590 018

A Mini-Project Report on

"Conversion to Smart Home"

Submitted in partial fulfilment of the requirements for the degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS & COMMUNICATION ENGINEERING

Submitted by

Amith Bhat	**4SF19EC013**
Karthik R	**4SF19EC041**
Deepak P Shetty	**4SF19EC031**
K Rahul Bhat	**4SF19EC039**

Under the Guidance of

Dr. Sandeep Bhat

Associate Professor

Department of Electronics & Communication Engineering

SAHYADRI

COLLEGE OF ENGINEERING & MANAGEMENT

An Autonomous Institution

(Approved by AICTE, Accredited by NBA, NAAC, New Delhi & Affiliated to VTU, Belagavi)

Academic Year 2021-2022

SAHYADRI
COLLEGE OF ENGINEERING & MANAGEMENT
An Autonomous Institution

(Approved by AICTE, Accredited by NBA, NAAC, New Delhi & Affiliated to VTU, Belagavi)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the Mini-Project entitled "**Conversion to Smart Home**" has been successfully submitted by Amith Bhat D (4SF19EC013), Karthik R (4SF19EC041), Deepak P Shetty (4SF19EC031), K Rahul Bhat (4SF19EC039), bonafide students of Sahyadri College of Engineering & Management, Mangaluru, in partial fulfilment for the VI semester of Bachelor of Engineering in Electronics & Communication Engineering of Visvesvaraya Technological University, Belagavi during the academic year 2021-22. The Mini-Project report has been approved as it satisfies the academic requirements as per university guidelines.

Project guide	Mini-Project Coordinator	Head of the Department
(Dr. Sandeep Bhat)	(Mrs. Roopashree)	(Dr. Anush Bekal)

Name of the Examiners	Signature with Date
1.	
2.	

SAHYADRI
COLLEGE OF ENGINEERING & MANAGEMENT
An Autonomous Institution
(Approved by AICTE, Accredited by NBA, NAAC, New Delhi & Affiliated to VTU, Belagavi)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

DECLARATION

We hereby declare that the Mini-Project work entitled "Conversion to Smart Home " which is being submitted in partial fulfilment for the award of Bachelor of Engineering in Electronics & Communication Engineering of the Visvesvaraya Technological University, Belagavi, is the authenticated Project work carried out by us under the guidance of Dr. Sandeep Bhat, Associate Professor, Department of Electronics & Communication Engineering and has not submitted the results of the same, partially or fully in any other university or college.

	Name	USN	Signature with Date
1	Amith Bhat D	4SF19EC013	21/7/22
2	Karthik R	4SF19EC041	21/7/22
3	Deepak P Shetty	4SF19EC031	21/7/22
4	K Rahul Bhat	4SF19EC039	21/7/22

ACKNOWLEDGEMENT

It is with great satisfaction and euphoria that we are submitting the Mini Project Report on **"Conversion to Smart Home"**. We have completed it as a part of the curriculum of Visvesvaraya Technological University, Belagavi in partial fulfillment of the requirements of the VI semester in Bachelors of Engineering in Electronics & Communication Engineering.

We wish to express our sincere gratitude to our Project guide **Dr. Sandeep Bhat , Associate Professor** , Department of Electronics & Communication Engineering, Sahyadri College of Engineering & Management, Adyar (SCEM) for his valuable guidance and suggestions hence improving our knowledge.

We thank our Project Coordinator **Mrs. Roopashree,** Assistant Professor, Department of Electronics & Communication Engineering, for her valuable guidance and suggestions.

We express my sincere gratitude to **Dr. Anush Bekal**, HoD, Department of Electronics & Communication Engineering for his invaluable support and guidance.

We are indebted to our beloved Principal, **Dr. Rajesha S,** and **Dr. Manjappa Sarathi** Director of Research & Development, President Sahyadri Institute Innovation Council (IIC), and **Dr. D L Prabhakara**, Director, SCEM for their constant support & encouragement.

We extend our sincere regards & respect to **Dr. Manjunath Bhandary**, Chairman, SCEM, having provided all the facilities that helped us in the timely completion of this project report.

Finally, we thank all the Teaching and Non-Teaching staff of the Department, of Electronics & Communication Engineering for their valuable help and support.

Amith Bhat	4SF19EC013
Karthik R	4SF19EC041
Deepak P Shetty	4SF19EC031
K Rahul Bhat	4SF19EC039

ABSTRACT

This project presents a Voice Controlled Home Automation System with an Android app. This project is useful to control almost all the home or office devices. All instructions from the user are executed using a microcontroller. The user does not need to call for assistance if he or she cannot reach or use any devices, those are far to reach. Using the right voice commands, the user can operate any electrical device connected to the system without moving. It is also designed in such a way that simple household activities like automatic lighting and fans can be done using IoT.

Keywords:

IoT, Home Automation, Voice commands, Microcontroller.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

Abbreviations	Expansion
IoT	Internet of things
PC	Personal computer
IR	Infrared
LED	Light Emitting Diode
LAN	Local Area Network
Wi-Fi	Wireless Fidelity
GSM	Global System for Mobile Communications
MCU	Micro Controller Units
IDE	Integrated Development Environment
PWM	Pulse Width Modulation
I/O	Input / Output
USB	Universal Serial Bus
UI	User Interface
BPS	Bits per second
GIS	Graphic Information System

CHAPTER 1

INTRODUCTION

1.1 Overview

One of the most trending research topics of the 21st century is home automation. Technology plays an important role in daily life, so it is growing in importance as a result of its promising advancements. In the home automation industry, the Internet of Things is gaining popularity because it allows users to monitor a facility remotely without actually having to be present.

Our various households do not have a habit of putting in place practices that will reduce electricity consumption, which largely accounts for this issue. For instance, people forgetting to turn off their outside lights during the day. This is also evident in our various street lightening systems and it is one of the various ways of which energy is used inefficiently, causing power shortages in most part of the country. At the core of home automation lies efficient use of energy (electricity). In households with no automation, tasks are done manually which consumes time and resources. Operation of televisions, air conditioners, music systems, and garage doors that are controlled via a dedicated remote control. Most of these physical devices are now implemented as software apps running on smart phone, tablets and PCs. The idea of controlling homes switches with the use of a button-driven control unit is widely implemented worldwide.

1.2 Statement of the problem

The manual way of controlling appliances in houses / office premises is difficult at times and also during emergencies the ability to use them with voice commands makes it simple.

1.3 Motivation

Nowadays IoT is everywhere in the world to make the smarter world. Due to IoT we can see many smart devices around us .The concept of home automation aims to integrate various technologies into an automation system. Nowadays, systems such as motion sensing, intelligent thermostat control, controllable lights, IR technology are used. There are lots of cheap and costly home automation products in the market. Each has a way to communicate to the device controllers. The standard hardware and software architectures, models and protocols are hidden by most companies. This project aims to make a cheap and open source home automation system with an android as its main interface.

1.4 Challenges

- Hard to obtain all components on time.
- The connections in the prototype were difficult to understand.
- The circuit design that will work with our app in Proteus software was moderately hard.
- The +5V supply on the microcontroller board could not provide the necessary current for both Bluetooth module and relay module at the same time so we have to get a 12V to 5V converter.

1.5 Objectives

- To use voice commands to execute day to day activities.
- To cheaper way for home automation
- Use voice commands to assist physically challenged and elderly people with limited mobility.
- To increase privacy where necessary by not needing to connect to internet where privacy concern exist.
- To make this project accessible easily, open source platforms are used.

1.6 Organization of report

Chapter 1 section gives the overview of our project, basically here we explained the IoT background. Next is our project problem statement where it contains the problem faced in the IoT domain. Next comes the motivation which is the main moto for selecting this problem. Next are the challenges that we faced during our project and last comes the main objective of the project.

Chapter 2 section outlines the literature surveys which we have done before starting our project it gives the summary of the research and development work of the paper to which we have referred. It contains 5 research paper which is related to our project or the field.

Chapter 3 explains the methodology used in the development of our project. Which contains all the experimental methods we used to get the desired output and a flowchart which explains about the step by step process of our project

Chapter 4 talks about the requirement analysis of the project. where our project is divided into two parts hardware and software. Software requirement gives which and all software we used to design this project and simulation of the project. The hardware requirement gives the introduction to the components which we used in this project.

Chapter 5 briefs about the result or the output of our project. This section gives information about the functioning of the project. How both hardware and software part is going to work, and how they can be used.

Chapter 6 briefs about the conclusion of the project. We have discussed the future work of the project like how we are going to upgrade this project in the future and make it userfriendly. Further, we discussed the future scope of the project and how this project can be used in different domains.

CHAPTER 2

LITERATURE SURVEY

The popularity of home automation is on the rise. Large amount of home automation systems were installed around the world in the recent years.

[1] The Internet of things can be defined as connecting the various types of objects like smart phones, personal computer and Tablets to internet, which brings in very new-fangled type of communication between things and people and also between things.

Home automation system is incorporated into smart homes to provide comfort, convenience, and security to home owners. Home automation system represents and reports the status of the connected devices in an intuitive, user-friendly interface allowing the user to interact and control various devices with the touch of a few buttons.

In recent years, there has been a growing interest among consumers in the smart home concept. Home automation system represents and reports the status of the connected devices in an intuitive, user-friendly interface allowing the user to interact and control various devices with the touch of a few buttons. Some of the major communication technologies used by today's home automation system include Bluetooth, Wi-MAX and Wireless LAN (Wi-Fi), ZigBee, and Global System for Mobile Communication (GSM). With regard to the IoT, anything can be interconnected with the global information and communication infrastructure.

The wide variety of potential IoT applications needs a software development environment that ties together the applications, the command, control and routing processing and the security of the node and system. While the importance of software in MCU solutions has increased during the past few years, for MCUs supporting the IoT, even more software, tools and enablement will be needed. A broad ecosystem with easily accessible support is key to enabling the development of embedded processing nodes and IoT applications.The IoT is capable of providing thing-related services within the constraints of things, such as privacy protection and semantic consistency between physical things and their associated virtual things. In order to provide thing-related services within the constraints of things, both the technologies in physical world and information world will change

[2] Arduino is an open source programmable board. It is very easy to use and powerful single board computer that has gained considerable traction in the hobby and professional market. It consists an Integrated Development Environment (IDE) where one can write and run the programs and these programs are known as sketch in Arduino and a microcontroller

Arduino UNO is the commonly used board that is also known as classic Arduino. This board has 14-digital I/O pins, where 6- pins can be used as PWM, 6-analog inputs, a reset button, a power jack, a USB connection and more. This board can receive and send information over the internet with the help of Arduino shields With Arduino boards we can control the home activities with the control systems such as motion sensors, outlet control, temperature sensors, blower control, garage door control, air flow control, sprinkler control and bill of materials

[3] MIT App Inventor is an online development platform that anyone can leverage to solve real-world problems. It provides a web-based "What you see is what you get" (WYSIWYG) editor for building mobile phone applications targeting the Android and iOS operating systems. It uses a block-based programming language built on Google Blockly (Fraser, 2013) and inspired by languages such as StarLogo TNG (Begel & Klopfer, 2007) and Scratch (Resnick et al., 2009; Maloney, Resnick, Rusk, Silverman, & Eastmond, 2010), empowering anyone to build a mobile phone app to meet a need. To date, 6.8 million people in over 190 countries have used App Inventor to build over 24 million apps. We offer the interface in more than a dozen languages. People around the world use App Inventor to provide mobile solutions to real problems in their families, communities, and the world. The platform has also been adapted to serve requirements of more specific populations, such as building apps for emergency/first responders (Jain et al., 2015) and robotics (Papadakis & Orfanakis, 2016).

The MIT App Inventor user interface includes two main editors: the design editor and the blocks editor. The design editor, or designer, is a drag and drop interface to lay out the elements of the application's user interface (UI). The blocks editor is an environment in which app inventors can visually lay out the logic of their apps. Developers can use to test and adjust the behaviour of their apps in real time. In this way, anyone can quickly build a mobile app and immediately begin to iterate and test. The design editor for App Inventor allows developers to see how the app will appear on the device screen and adjust the form factor of the visualized device

Adjustments to properties of the visual components, for example, background color and size, are reflected in real time. Apps can also be run in a live development mode using the Companion, which we will be discussed in more detail below.

The App Inventor team recently added capability for creating map-based applications. The functionality allows app inventors to drag, drop, and edit markers, lines, polygons, rectangles, and circles in their maps, as well as integrate web-based data from geographic information systems (GIS) to build content-rich apps. This way, the user can move the content around easily to achieve great results without needing to provide most of the logic for this in code.

[4] Various IoT applications generate a huge amount of data from different types of resources, including smart cities, manufacturing industries, health institutions, and governments. Due to the pervasive nature of IoT and the limitless opportunities that this technology provides, security and privacy becomes two key concerns for the users of these smart offerings. Most of the privacy threats disclosing the private information to unwanted party and gives rise to serious implications in various IoT application.

[5] Smart homes obviously have the ability to make life easier and more convenient. Home networking can also provide peace of mind. Whether you're at work or on vacation, the smart home will alert you to what's going on, and security systems can be built to provide an immense amount of help in an emergency. For example, not only would a resident be woken with notification of a fire alarm, the smart home would also unlock doors, dial the fire department and light the path to safety. Smart homes also provide some energy efficiency savings. Because systems like Z-Wave and ZigBee put some devices at a reduced level of functionality, they can go to "sleep" and wake up when commands are given. Electric bills go down when lights are automatically turned off when a person leaves the room, and rooms can be heated or cooled based on who's there at any given moment. One smart homeowner boasted her heating bill was about onethird less than a same-sized normal home. Some devices can track how much energy each appliance is using and command it to use less. Smart home technology promises tremendous benefits for an elderly person living alone. Smart homes could notify the resident when it was time to take medicine, alert the hospital if the resident fell and track how much the resident was eating. If the elderly person was a little forgetful, the smart home would perform tasks such as shutting off the water before a tub overflowed or turning off the oven if the cook had wandered away. It

also allows adult children who might live elsewhere to participate incare of their aging parent. Easy-tocontrol automated systems would provide similar benefits to those with disabilities or a limited range of movement. Smart Home Appliances for Physically Challenged Individuals: If an individual has difficulty moving around effectively, they are often forced to depend on others for care. With the implementation of smart home appliances, such as an effective security system, those with physical challenges are often able to live on their own. A smart home security system allows the homeowner to remotely view visitors on a camera, and speak to them via microphone and speakers. If the visitor is welcome, the security system unlocks and opens the door to allow the visitor access to the home. Smart home security systems can also learn which visitors are always allowed, and what areas they may have access to.

Table No 2.1: Comparison of Wi-Fi, ZigBee and Bluetooth Technologie

	WI-FI	ZIGBEE	BLUETOOTH
Technology	Requires using a router of longer range to send data	It is designed to carry small amount of data over relatively short distance	Wireless technology used to transfer data over short distances
Networking Type	Centralized hub type network	Mesh networking standard	Uses the IEEE 802.14.1 standard
Power Consumption	High power consumption	Low power consumption	Uses less power for its operation
Speed	Up to 5Gbps	250Kbps	25Kbps
Cost	Higher but affordable	Cheap	Very cheap
Type of data	Higher bandwidth data can stream music, videos ,images and text	Highest is text based data	It can carry music, image, videos and text based data
Implementation	Lots of online documentation support general public to use and Wi - fi based network implementation	Very technical for general users to understand and implement the technology	It has easy implementation
Availability	High on market	Not widely available compared to Wi – Fi technology	Very common on the market

CHAPTER 3

METHODOLOGY

3.1 Experimental work

- In this project, the android app is used to receive voice commands. Which is converted to text. The text is sent to a microcontroller via Bluetooth technology. The microcontroller upon receiving the commands acts on the instructions, thus by comparing the received commands to the instructions loaded onto the microcontroller. If the commands match, then the associated task is executed by the microcontroller. The major components of the project include Arduino board, Android device, Bluetooth module and Relay modules. Using all the inputs from the components, the Arduino decides the turning on and off the various devices connected to it.

- The "Conversion to smart homes" consists of several individual components put together to perform its function.

1. AC source and Power unit
2. Load and Relay unit
3. Bluetooth Unit
4. Arduino Units

3.1.1 Android Application: The Android application is developed using MIT app inventor and can control the devices remotely with buttons in the app or voice commands. The voice commands can be easily edited using MIT app inventor and the colours of the buttons or the background can be edited easily as wellThe app is used to convert voice commands into strings that are recognised and a string that corresponds to the given command is sent to the microcontroller. The microcontroller acts upon this received string of data.

The same data is sent when button is pressed as well. The data sent for voice commend for a certain task and the data sent for button for the same task are same.

Example:- "All on" voice command and All on button both send the string 'all on' to the microcontroller that compares the string with the loaded code to turn on all devices connected .

3.1.2 Simulation: The simulation is done using the Proteus Application. We connect the components as the figure 3.6 then run the code for Arduino and copy the location of compilation and past it on the Arduino block and run the simulation from this it can be connected to the Android app using Bluetooth and the bulbs in the simulation can be controlled using the buttons or voice commands

3.1.3 Voice Commands: Voice commands currently implemented are

- All on
- All off
- Light on
- Light off
- Fan on
- Fan off
- Socket on
- Socket off
- Relay on
- Relay off

These commands can be easily edited within the MIT app inventor without changing any code on the Arduino making maintenance easier.

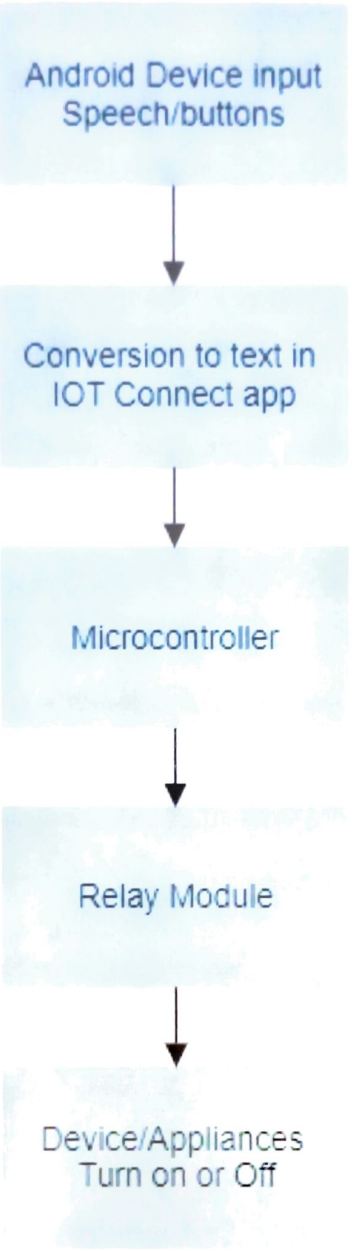

Fig 3.1 Methodology flowchart

3.2 Design

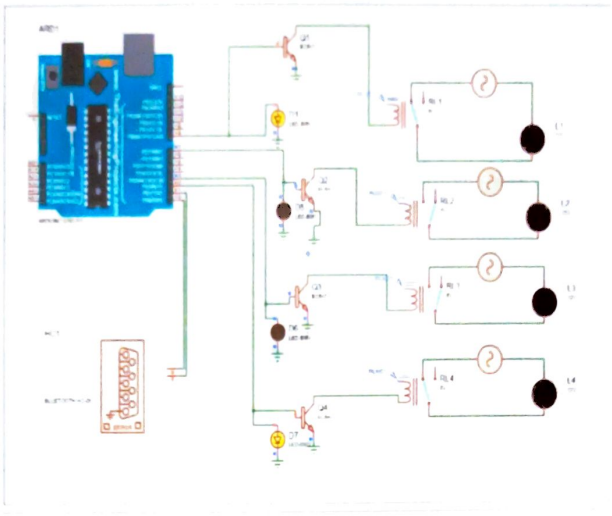

Fig 3.2 : Schematic diagram

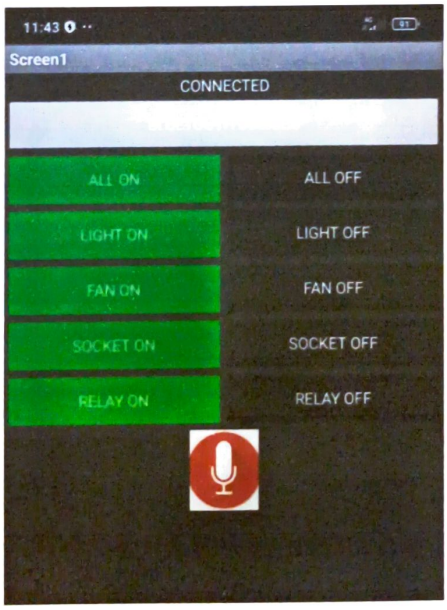

Figure 3.3 User Interface of Android application

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 Software Description

4.1.1 Arduino Integrated Development Environment (IDE):

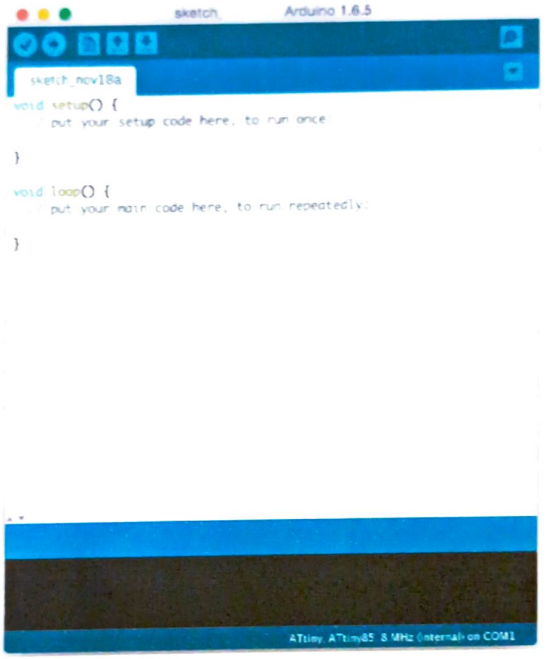

Fig 4.1 Arduino Integrated Development Environment (IDE):

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board. The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. Arduino Software (IDE) includes the built in support for the boards in the following list, all based on the AVR Core.

The Boards Manager included in the standard installation allows to add support for the growing number of new boards based on different cores like Arduino Due, Arduino Zero, Edison, Galileo and so on.

4.1.2 MIT App Inventor:

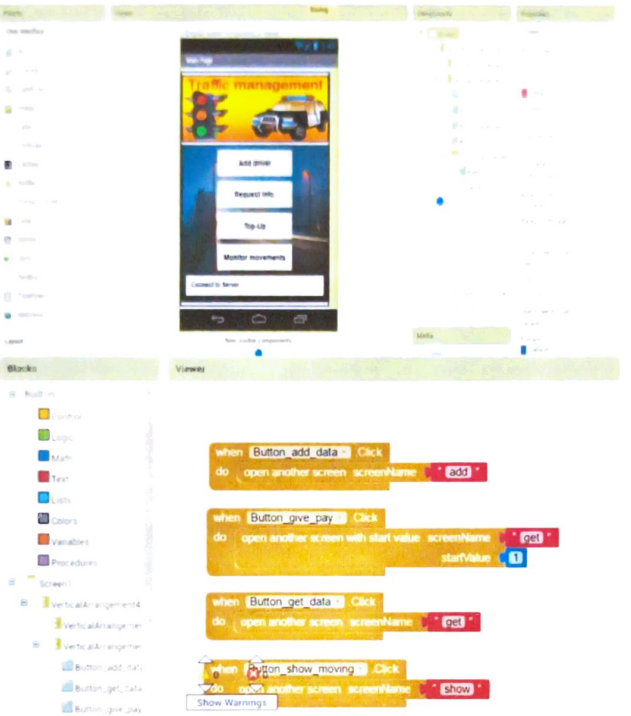

Fig 4.2 MIT App Inventor

MIT App Inventor is an intuitive, visual programming environment that allows everyone – even children – to build fully functional apps for Android phones, iPhones, and Android/iOS tablets. Those new to MIT App Inventor can have a simple first app up and running in less than 30 minutes. And what's more, our blocks-based tool facilitates the creation of complex, high-impact apps in significantly less time than traditional programming environments. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation. A small team of MIT CSAIL staff

and students, led by Professor Hal Abelson, forms the nucleus of an international movement of inventors. In addition to leading educational outreach around MIT App Inventor and conducting research on its impacts, this core team maintains the free online app development environment that serves more than 6 million registered user

4.2 Hardware Description

4.2.1 Power relay module : It is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit. Load and relay are used as the ac switches which are fan, inside light and outside light are interfaced. This part is very critical and dangerous since it is dealing with 240V AC. The Arduino cannot control high voltages, so a relay is used to as an intermediate between the AC switches and the Arduino microcontroller.

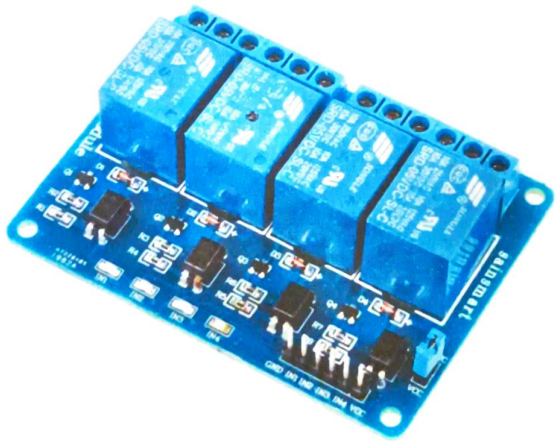

Figure 4.3 A Relay Module [6]

Normally Closed Connection, Normally Open Connection and Common Connection. The normally open connection is the terminal that acts like a switch. The relay when trigger connects to the Common connection by an electromagnet inside the relay. The circuit is closed when it the relay is triggered. The normally closed is most of the time in contact with the Common connection,

even when the relay is not powered up. It opens the circuit when it is triggered. Three light emitting diodes are attached to the relays to serve as power indicators. The relay ports are where the fan switch, inside light switch and outside are interface with the microcontroller.

4.2.2 The Bluetooth interface (HC-05):

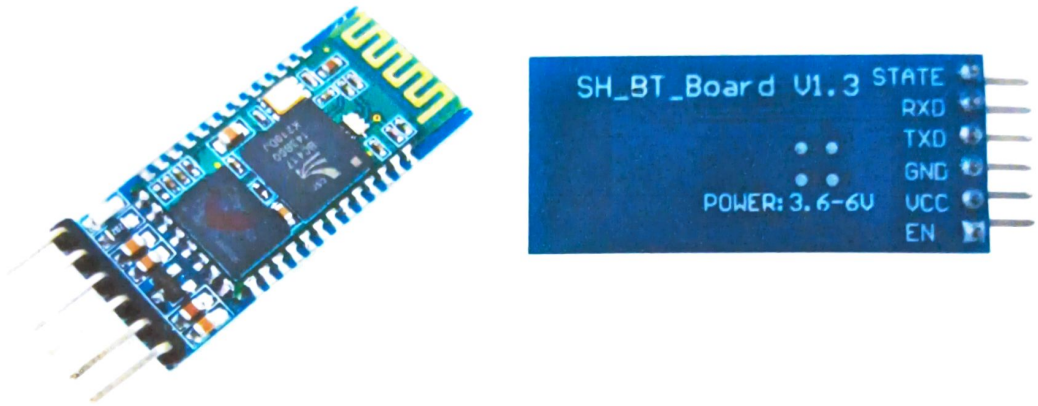

Figure 4.4 Bluetooth Module (HC05) [7]

It is the communication for this system. VCC and GND of the Bluetooth module are respectively connected to 5V and GND of the microcontroller whiles the TX pin of the Bluetooth module is connected to the RX pin on Arduino microcontroller. The RX pin requires 3.3V in order function properly but the TX pin of the microcontroller supplies 5V. A 1.5K and 2.7K resistor are connected in a parallel manner to a create a potential divider to supply the required voltage to the pin .Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.

It has 6 pins -

1. Key/EN: It is used to bring Bluetooth module in AT commands mode. If Key/EN pin is set to high, then this module will work in command mode. Otherwise by default it is in

data mode. The default baud rate of HC-05 in command mode is 38400bps and 9600 in data

2. VCC: Connect 5 V or 3.3 V to this Pin.

3. GND: Ground Pin of module.4. TXD: Transmit Serial data (wirelessly received data by Bluetooth module transmitted . out serially on TXD pin)

5. RXD: Receive data serially (received data will be transmitted wirelessly by Bluetooth module).

6. State: It tells whether module is connected or not.

4.2.3 The Arduino UNO microcontroller:

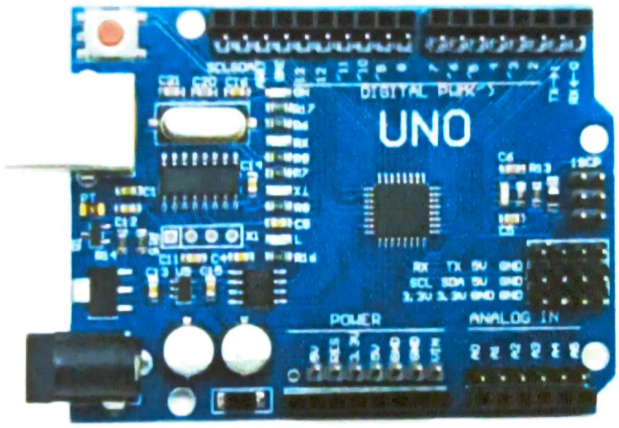

Figure 4.5 The Arduino microcontroller [8]

Arduino UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family. Arduino microcontroller with the Bluetooth module and the home circuit are wired together on the same board. Through the application the microcontroller can be instructed to turn on/off a switch. After the instruction is passed through the Bluetooth module, the microcontroller gives the signal to the corresponding relay on the board. The application first searches for the Bluetooth device. It

launches the voice recognizer.It converts the audio signal into a string. The string is passed to the microcontroller for processing. The microcontroller uses the port in serial mode. The processor on the microcontroller decodes the input string and sends a signal to port through which the corresponding switch will be activated. The relays control the opening and closing of the contacts of the circuit which disconnects or reconnects the supply of power based on the microcontroller's programmed instruction. The Arduino microcontroller is connected to the sensor unit. From this unit it retrieves data and performs respective operations.

4.2.3 Jump Wire:

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering. Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

Figure 4.6 Jumper wires [9]

CHAPTER 5

Results and Discussions

- An Android app to receive inputs including voice commands and transmit it to microcontroller.
- Microcontroller processes the data received and performs respective operations.
- The devices are turned on and off accordingly.

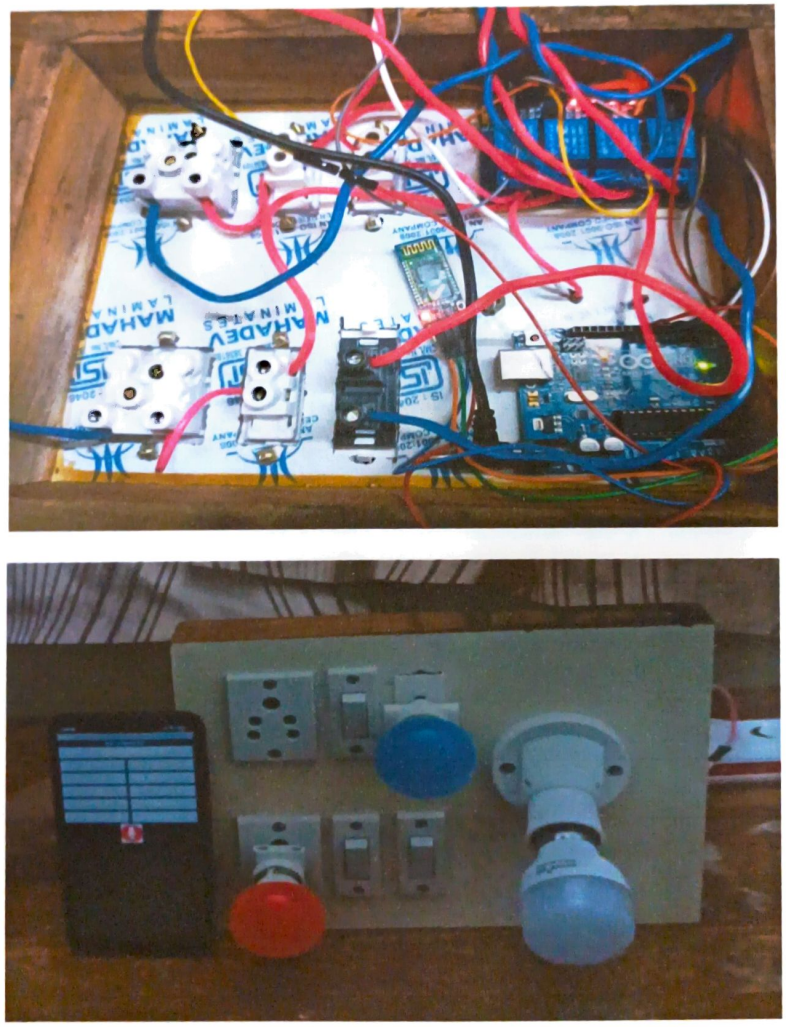

Figure 5.1 Prototype

CHAPTER 6

Conclusion and Future Scope

6.1 Conclusion: Voice Controlled Home Automation System with an Android app with which we can control almost all the electric appliances in our house, office and in other premises. Using the right voice commands, the user can operate any electrical device connected to the system without moving.

6.2 Future Scope: Number of different sensors can be implemented to the circuit to perform more versatile operations. Can also be used as a security device to alert in any situation.

REFERENCES

[1] Swati Tiwari , Rahul Gedam , "A Review Paper on Home Automation System Based on Internet of Things Technology" Volume - 3 (2016)

[2] Kuldeep Singh , Kaswan , Santar Pal Singh, Shrddha Sagar , "Role Of Arduino In Real World Applications"- Volume 9, Issue 01 (2020)

[3] Even Patton , Michael Tissenbaum & Farzeen Harunani W , "MIT App Inventor: Objectives, Design, and Development " (2019)

[4] Naqliyah Zainuddin , Maslina Daud , Sabariah Ahmad, "A Study on Privacy Issues in Internet of Things (IoT)" published by IEEE (2019)

[5] Rosslin John Robles1 and Tai-hoon Kim1, Applications, Systems and Methods in Smart Home Technology: A Review (2010)

[6]https://www.makerfabs.com/image/cache/makerfabs/HC05%20Serial%20Bluetooth%20Module/HC-05%20Serial%20Bluetooth%20Module-1000x750.JPG

[7]https://img.staticbg.com/thumb/large/oaupload/banggood/images/A9/2C/cb8486df-3a6a-49ca-8a52-8a1c9933f8bc.JPG

[8]https://i5.walmartimages.com/asr/6afc41ec-5ef9-435a-96c6-877d66e1976d_1.524aeba9aa11757c4a5fac69370e8ea5.jpeg

[9]https://cdn.littlebird.com.au/images/files/000/100/348/large/LB-LR0293-12-40_pin_30CM_Jumper_wire_F_M.jpg?1539669507