

VOICE ACTIVATED AUTOMATION SYSTEM FOR ELDERLY AND DISABLED PEOPLE

Submitted in partial fulfilment of the requirements for the award of Bachelor of
Engineering Degree in Electronics and Communication Engineering

By

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INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Nisha R (39130326)** and **Iris Sherline Gladis (39130171)** who carried out the project entitled "**VOICE ACTIVATED AUTOMATION SYSTEM FOR ELDERLY AND DISABLED PEOPLE** " under my supervision from November 2022 to April 2023.

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DECLARATION

We, **Nisha R (39130326)** and **Iris Sherline Gladis (39130171)** here by declare that the Project Report entitled " **VOICE ACTIVATED AUTOMATION SYSTEM FOR ELDERLY AND DISABLED PEOPLE** " done by us under the guidance of **Dr. M . SUBRAMONIAM, M.E., Ph. D.**, Associate Professor, Dept. of Electronics and Communication Engineering, Sathyabama institute of science and technology , Chennai, submitted partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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ABSTRACT

As we know that the problem lies with the situation of the elderly or disabled people, who cannot usually help themselves to move around, and might require external assistance. People who live alone might also need a helping hand at home. As in our busy schedule we cannot be able to help them at all. And there is a chance that the elderly or disabled people may fall when they tend to operate something at home. These can lead to injure to person which may lead to dead. Overcome this scenario automating the home is the easiest method to reduce the time and effort of the peoples.

Therefore, a voice controlled home automation system is designed, so that the users can perform certain tasks by just the use of their voices, moreover, the system is designed to have a handheld device(remote) so that the user can easily speak their commands, otherwise they would have to walk over to the microphone to speak. Having a remote will make the system more user-friendly and portable. The smart automation system is most beneficial for disabled or aged people. The purpose of this system is to control some of the major devices by voice. It is not only aimed at providing a healthy and comfortable lifestyle to the users, but also at aiding the sick or handicapped and people living alone. So that they can easily manage all their tasks at a convenience.

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CHAPTER 1

INTRODUCTION

The demand for voice-controlled switch systems has increased in home environments, not just for luxury but also to assist people with special needs such as the elderly and disabled. According to the World Health Organization, there are 785 million people over the age of 15 who live with disabilities, and 110 million of them have significant difficulties functioning. Voice-controlled systems are being adopted to make home automation easier for these individuals. The goal of the project is to bring convenience to living spaces by providing interaction with the home environment. The use of voice recognition technology is necessary to control lighting systems in a simple manner.

The system needs to recognize human languages, not machine instructions or programming languages. To achieve this, analog audio needs to be converted into digital signals through analog to digital conversion. The speech patterns are stored on the hard drive and loaded into memory when the program is run. The vocabulary size of a voice recognition program is directly related to the RAM capacity of the computer. Processing speed is crucial, as it affects how quickly the computer can search the RAM for matches. Voice recognition systems may have errors due to background noise and words that sound alike but have different meanings. However, using voice, many projects related to home automation can be easily achieved, making life easier for individuals with special needs.



Fig: 1.1 : Voice automation

Smart homes differ from traditional homes in that they have integrated communication systems that allow different devices to communicate with each other. This provides better control locally and remotely, supports special needs such

as services for the elderly, and improves the usability and functionality of any home. Home automation systems allow one to control household appliances from a centralized control unit, which is wireless. These systems can target luxury and sophisticated home automation platforms or those with special needs like the elderly and disabled.

Voice-controlled home automation systems are becoming popular for the elderly and disabled, allowing them to perform tasks using their voices or a handheld device. Home automation for the elderly and disabled focuses on making it possible for them to remain at home, safe and comfortable, using similar technology and equipment as home automation for security, entertainment, and energy conservation.

There are many types of home automation systems like Bluetooth controlled, Internet Controlled, Remote Controlled (IR Remote) etc. Each type has its own advantages and disadvantages.

In this project, we have designed a voice activated home automation system, where different appliances are controlled by sending a voice command.



Fig: 1.2: Voice controlled home automation

The voice activated home Automation project is implemented using Arduino UNO, Bluetooth, and a smartphone. We are showing a voice control home automation system to control appliances with their own voice command.

The voice-controlled home automation system is a technological advancement that allows users to control their home appliances and devices through voice commands. This system has proven to be particularly useful for elderly and disabled people who may have physical limitations that make it difficult for them to operate devices or

appliances manually. By using voice commands, these individuals can easily and conveniently control various aspects of their home environment without the need for physical exertion or assistance from others. This technology has the potential to improve the quality of life for elderly and disabled individuals, allowing them to live more independently and comfortably in their own homes. With the increasing prevalence of smart home technology, the voice-controlled home automation system is becoming more accessible and affordable, making it a viable option for a wide range of individuals.

It can be used to turn lights on and off, adjust the temperature, control the TV and entertainment system, lock and unlock doors, and even make phone calls. This system can provide a convenient and easy-to-use solution for those who may have difficulty with physical mobility or have limited dexterity, allowing them to maintain independence and control in their daily lives.

The main aim of our system is to build a perfect companion for someone to be at home or in his/her office and control electronic appliances using voice. It's a Bluetooth and GSM technology system based that can accept voice as direct commands and process them. The system is cheap, easy to configure and easy to use. The users should be able to control all the appliances from any point in their home or office by establishing a wireless control via Bluetooth.

The proposed scheme can produce an integrated portable system that can wirelessly control two or more appliances. We demonstrate a system that can be integrated as a single portable unit and allows the user to wirelessly control home electrical appliance by turning them ON and OFF accordingly. The voice command conveyed to the control unit has been converted to binary sequence by the microcontroller which switches the load ON/OFF as desired. The microcontroller unit takes command and performs the required decision.

Thus, the objectives of this project. An especially critical point of disability that has for a long time been confirmed is that of the older people. This type of disability makes the people affected not to work on their tasks effectively hence the lack of agility and mobility for the various 3 working experiences.

Automation is a trending topic in the 21st century making it play a key role in our daily lives. The main attraction of any automated system is reducing human labour, effort, time, and errors due to human negligence. With the development of modern technology, smart phones have become a necessity for every person on this planet. Applications are being developed on android systems that are useful to us in many ways. Another upcoming technology is natural language processing which enables us to command and control things with our voice. Combining all of these, our paper presents a micro controller based voice controlled home automation system using smart phones. Such a system will enable users to have control over every appliance in his/her home with their voice. All that the user needs are an android smartphone, which is present in everybody's hand nowadays, and a control circuit. When the first computers came around, achieving the level of sophistication to narrate commands using voice to a machine was only realised in science fiction. However, with tremendous breakthrough in the field, we are at the precipice of truly using voice to interface with devices.

Voice controlled wireless smart home system has been presented for elderly and disabled people. The concept of controlling home appliances using human voice is interesting. The proposed system has two main components, they are voice recognition system, and wireless system. This system to control home appliances uses a voice controlled android application. By the increasing use of PC (personal computers), internet, mobile phone, and wireless technology, it makes it easy for a user to remotely access and control the appliances.

A lot of research has been done and many solutions have been proposed to remotely access the appliances. Some of them used internet, wireless technology to communicate and control home appliances, others used Bluetooth and GSM technology for controlling the home appliances. The main aim of our system is to build a perfect companion for someone to be at home. Home automation research targeted many needs like applications that provide the luxury smart requirements while some threw light on the special needs for elderly and disabled etc. our system is a computer based system that can accept voice to direct commands and process them. The system provides us switching any device ON/OFF

CHAPTER 2

LITERATURE SURVEY

2.1 Inference from Literature survey

This survey was proposed by Sitaram Pal, Ashish Chauhan, Sanjeev Kumar Gupta on September 2019 at International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-3, September 2019. This paper aims utilizing present day innovation for example Voice controlled smart home automation system. The home automation is the future and important part of a house. The home automation is highly dependable in system for controlling house electrical appliances. As technologies improves the home automation system are becoming smarter and can regulate certain tasks automatically and autonomously. In this paper a home automation system is discussed, the system controls the electrical appliance of house by using user interface device and speech recognition technology by using microcontroller device via a Bluetooth module and a mechanical relay acting as a switch for controlling electrical appliances.

This survey was proposed by Mok Wai Shan, Final Year Student Faculty of Integrative Sciences and Technology Quest International University Perak Perak, Malaysia. Today, voice recognition system is a popular trend for home automation since the technologies are improved day by day. Voice recognition system for home automation able to provide an affordable and simple to implement. Voice recognition system is the process that a physical device able to control by recognize voice of the speaker. The main purpose of this system design is to provide a straightforward way for normal, handicapped, and old aged person to control and operate for luxury and sophisticated home automation. This project is proposed voice recognition module which used to record and import the instructions or commands that used to control the basic function of the physical devices. With the help of Arduino Uno, the physical devices able to control through speaker's voice. Besides, this project also implemented as a wireless control system.

The project is to build a Voice Control Home Automation System Using Arduino and HC-05. This project utilizes a microcontroller and Bluetooth module. A microcontroller is a compact integrated circuit designed to govern a specific

operation in an embedded system. So, in this system the microcontroller controls the function of the lights. HC-05 module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. This way the lights can be controlled wirelessly with Bluetooth. 6 The project is to build a Voice Control Home Automation System Using Arduino and HC-05. This project utilizes a microcontroller and Bluetooth module. A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. So, in this system the microcontroller controls the function of the lights. HC-05 module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. This way the lights can be controlled wirelessly with Bluetooth.

This survey was proposed by Babit Geo, Baby Adarsh Sunny, U.Saraswathi ,UG Scholar ,Assistant Professor ,Department of Electronic and Communication Engineering ,Christ the King Engineering College, Coimbatore . “Voice Controlled Home Automation for People with Disabilities” is designed to assist the people with physical disabilities, bedridden or elderly to control the electrical home appliances using android application. Mostly the bedridden and elderly people find it difficult to operate the home appliances. This system uses voice commands as well as the switches to operate the electrical appliances in home. An android application is used to get the voice commands from user. A Wi-Fi enabled WEMOS D1 Mini board is used, and the home appliances are connected to this board using relays. The cloud service is used to link the android application and the WEMOS board. A small Wi-Fi enabled WEMOS board relates to the home appliances by using relay. Firebase which is mobile and web application development platform which provides a link between the android application and the WEMOS. The users of this product can remotely access their home appliances from anywhere in the world.

This paper was proposed by Mohammed Amour, Khalid Al Radaideh , Ahmed Shadaideh , Osama Okour. Home automation is a technology that can help normal, elderly, or even disabled users in controlling electrical appliances in a house by utilizing his/her voice. Home automation could facilitate their life especially if they need caregivers and continuous attention. This research designs an entirely useful system that can recognize the human voice and differentiate between his/her commands. This research also seeks to design and implement a voice-based

system that helps users to operate the electrical appliances at home via utilizing android mobile phones. Using android mobile phone in controlling the electrical appliances could provide several benefits to diver's users such as system security where the system can validate specific voice that belongs to the system owner, accessibility where the system can be used by people that have disabilities as (blinded, deaf, dumb).



Fig: 2.1: Audio control

This survey was proposed by P. Navaraja, P. Kishore, S. Dineshkumar , R. Karthick , C. Kavinkumar. The aim of home automation is to make our lives easier and to improve the quality of life. The concept of Smart Homes builds on the progressing maturity of areas such as Artificial Intelligence and Natural Language Processing. Here, natural eight language processing (NLP) plays a vital role since it acts as an interface between human interaction and machines. Through NLP users can either command or control devices at home even though disabled persons command or request varies from presets. An application area of AI is Natural Language Processing (NLP). Voice assistants incorporate AI using cloud computing and can communicate with the users in natural language. Voice assistants are easy to use and thus there are millions of devices that incorporate them in households nowadays. Due to the drawbacks of the current systems and with the rise of IoT technology, the proposed system is predicated on IoT which acts as an interface between physical home appliances and user, as well as having functionality kindred toa digital assistant.

2.2 Open problems in existing system

Smart home automation is getting pervasive gratitude due to the expediency it provides to the community. Smart home automation allows centralizing the process of managing and controlling several home parts such as lighting, heating, ventilation and air conditioning, appliances, etc. Smart home voice-based control systems

allow home residents to wirelessly control any electrical appliances that can be configured to operate virtually. As real example, the home light system can be controlled by using voice command recognition where then can be translated to turn on, turn off, or set the levels of different rooms lights. In our project, it will be possible to run any system from any place using a single voice command. The use of voice recognition provides a significant increase in security, emulating an individual's voice is much more challenging, and need the use of modern communication technology. Android is a software stack for mobile devices that includes an operating system, middleware, and key applications. Android boasts a healthy array of connectivity ten options, including Wi-Fi, Bluetooth, and wireless data over a cellular connection (for example, GPRS, EDGE (Enhanced Data rates for GSM Evolution), and 3G). Home automation is one of the major growing industries that can change the way people live. Some of these home automation systems target those seeking luxury and sophisticated home automation platforms; others target those with special needs like the elderly and the disabled. The system is portable and constructed in a way that is easy to install, configure, run, and maintain. The perfect user interface still does not exist at present and to build a good interface requires knowledge of both sociology and technology fields.

Voice-controlled home automation has become increasingly popular in recent years. It allows homeowners to control various aspects of their homes using simple voice commands. While this technology has come a long way, there are still several open problems that need to be addressed in the existing system of voice-controlled home automation.

One of the most significant problems is the lack of interoperability between different voice assistants. For example, if a homeowner has a Google Home and an Amazon Echo in their home, they may not be able to use both devices to control their home automation system. This is because each device uses a different voice assistant, and they are not always compatible with each other.

Another problem is the lack of standardization in the way that voice commands are interpreted. Different devices may interpret the same command in diverse ways, which can be confusing for users. For example, one device may interpret the command "turn on the lights" to mean that all the lights in the room should be turned

on, while another device may interpret the command to mean only the lights in that room.

The accuracy of voice recognition is another open problem in the existing system of voice-controlled home automation. While voice recognition technology has come a long way in recent years, it is still not perfect. Accents, background noise, and other factors can all impact the accuracy of voice recognition, which can lead to frustration for users.

Another problem is the lack of privacy and security in voice-controlled home automation systems. Many of these systems require users to share personal information and data, such as their location and voice recordings, which can be a privacy concern. In addition, these systems may be vulnerable to hacking and other security threats, which can put users at risk.

Finally, there is a lack of customization in voice-controlled home automation systems. While many systems offer some degree of customization, they are often limited in terms of the types of commands that can be used and the actions that can be performed. This can make it difficult for users to tailor the system to their specific needs and preferences.

In conclusion, while voice-controlled home automation systems have come a long way in recent years, there are still several open problems that need to be addressed. These include interoperability between different voice assistants, standardization of voice commands, accuracy of voice recognition, privacy and security concerns, and a lack of customization. Addressing these problems will be critical to ensure that voice-controlled home automation systems are user-friendly, reliable, and secure for all users. A lot of research has been done and many solutions have been proposed to remotely access the appliances. The main aim of our system is to build a perfect companion for someone to be at home. Home automation research targeted many needs like applications that provide the luxury smart requirements while some threw light on the special needs for elderly and disabled etc. our system is a computer based system that can accept voice to direct commands and process them. The system provides us switching any device ON/OFF.

CHAPTER 3

REQUIREMENTS ANALYSIS

3.1 Feasibility studies

Feasibility studies are conducted to evaluate the practicality and potential success of a proposed project. In the case of a voice-controlled home automation project, several feasibility studies can be conducted to ensure that the project is feasible and can be completed within budget and time constraints.

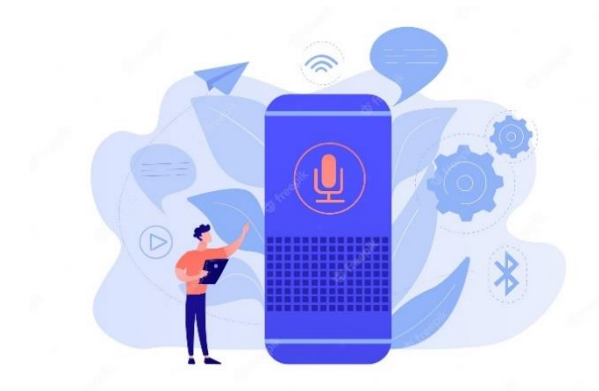


Fig: 3.1: Automation through mobile

1. **Technical Feasibility:** The technical feasibility study is conducted to determine if the technology needed for the project is available and can be implemented within the constraints of the project. For the voice-controlled home automation project, the technical feasibility study will determine if the hardware and software components needed for the project are available and can be integrated to work together. This study will also identify any technical challenges that may arise during the project and determine if they can be overcome.
2. **Economic Feasibility:** The economic feasibility study is conducted to determine if the proposed project is financially viable. This study will identify the estimated costs of the project, including the hardware and software components, labour costs, and any other expenses associated with the project. The study will also identify the potential benefits of the project, including any cost savings, increased productivity, or other advantages. The

economic feasibility study will help to determine if the project can be completed within budget and if it will provide a positive return on investment.

3. **Operational Feasibility:** The operational feasibility study is conducted to determine if the proposed project can be implemented and integrated into the existing operational environment. For the voice-controlled home automation project, the study will evaluate if the system can be integrated with existing home automation systems or if it will require significant modifications to the existing setup. This study will also identify any potential operational challenges that may arise during the implementation of the system.
4. **Legal Feasibility:** The legal feasibility study is conducted to identify any legal and regulatory issues that may arise during the implementation of the project. This study will determine if the voice-controlled home automation system complies with local laws and regulations, including privacy and data protection laws.
5. **Schedule Feasibility:** The schedule feasibility study is conducted to determine if the proposed project can be completed within the established timeline. For the voice-controlled home automation project, this study will evaluate the estimated time required to complete each phase of the project, including hardware and software installation, testing, and integration. The study will help to determine if the project can be completed within the desired timeframe.

In conclusion, the feasibility studies for the voice-controlled home automation project are essential to ensure that the project is feasible, viable, and can be completed within the established budget, time, and operational constraints. By conducting these studies, project managers can identify potential challenges and risks, develop contingency plans, and make informed decisions to ensure the successful completion of the project.

3.2 System requirements

3.2.1 Arduino hardware part

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on

the Arduino website. Layout and production files for some versions of the hardware are also available. Although the hardware and software designs are freely available under copyleft licenses, the developers have requested the name Arduino to be exclusive to the official product and not be used for derived works without permission. Most Arduino boards consist of an Atmel 8-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced in 2012.



Fig: 3.2: Arduino UNO

The boards use single or double-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple and stacked shields may be individually addressable via an I²C serial bus. Arduino microcontrollers are preprogrammed with a boot loader that simplifies uploading of programs to the on-chip flash memory.

The default bootloader of the Arduino UNO is the Opti boot bootloader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232.

Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to serial adapter board or cable, Bluetooth, or other methods. When used with traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used. Many enhance

the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and small robots. Others are electrically equivalent but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

3.2.2 Arduino software part

IDE The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching, and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, which are compiled and linked with a program stub `main ()` into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. A program written with the Arduino IDE is called a sketch. [58] Sketches are saved on the development computer as text files with the file extension. `.ino`. Arduino Software (IDE) pre-1.0 saved sketches with the extension. `.pde`.

A minimal Arduino C/C++ program consist of only two functions: `setup ()`: This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch. `loop ()`: After `setup()` has been called, function `loop()` is executed repeatedly in the main program. It controls the board until the board is powered off or is reset.

Blink example Most Arduino boards contain a light-emitting diode (LED) and a load resistor connected between pin thirteen and ground, which is a convenient feature for many tests and program functions. A typical program for a beginning Arduino programmer blinks a LED repeatedly. This program uses the functions `pinMode ()`,

digitalWrite(), and delay(), which are provided by the internal libraries included in the IDE environment. This program is usually loaded into a new Arduino board by the manufacturer.

3.2.3 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays.

Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. On a single coil device, the relay will operate in one direction when power is applied with one polarity and will reset when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands.

The Arduino Relay module allows a wide range of microcontroller such as Arduino, AVR, PIC, ARM with digital outputs to control larger loads and devices like AC or DC Motors, electromagnets, solenoids, and incandescent light bulbs. This module is designed to be integrated with 2 relays that it is capable of control 2 relays. The relay shield uses one QIANJI JQC-3F high-quality relay with rated load 7A/240VAC,10A/125VAC,10A/28VDC. The relay output state is individually indicated by a light-emitting diode.

Relays are used wherever it is necessary to control a high power or high voltage circuit with a low power circuit, especially when galvanic isolation is desirable. The first application of relays was in long telegraph lines, where the weak signal received at an intermediate station could control a contact, regenerating the signal for further transmission. High-voltage or high-current devices can be controlled with small, low voltage wiring and pilots' switches. Operators can be isolated from the high voltage circuit. Low power devices such as microprocessors can drive relays to control electrical loads beyond their direct drive capability. In an automobile, a starter relay

allows the high current of the cranking motor to be controlled with small wiring and contacts in the ignition key. Electromechanical switching systems including Strowger, and Crossbar telephone exchanges made extensive use of relays in ancillary control circuits. The Relay Automatic Telephone Company also manufactured telephone exchanges based solely on relay switching techniques designed by Gotthilf Ansgarius Betulander. The first public relay based telephone exchange in the UK was installed in Fleetwood on 15 July 1922 and remained in service until 1959. The use of relays for the logical control of complex switching systems like telephone exchanges was studied by Claude Shannon, who formalized the application of Boolean algebra to relay circuit design in *A Symbolic Analysis of Relay and Switching Circuits*.

Relays can perform the basic operations of Boolean combinatorial logic. For example, the boolean AND function is realised by connecting normally open relay contacts in series, the OR function by connecting normally open contacts in parallel. Inversion of a logical input can be done with a normally closed contact. Relays were used for control of automated systems for machine tools and production lines.

The Ladder programming language is often used for designing relay logic networks. Early electro-mechanical computers such as the ARRA, Harvard Mark II, Zuse Z2, and Zuse Z3 used relays for logic and working registers. However, electronic devices proved faster and easier to use. Because relays are much more resistant than semiconductors to nuclear radiation, they are widely used in safety-critical logic, such as the control panels of radioactive waste-handling machinery. Electromechanical protective relays are used to detect overload and other faults on electrical lines by opening and closing circuit breakers.

3.2.4 Bluetooth module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04- External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency

Hopping Feature). Bluetooth Module HC-05 The Bluetooth module HC-05 is a MASTER/SLAVE module.

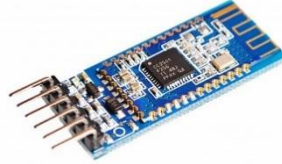


Fig: 3.3: Bluetooth module

The HC-05 Bluetooth Module has 6 pins. They are as follows: ENABLE: When enable is pulled LOW, the module is disabled which means the module will not turn on and it fails to communicate. When enable is left open or connected to 3.3V, the module is enabled i.e., the module remains on, and communication also takes place. Vcc: Supply Voltage 3.3V to 5V GND: Ground pin TXD & RXD: These two pins function as an UART interface for communication STATE: It acts as a status indicator.

When the module is not connected to paired with any other Bluetooth device, signal goes Low. At this low state, the led flashes continuously which denotes that the module is not paired with another device. When this module is connected to/paired with any other Bluetooth device, the signal goes High. At this high state, the led blinks with a constant delay say for example 2s delay which indicates that the module is paired.

A Bluetooth module is interfaced to the Arduino board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected. By touching the specified location on the GUI, the loads can be turned ON/OFF remotely through this technology.

Uses android mobiles internal voice recognition to pass voice commands to your robot Pairs with Bluetooth Serial Modules and sends in the recognized voice as a string for example if you say Hello the android phone will return a string *Hello# to your bluetooth module *and # indicate the start and stop bits Can Be used with any micro controller which can handle strings Examples Platforms : Arduino , ARM , PICAXE , MSP430 , 8051 based and many other processors and controllers.

3.2.5 LED

In the voice-controlled home automation project, LED lights can be controlled through voice commands using a microcontroller and relay board. The system uses voice recognition APIs based on Google to recognize the user's voice and respond with appropriate commands to control the lighting system. The project involves programming the microcontroller in C language, integrating Google APIs and libraries, and creating vocabulary templates to recognize specific words and phonemes. The Android application can be used to instruct the microcontroller to switch the lighting system on/off through the Bluetooth module.

The microcontroller then sends a signal to the relay board, which turns the lights on/off based on the voice commands received from the user. When a low voltage signal is given to the relay, the lights are turned off, and when a high voltage signal is given, they are turned on.

3.2.6 Gear motor

In voice-controlled home automation projects, gear motors are often used to control the movement of physical objects such as doors, windows, curtains, and blinds. Gear motors are electric motors with gears attached to their shafts. The gears provide additional torque to the motor, which makes it possible for the motor to turn heavy objects.



Fig: 3.4: Gear motor

In the context of home automation, gear motors are commonly used in conjunction with sensors and microcontrollers. For example, a gear motor might be connected to a sensor that detects when a window has been opened. The microcontroller

would then activate the gear motor to close the window when the sensor detects that it is open.

There are several types of gear motors that can be used in home automation projects. One of the most common types is the DC gear motor, which is a small, low-cost motor that is suitable for many applications. DC gear motors are available in a range of sizes and torque ratings and can be controlled using PWM signals from a microcontroller.

When selecting a gear motor for a home automation project, there are several factors that should be considered. One crucial factor is the torque rating of the motor, which should be sufficient to move the object being controlled. Another factor to consider is the speed of the motor, which should be appropriate for the application. For example, a gear motor used to open and close a door should be slow enough to prevent the door from slamming shut.

In conclusion, gear motors are an essential component of many voice-controlled home automation projects. They provide the necessary torque to move heavy objects such as doors, windows, and blinds, and can be controlled using sensors and microcontrollers. When selecting a gear motor for a home automation project, it is important to consider factors such as torque, speed, voltage, and current rating to ensure that the motor is suitable for the application.

3.2.7 Servo motor

A voice-controlled home automation project for motion of bed requires the use of servo motors. Servo motors are small, efficient motors that can be controlled precisely to achieve specific movements. In a voice-controlled bed motion system, servo motors can be used to control the movement of the bed, allowing the user to adjust the position of the bed using voice commands.



Fig: 3.5: Servo motor

Servo motors work on the principle of feedback control, where a control signal is sent to the motor, and the motor adjusts its position until it reaches the desired position. Servo motors have three main components, which include a motor, a position sensor, and a control circuit. The position sensor continuously monitors the position of the motor shaft, and the control circuit uses this information to adjust the motor's position until it reaches the desired position.

In a servo motor, the motor shaft is connected to a control system, which consists of a potentiometer, gears, and a control circuit. The potentiometer is connected to the motor shaft and produces a voltage proportional to the motor's position. The gears amplify the motor's movement and provide the necessary torque to move the load. The control circuit compares the feedback voltage from the potentiometer with the desired position and sends a control signal to the motor to adjust its position accordingly.

In a voice-controlled bed motion system, servo motors can be used to control the movement of the bed. The system can be designed to respond to voice commands such as "Raise the head of the bed" or "Lower the foot of the bed." The servo motors can be used to adjust the position of the bed, accordingly, allowing the user to achieve the desired position without the need for manual adjustment.

To implement the voice-controlled bed motion system, the servo motors can be connected to the bed's frame and controlled using a microcontroller. The microcontroller can be programmed to receive voice commands through a voice recognition module and adjust the position of the servo motors accordingly. The system can be designed to respond to specific voice commands and adjust the bed's position to specific angles or positions.

3.2.8 Solenoid switch

A solenoid switch is an electromechanical device that is commonly used in various applications, including door locks, to convert electrical energy into mechanical movement. In a voice-controlled home automation project, a solenoid switch can be used to actuate a door lock based on voice commands.

The solenoid switch can be used as an actuator to control the lock mechanism, either by engaging or disengaging the lock. The switch is usually made up of a coil

of wire wrapped around a metal core, which generates a magnetic field when a current flows through the wire. This magnetic field then attracts an iron or steel plunger, which is used to push or pull the lock mechanism.

In a voice-controlled home automation project for a door lock, the solenoid switch can be controlled by a microcontroller, such as an Arduino or a Raspberry Pi, using a relay module or a transistor circuit. The microcontroller can receive voice commands from a user and then send a signal to the solenoid switch to activate the lock mechanism.



Fig: 3.6: Solenoid Switch

Implement the solenoid switch in the door lock, a suitable solenoid switch must be selected that is appropriate for the type of lock that is being used. The switch should also be compatible with the microcontroller that is being used in the system.

Once the appropriate solenoid switch has been selected, the next step is to design the circuit for the switch. This can involve using a relay module or a transistor circuit to control the switch. The circuit should be designed to protect the switch from voltage spikes and other electrical hazards that can damage the switch.

Implement the circuit, the microcontroller must be programmed to receive voice commands from the user and then send a signal to the switch to activate the lock mechanism. The microcontroller can be programmed using suitable programming languages, such as C or Python.

After the circuit has been designed and programmed, it must be evaluated to ensure that it is functioning correctly. This can involve evaluating the switch with several types of voice commands and checking if the lock mechanism is being engaged or disengaged correctly. The system should also be evaluated for reliability and security, to ensure that the lock mechanism is not being compromised by unauthorized access.

In conclusion, a solenoid switch can be an effective component of a voice-controlled home automation system for a door lock. It can be used to control the lock mechanism based on voice commands from the user and can be implemented using a microcontroller and suitable circuit design.

The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

For the communication between mobile phone and microcontroller Bluetooth module (HC-05) is used. HC-05 is low power 1.8V operation and is easy to use with Bluetooth SPP (serial port protocol). Serial port Bluetooth module have a Bluetooth 2.0+EDR (enhanced data rate), 3Mbps modulation with complete 2.4GHz radio transceiver and baseband. Using Bluetooth profile and android platform architecture different type of Bluetooth applications can be developed.

Relay is an electromagnetic switch which can be turn on and off by an applying the voltage across its contacts. In this project used a 5V 4-channel relay.

Android is an open-source operating system which means that any manufacturer can use it in their phones free of charge. It was built to be truly open. Android is built on the open Linux Kernel. Furthermore, it utilizes a custom JAVA virtual machine that was designed to optimize memory and hardware resources in a mobile environment.

The Android platform includes support for the Bluetooth network stack, which allows a device to wirelessly exchange data with other Bluetooth devices. The application framework provides access to the Bluetooth functionality through the Android Bluetooth APIs.

3.3 System use cases

System use cases refer to the different scenarios and interactions between users and the proposed system. In the case of the voice-controlled home automation project, the following use cases can be identified:

1. Turning on/off lights: The user can speak a command to turn on or off the lights in a particular room or area of the house.
2. Adjusting thermostat: The user can speak a command to adjust the temperature of the thermostat to a desired level.
3. Controlling appliances: The user can control various home appliances such as TV, music system, or other smart devices through voice commands.
4. Opening/closing doors: The user can use voice commands to open or close doors in the house, such as the front door or garage door.
5. Security system: The user can arm or disarm the security system of the house through voice commands.
6. Setting reminders: The user can set reminders or alarms for various tasks, such as waking up in the morning or taking medication.
7. Checking the weather: The user can ask the system to provide weather updates for the current or future days.
8. Providing information: The user can ask for information on several topics such as news, sports, or current events.
9. Ordering groceries: The user can use the system to order groceries or other household supplies through online retailers.
10. Personalized settings: The system can be programmed to recognize different users and personalize settings and preferences for everyone.

Overall, the voice-controlled home automation system can provide users with increased convenience, efficiency, and accessibility in managing various aspects of their home environment through simple voice commands.

In this project, a simple Voice Activated Home Automation system is designed. Voice commands are used to control different appliances. We will now see the working of the project. All the connections are made as per the circuit diagram above. After making the necessary connections, we must switch on the power supply to the circuit. Now, we need to pair the Phone's Bluetooth to the HC – 05

Bluetooth Module. Before that, we must install the App mentioned above in the phone. The home screen of the app looks something like this.

Next step is to connect the phone with the Bluetooth module. For this, choose the option “Connect Robot” and select the appropriate Bluetooth Device. If the devices are not paired earlier, we need to pair them now using the Pin of the HC – 05 Bluetooth Module. Next step is to connect the phone with the Bluetooth module.



Fig: 3.7: System use case

For this, choose the option “Connect Robot” and select the appropriate Bluetooth Device. If the devices are not paired earlier, we need to pair them now using the Pin of the HC – 05 Bluetooth Module. When the string “turn on light” is detected by the app, it will send the string as “*turn on light#.” So, the actual message received by the Bluetooth Module is in the format of “*Message#.” The reason for padding the ‘*’ and ‘#’ at the begging and end of the string is to identify the starting and ending of the message.

We can delete the ‘#’ from the string but left out the ‘*’ to identify the starting of the string. The received message is compared with some predefined strings and if the message matches with any of them, then corresponding action like turning on or turning off the load happens.

We have used the following commands: “turn on AC,” “turn off AC,” “turn on light,” “turn off light,” “turn on TV,” “turn off TV,” “turn on fan,” “turn off fan,” “turn on all” and “turn off all.”

Another popular use case for voice-controlled home automation systems is temperature control. With a voice command, homeowners can adjust their

thermostats to their desired temperature, ensuring maximum comfort while minimizing energy usage. This feature is particularly useful for people who want to save energy and money by optimizing their HVAC usage.

Voice-controlled home automation systems can also control various devices in a home office, such as printers, computers, and lights. With a voice command, homeowners can turn on their computers, print documents, and adjust the lighting in their workspace. This feature is particularly useful for people who work from home and want to optimize their productivity.

The complete system should be able.

- i. to implement the voice user as an input to microcontroller to always control the lighting system.
- ii. to use Bluetooth connection to control the lights via a phone from anywhere in a room.
- iii. to use a relay board to control the switching on and off specific bulbs

The voice controlled lighting system uses voice recognition APIs based on google to articulate the voice of the person speaking and effectively come up with the command to enable the person to control the lighting system effectively. Throughout the project design and implementation, it would be crucial to make use of the Arduino programming language of C programming language while at the same time integrating the google APIs and libraries in the ultimate design of the required software. Of essence is the use of the various vocabulary templates that would include specific words and phonemes. In the end, there would be a user aspect of the voice recognition system that would control the lighting of the house by the manipulating of the relay board. Using the relay board, the control of the various lights of the house would be easier.

Through the android application we can instruct the microcontroller to switch on/off the lighting system. After getting the instruction through the Bluetooth module the microcontroller gives the signal to the relay board. The relay then turns the lights on/off depending on the voice commands from the user. When a low voltage signal is given to the relay, the lights are turned off and when a high voltage signal is given it is turned on.

Moreover, with the rising levels of lifestyle diseases, it is quite significant to note that most of the people above the age of twenty are constantly reporting mobility related issues. Of all these, others do not really get the chance to get the most effective gain out of the available technology. There is, therefore, need to have a voice controlled lighting system for the elderly and persons with special needs.

CHAPTER 4

DESCRIPTION OF PROPOSED SYSTEM

4.1 Selected methodology

Speech recognition is becoming the method of choice for controlling appliances, toys, tools, computers, and robotics. The voice-controlled appliances like computer, TV, lighting system, security system, etc. become easier to use, while increasing the efficiency and effectiveness of working with that device. Different Speech recognition integrated circuit are available in the market. The HM2007 speech recognition integrated circuit is one of them that provides the options of recognizing either forty .96 second words or twenty 1.92 second words. It allows either the .96 second word length (40-word vocabulary) or the 1.92 second word length (20- word vocabulary). The HM2007 stores the "trained" word patterns used for recognition in external memory. For memory, the circuit uses an on board 8K x 8 static RAM supported by coin battery.

Speech recognition is classified into two categories, speaker dependent and speaker independent. Speaker independent is a system trained to respond to a word regardless of who speaks. Therefore, the system must respond to a large variety of speech patterns, inflections, and enunciations of the target word. The command word count is usually lower than the speaker dependent however high accuracy can still be maintained within processing limits. Industrial requirements more often need speaker independent voice systems. Speaker dependent systems are trained by the individual who will be using the system. These systems can achieve a high command count and better than 95% accuracy for word recognition. The drawback to this approach is the system only responds accurately only to the individual who trained the system.

One of the constraints of speech recognition systems is the style of speech they can recognize. There are three distinctive styles of speech that are isolated, connected, and continuous. Isolated speech recognition systems – It can only manage words that are spoken separately. This is the most common speech recognition systems. The user must pause between each word and command spoken. Connected – It is a half-way point between isolated word and continuous speech recognition. It allows

users to speak multiple words. Continuous – It is the natural conversational speech people are accustomed to in everyday life. It is extremely difficult for a recognizer to shift through the text as the words tend to merge. Isolated speech recognition system is another feature, of IC HM2007, and a characteristic of the system.

4.2 System architecture

The proposed system is designed to use speech recognition to control various appliances and devices. The system architecture consists of several components, including the speech recognition module, the control module, and the device interface module. In addition, the system architecture includes a microphone for capturing speech input, a memory module for storing voice patterns, and a processing unit for performing voice recognition.

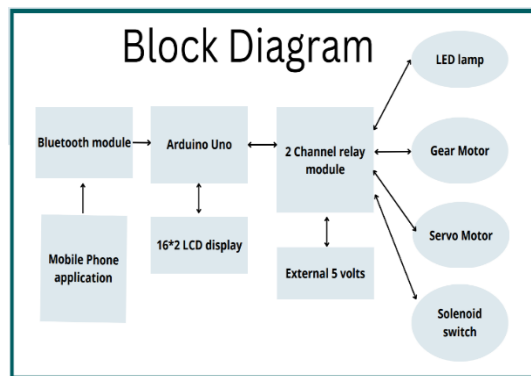


Fig: 4.1 : Block diagram

The system architecture can be divided into four main components, as follows:

1. **Speech Recognition Module:** The speech recognition module is the core of the proposed system. It is responsible for recognizing the voice commands and converting them into digital signals that can be processed by the control module. The speech recognition module is implemented using the HM2007 speech recognition integrated circuit. The HM2007 provides the option of recognizing either forty 0.96-second words or twenty 1.92-second words. The IC stores the "trained" word patterns used for recognition in external memory, which can be either a read-only memory (ROM) or an electrically erasable programmable read-only memory (EEPROM).

2. **Control Module:** The control module is responsible for processing the digital signals generated by the speech recognition module and performing the desired action. The control module is implemented using a microcontroller or a digital signal processor (DSP). The microcontroller or DSP reads the digital signals generated by the speech recognition module, interprets them, and generates the appropriate control signals to operate the device interface module.
3. **Device Interface Module:** The device interface module is responsible for interfacing with the devices or appliances that need to be controlled. The device interface module can be implemented using relays, transistors, or solid-state switches. The device interface module receives the control signals generated by the control module and operates the devices or appliances accordingly. For example, if the speech command is "turn on the lights," the device interface module will generate a control signal to turn on the lights.
4. **User Interface Module:** The user interface module is responsible for providing feedback to the user about the status of the system and the devices being controlled. The user interface module can be implemented using a display, LEDs, or a speaker. For example, if the speech command is "turn on the lights," the user interface module can display a message saying "lights on" or play a beep sound to indicate that the command has been executed successfully.

Overall, the proposed system architecture uses speech recognition technology to provide a more intuitive and user-friendly way of controlling various appliances and devices. The system is designed to be highly scalable and can be easily customized to control several types of devices or appliances. The system architecture is also highly modular, making it easy to replace or upgrade individual components as needed.

A Bluetooth wireless technology as a wireless means of communication is used. An android based application is installed on the smart phone which has inbuilt interface that can centrally control individual electrical appliances. The Bluetooth module receives the command from mobile phone and passes to the Arduino and from the Arduino to the relay circuit. The main purpose of using Bluetooth wireless

technology is to provide the desired range and feasibility. The microcontroller device with the Bluetooth module and relay circuit needs to be attached to the bread board.

The microcontroller is instructed to switch ON/OFF an appliance when the android base application “Smart Voice” is launched. After getting the instruction through the Bluetooth module, the microcontroller gives the signal to the relay board [5]. The application first searches for the Bluetooth device. The voice recognizer is launched if the application finds the appropriate available Bluetooth. The audio signal is converted to a string having read the voice by the application. A value is produced for each appliance and sent to the microcontroller. A signal is sent to the parallel port for the purpose of activating the relay circuit when the input data is read and decoded.

4.3 Description of software for implementation

The proposed system described earlier involves the use of hardware components such as microcontrollers, sensors, and speech recognition integrated circuits. However, software plays a crucial role in integrating all these components and providing a user-friendly interface for the end-user.

The software for implementing the proposed system can be divided into two main components: the firmware for the microcontroller and the software for the user interface.

Firmware: The firmware is the software that runs on the microcontroller and controls all the hardware components. The firmware is responsible for reading sensor data, processing speech input from the user, and controlling output devices. In the case of the proposed system, the firmware would be responsible for reading sensor data from the environment and processing the speech input from the user using the speech recognition integrated circuit. Once the input is processed, the firmware would control the output devices such as lights, fans, and motors accordingly. The firmware would also include error handling and feedback mechanisms to ensure the system functions correctly and provides a user-friendly experience.

User Interface Software: The user interface software is responsible for providing an interface for the end-user to interact with the system. The user interface software could be implemented as a desktop or mobile application or a web application. The user interface

would allow the user to interact with the system by providing voice commands, selecting options, and viewing feedback from the system. The software would also include features such as user management, scheduling, and customization of the system.

The user interface software would communicate with the firmware through a communication protocol such as UART or Bluetooth. The user interface would send commands to the firmware based on user input, and the firmware would respond with feedback and status updates.

The software would need to be designed to be easily scalable and maintainable, with provisions for updates and bug fixes. The software should also be designed with security in mind, with provisions for user authentication and data encryption.

Implement the software for the proposed system, various programming languages and frameworks can be used. The firmware could be written in C or C++, and the user interface could be implemented using languages such as Python, JavaScript, or Java. The user interface could be implemented as a web application using frameworks such as React or Angular, or as a desktop application using frameworks such as Qt or Electron.

In conclusion, the software for implementing the proposed system would involve developing firmware for the microcontroller and software for the user interface. The firmware would be responsible for controlling all the hardware components, and the user interface would provide an interface for the end-user to interact with the system. The software would need to be scalable, maintainable, and secure, with provisions for updates and bug fixes. Various programming languages and frameworks can be used to implement the software, depending on the specific requirements of the system.

4.4 Project management plan

The project management plan for the proposed system includes the processes, tools, and techniques used to manage the project from start to finish. The plan outlines the project scope, objectives, timelines, resource requirements, and risk management strategies. Here is a brief overview of each element of the project management plan:

1. **Project Scope:** The project scope outlines the boundaries of the project, including what will be delivered, the timeline, and the resources required. The project scope is defined by the project manager in collaboration with the stakeholders.
2. **Objectives:** The objectives of the project are the goals that the project is intended to achieve. These objectives are defined in collaboration with the stakeholders, and are used to measure the success of the project.
3. **Timelines:** The timeline for the project includes the start and end dates, as well as any intermediate milestones. The timeline is developed based on the scope of the project and the resources available.
4. **Resource Requirements:** The resource requirements for the project include the people, tools, and equipment required to complete the project. The project manager must ensure that the necessary resources are available and allocated appropriately.
5. **Risk Management:** Risk management involves identifying potential risks to the project, assessing the likelihood and impact of each risk, and developing strategies to mitigate or avoid those risks. The risk management plan should be developed early in the project planning process and updated throughout the project.
6. **Budget:** The project budget includes all the costs associated with the project, including personnel, equipment, materials, and other expenses. The project manager must ensure that the project stays within the approved budget.
7. **Communication Plan:** The communication plan outlines how information will be shared among project stakeholders, including the project team, sponsors, and other stakeholders. The communication plan should include regular status updates, progress reports, and other relevant information.
8. **Quality Management:** Quality management involves ensuring that the project meets the expected standards of quality. This includes defining quality standards, establishing processes for monitoring, and measuring quality, and ensuring that quality standards are met throughout the project.

9. Change Management: Change management involves managing changes to the project scope, objectives, timelines, or resources. The project manager must ensure that any changes are carefully considered and approved by all stakeholders.
10. Project Closure: The project closure plan outlines the process for closing out the project, including finalizing all deliverables, conducting a project review, and transitioning any ongoing operations to the appropriate stakeholders.

Overall, the project management plan for the proposed system is critical to ensuring that the project is completed on time, within budget, and to the expected level of quality. The plan should be developed early in the project planning process, and should be reviewed and updated regularly throughout the project. Effective project management requires a strong focus on communication, risk management, and stakeholder engagement, as well as the ability to adapt to changing circumstances and priorities.

4.5 Financial report on estimated costing

Estimate the cost of the proposed system for voice activated automation, several factors need to be considered, such as hardware, software, personnel, training, and maintenance costs.

Hardware Costs: The hardware cost includes the cost of the microcontroller, speech recognition integrated circuit (IC HM2007), sensors, actuators, and other electronic components. The estimated cost of these hardware components depends on the quality of components and the number of devices to be automated.

Software Costs: The software cost includes the cost of the development of the software required to operate the system. This includes the cost of the speech recognition software, control software for the automation devices, and software required for data storage and analysis.

Personnel Costs: Personnel costs include the salary of the team members involved in the development of the system, including project managers, software developers, hardware engineers, and quality assurance engineers.

Maintenance Costs: Maintenance costs include the cost of maintenance of the system after deployment. This includes the cost of troubleshooting, bug fixing, and

updating the software and hardware components of the system. The estimated cost of maintenance depends on the complexity of the system and the number of devices to be maintained.

The cost may vary depending on the quality of components used, the complexity of the software, the experience of the personnel involved, and the number of devices to be automated.

The technology behind this phenomenon is quite complex, but the concept is simple: the use of voice commands to control various devices in a home or office environment. This technology is based on the use of several components, including Arduino, relay, solenoid switch, gear motor, servo motor, and Bluetooth module, among others. In this financial report, we will discuss the cost implications of implementing voice-controlled home automation technology using these components.

Arduino is a microcontroller platform that is widely used in the development of electronic projects. It is an open-source platform, which means that it is freely available for use by anyone. The cost of an Arduino board varies depending on the model and the features it offers.

Relays are electrical switches that allow you to control a high-powered device with a low-powered signal. They are commonly used in home automation systems to control appliances such as lights and fans. The cost of a relay depends on its specifications, including the voltage, current rating, and switching speed.

Solenoid switches are electromagnetic switches that are used to control the movement of a mechanical device. They are commonly used in automated door locks and other security systems. The cost of a solenoid switch depends on its specifications, including the voltage, current rating, and actuation speed.

Gear motors are motors that are specifically designed to provide high torque output. They are commonly used in home automation systems to control devices such as curtains and blinds. The cost of a gear motor depends on its specifications, including the torque output, voltage rating, and speed.

Servo motors are motors that are specifically designed to provide precise control over the position of a mechanical device. They are commonly used in home

automation systems to control devices such as robotic arms and cameras. The cost of a servo motor depends on its specifications, including the torque output, voltage rating, and speed. On average, a servo motor costs around \$5 to \$15, depending on its specifications.

Bluetooth modules are electronic devices that allow you to communicate wirelessly with other devices. They are commonly used in home automation systems to control devices such as lights and speakers. The cost of a Bluetooth module depends on its specifications, including the range, data transfer rate, and compatibility with other devices.

To implement a voice-controlled home automation system using these components, you will need to consider several factors that will affect the cost. These factors include the number of devices that you want to control, the complexity of the control system, and the cost of installation.

The cost of the voice-controlled home automation system will depend on the number of devices that you want to control. The more devices you want to control, the higher the cost will be. For example, if you want to control only the lights in your home, the cost will be low. However, if you want to control the lights, fans, blinds, and other devices, the cost will be higher. The complexity of the control system will also affect the cost of the voice-controlled home automation system.

Manage the cost effectively, the project manager needs to ensure that the project is completed within the estimated budget and timeline. The project manager should also ensure that the resources are utilized effectively and efficiently, and the risk factors are identified and mitigated in time. Additionally, the project manager should conduct regular reviews and audits to ensure that the project is on track and identify any deviations from the planned budget and timeline. By managing the project effectively, the cost can be optimized, and the project can be delivered within the budget and timeline constraints.

4.6 Software to operations plan

Before implementing a voice-controlled home automation system, you need to determine your specific needs. What devices do you want to control with your voice,

and what functions do you need to automate? Identifying your needs will help you choose the right software and ensure that you get the most out of your system.

There are several voice assistants available, including Amazon Alexa, Google Assistant, and Apple's Siri. Each of these assistants has its unique features, so you need to choose the one that best suits your needs. Consider factors such as the devices you already own and your preferred ecosystem.

The software utilizes natural language processing (NLP) technology to understand and interpret voice commands. It analyzes the command and translates it into a specific action that can be performed by the smart home device. For example, if you say, "turn off the lights," the software will analyze the command, interpret it, and send a signal to the smart light bulbs to turn off.

The software is compatible with a wide range of smart home devices, including smart bulbs, thermostats, locks, and cameras. It provides homeowners with an easy and convenient way to control their homes without having to use their hands or a remote control.

One of the key benefits of using voice-controlled home automation software is that it enables homeowners to control their homes hands-free. This is particularly useful for individuals with mobility issues or disabilities. The software allows them to control their homes using their voice, which is more accessible and convenient than traditional control methods.

Another benefit of voice-controlled home automation software is that it enhances home security. The software can be integrated with smart cameras and locks, allowing homeowners to monitor their homes and control access using their voice. For example, if you hear a noise outside your home, you can use the software to turn on your outdoor security camera and see who is there without leaving your home.

The software to operations plans for the voice-controlled home automation system involves the steps required to ensure that the system runs smoothly and efficiently. It covers the process of implementing the software, testing, maintenance, and monitoring of the system to ensure it meets the requirements and specifications of the project.

1. **Implementation:** The first step is to implement the software into the hardware components of the system. The software should be installed in the control unit of the automation system and evaluated to ensure that it works correctly. The installation process should follow the guidelines provided in the software manual, and any issues should be addressed immediately.
2. **Testing:** After the software has been installed, the system should be evaluated to ensure that it meets the requirements and specifications of the project. This should include evaluating the speech recognition capabilities of the system, the accuracy of the system in recognizing voice commands, and the response time of the system. The testing should be conducted in different environments to ensure that the system works correctly in all scenarios.
3. **Maintenance:** Once the system is up and running, it is essential to ensure that it is well-maintained to ensure it operates efficiently. Maintenance should include updating the software to the latest version, regular backups of the system data, and monitoring the system for any issues or errors. Any hardware components that are faulty should be replaced promptly to ensure that the system runs smoothly.
4. **Monitoring:** The system should be monitored regularly to ensure that it is performing as expected. This should include monitoring the response time of the system, the accuracy of the voice recognition software, and any errors that occur. Any issues that arise should be addressed immediately to ensure that the system runs efficiently.

In conclusion, the software to operations plan for the voice-controlled home automation system involves implementing the software, testing, maintenance, monitoring, user training, technical support, and upgrades. These steps are essential to ensure that the system runs smoothly and efficiently, providing users with an excellent user experience.

CHAPTER 5

IMPLEMENTATION DETAILS

5.1 Development and deployment setup

The development and deployment setup for the voice-controlled home automation project involves several steps to ensure the smooth functioning of the system. Voice-controlled home automation systems have been gaining popularity over the past few years, enabling users to control various home appliances and devices through voice commands. This technology is rapidly evolving and becoming more sophisticated, allowing for more complex interactions and a greater level of control over smart homes. In this article, we will discuss the development and deployment of voice-controlled home automation systems.

The development of voice-controlled home automation systems involves several stages, including ideation, prototyping, testing, and final deployment. The first step in the development process is ideation, where designers and developers brainstorm and generate ideas for the system. This involves identifying user needs and requirements, identifying available technology and resources, and determining the overall goals of the project. Once a clear idea has been formulated, the team moves to the prototyping stage.

The prototyping stage involves creating a working model of the voice-controlled home automation system. This typically involves building a prototype of the hardware and software components, including the voice recognition software, the device interface, and the various home appliances and devices that the system will control. Once the prototype has been built, the team moves to the testing stage.

In the testing stage, the team conducts a series of tests to evaluate the functionality, reliability, and user-friendliness of the system. This involves both automated and manual testing, including simulated user interactions and real-world testing in a controlled environment. Based on the results of the testing, the team may need to adjust the system before proceeding to the final deployment stage.

The final deployment stage involves launching the voice-controlled home automation system to the market. This involves marketing and advertising the system, providing customer support, and training, and ensuring that the system is

compatible with a wide range of devices and appliances. Once the system has been deployed, the team continues to monitor its performance and make improvements as needed.

The deployment of voice-controlled home automation systems involves several key considerations, including the compatibility of the system with existing devices and appliances, the level of security and privacy provided by the system, and the ease of use for the end-user. In addition, the deployment process must be carefully managed to ensure that the system is deployed in a timely and efficient manner, and that customers are satisfied with the product.

One of the primary benefits of voice-controlled home automation systems is the convenience they offer to users. With voice commands, users can easily control various home appliances and devices without having to physically interact with them. This makes it easier to perform tasks such as turning off lights, adjusting the temperature, or playing music, without having to leave the comfort of one's seat or bed.

Another benefit of voice-controlled home automation systems is the increased level of accessibility they provide. For people with disabilities or mobility issues, voice commands can be a crucial way of controlling their environment and performing daily tasks. Voice commands can also be useful for older adults who may have difficulty with physical interactions or for anyone who wants to simplify their daily routines.

Here is a brief description of the various stages involved:

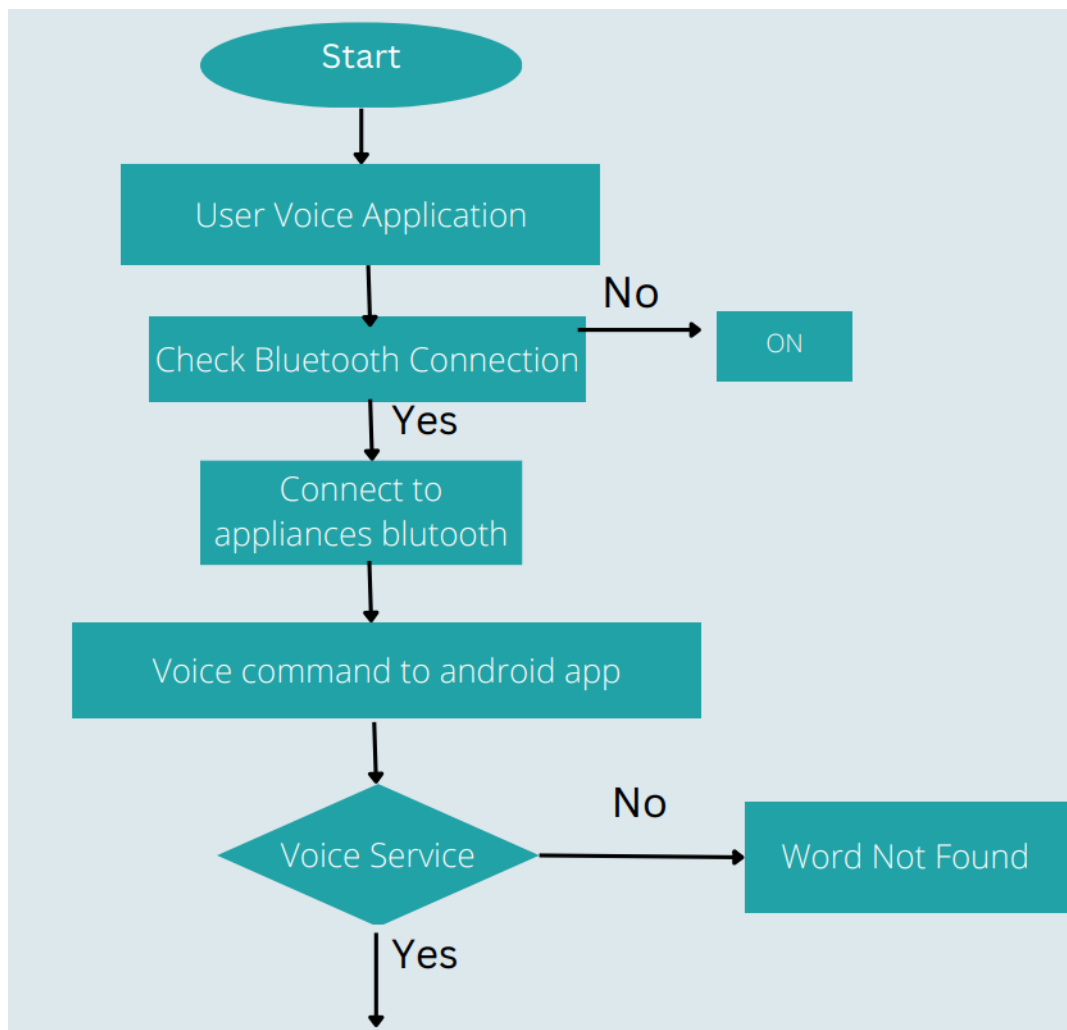
1. **Hardware Setup:** The first step involves setting up the hardware components required for the voice-controlled automation system, which includes microphones, speakers, the HM2007 speech recognition integrated circuit, and other related electronic components. The hardware setup should be carefully done to ensure that all the components work together seamlessly.
2. **Software Development:** The next step is to develop the software required for the voice-controlled automation system. The software should include the speech recognition algorithm, the user interface, and the control system that

connects to the different appliances in the home. The software should be developed in a way that is user-friendly, efficient, and robust.

3. **Testing:** Once the software and hardware setup is complete, it is time to evaluate the system thoroughly. The testing should be done in different scenarios, to ensure that the system works correctly in different conditions. The testing should also include identifying and fixing any bugs or issues that may arise during the testing process.
4. **Deployment:** After the testing phase is complete, the next step is to deploy the system. The deployment process involves setting up the system in the user's home and connecting it to the different appliances that the user wants to control using voice commands. The deployment process should be done with care, and the user should be given appropriate training on how to use the system.
5. **Maintenance and Support:** Once the system is deployed, it is important to provide maintenance and support to the user. This includes regular maintenance of the hardware and software components, troubleshooting any issues that may arise, and providing support to the user when required. The maintenance and support should be provided by trained professionals who have the necessary skills and expertise to manage the system effectively.

In summary, the development and deployment setup for the voice-controlled home automation project involves hardware setup, software development, testing, deployment, maintenance and support, and upgrades and enhancements. These stages should be carefully planned and implemented, ensuring that the system works seamlessly, and meets the user's needs effectively. With proper planning and execution, the voice-controlled home automation system can provide a convenient and efficient way for users to control their appliances using voice commands.

5.2 Algorithms



Voice-controlled home automation is a system that allows users to control various electronic appliances in their homes using voice commands. It is a technology that makes home automation easier and more convenient for users. The system uses a voice recognition algorithm to understand and interpret voice commands and then sends signals to the respective appliances to perform the desired actions. The algorithm of voice-controlled home automation is a complex process that involves multiple steps such as voice input, voice recognition, command interpretation, appliance selection, and command execution. The system uses various techniques such as pattern matching, statistical modelling, and artificial intelligence to accurately recognize and interpret the user's voice commands. This technology makes home automation more convenient and accessible to users and has the potential to revolutionize the way we interact with our homes.

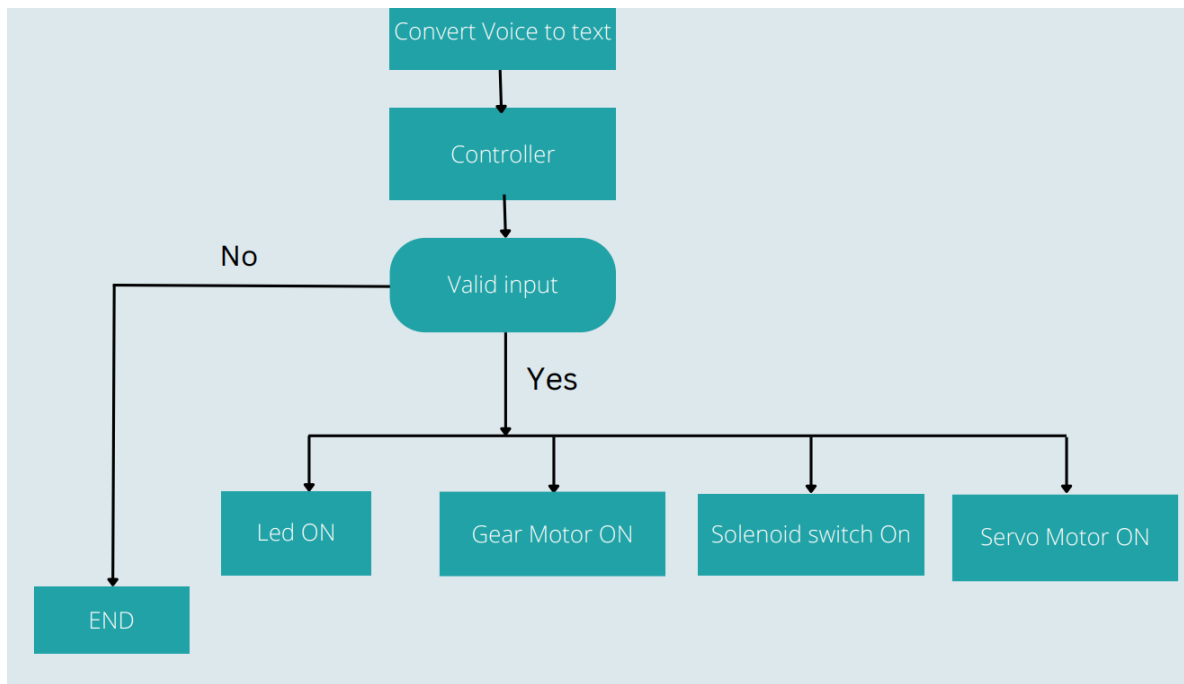


Fig: 5.1 : Flow chart

Using the above components, we implement our system. The core component of this system is the Arduino Uno which has a microcontroller i.e Atmega 328. Atmega 328 has a 32KB flash, it is needed to burn a boot loader and download arduino sketches. The boot loader is programmed under ISP program controller. An adapter of 12V output power supply is used as an input to the voice controlled Arduino system. Relays are connected to the output pins of Arduino Uno; these are used as switches to the loads. Android is a mobile operating system based on Linux kernel and currently developed by Google. We prefer android platform because of its huge market globally and it is easy to use user interface. The voice recognizer which is an inbuilt feature of android phones is used to build an application which the user can operate to automate the appliances at his house.

For wireless communication system a Bluetooth module HC-05 is used as a remote which is connected to the control unit for sensing the signals sent by the android voice application. The microcontroller device with the Bluetooth module and relay circuit needs to be connected to the switch board. Then we need to launch the android based application – “ANDROID MEETS ROBOT” on our smart phone.

Through the application we can instruct the microcontroller to switch ON/OFF an appliance. After getting the instruction through the Bluetooth module, the microcontroller gives the signal to the relay board. The application first searches for the Bluetooth device. If it is available, then it launches the voice recognizer. It reads the voice and converts the audio signal into string. It provides a value for each appliance which will be fed to the microcontroller device.

The microcontroller uses the port in serial mode. After reading the data it decodes the input value and sends a signal to the parallel port through which the relay circuit will be activated. 32 In this project, a simple Voice Activated Home Automation system is designed. Voice commands are used to control different appliances. We will now see the working of the project. All the connections are made as per the circuit diagram above.

After making the necessary connections, we must switch on the power supply to the circuit. Now, we need to pair the Phone's Bluetooth to the HC – 05 Bluetooth Module. Before that, we must install the App mentioned above in the phone.

The home screen of the app looks something like this. Next step is to connect the phone with the Bluetooth module. For this, choose the option "Connect Robot" and select the appropriate Bluetooth Device. If the devices aren't paired earlier, we need to pair them now using the Pin of the HC – 05 Bluetooth Module.

Next step is to connect the phone with the Bluetooth module. For this, choose the option "Connect Robot" and select the appropriate Bluetooth Device.

If the devices aren't paired earlier, we need to pair them now using the Pin of the HC – 05 Bluetooth Module. When the string "turn on light" is detected by the app, it will send the string as "**turn on light#." So, the actual message received by the Bluetooth Module is in the format of "*Message#."

The reason for padding the '*' and '#' at the beginning and end of the string is to identify the starting and ending of the message. We can delete the '#' from the string but left out the '*' to identify the starting of the string.

The received message is compared with some predefined strings and if the message matches with any of them, then corresponding action like turning on or turning off the load happens.

We have used the following commands: “turn on AC,” “turn off AC,” “turn on light,” “turn off light,” “turn on TV,” “turn off TV,” “turn on fan,” “turn off fan,” “turn on all” and “turn off all.”

5.3 Testing

Testing is a critical part of any software development project, and the voice-controlled home automation project is no exception. In this project, testing will involve several stages, including unit testing, integration testing, system testing, and user acceptance testing.

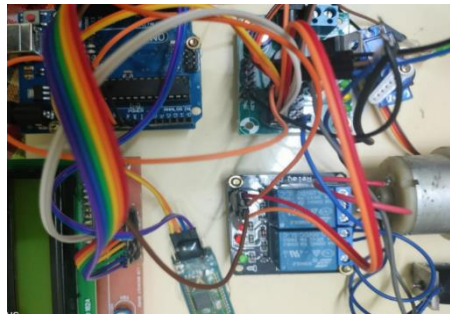


Fig: 5.2: Testing with all appliances OFF



Fig: 5.3: Testing with appliances ON

User acceptance testing is the final stage of testing and involves evaluating the system with real users in a real-world environment. This testing will be done using test cases that simulate different usage scenarios and user interactions. The purpose of user acceptance testing is to ensure that the system meets the needs and expectations of its users and is easy to use and understand.

To ensure that testing is conducted effectively, a comprehensive testing plan will be developed that outlines the testing approach, test cases, and expected outcomes. The testing plan will also specify the testing tools and techniques that will be used, as well as the roles and responsibilities of the testing team.

Every step of the system's creation included a performance test and measurement on a breadboard. This process involved mounting all the components onto their respective circuit positions on the breadboard. The microcontroller's configured output to input was also considered when mounting it. The microcontroller was examined after programming, and it was discovered to be functioning properly. After completing the component mounting, the entire system was evaluated, and the outcomes were measured. A digital multimeter was used to verify that the battery power source of 9V was adequate to power the Arduino Uno. The complete system was built in this manner during the laboratory installation.

Comments for Application	Description of comment
Turn ON Light	Light will ON
Turn ON Door	DOOR will Open
Turn ON Fan	FAN will ON
Turn ON Bed	BED will bend
Turn ON ALL	ALL appliances will TURN ON
Turn OFF ALL	ALL appliances will TRUN OFF

Table 6.1: Comments for application

In addition to testing, the project team will also conduct regular quality assurance reviews to ensure that the project is meeting its quality standards. These reviews will be conducted at key milestones throughout the project and will involve a review of all project deliverables to ensure that they meet the required quality standards.

Overall, testing is a critical part of the voice-controlled home automation project, and the project team will take a rigorous and comprehensive approach to testing to ensure that the system meets all its requirements and performs as expected in a real-world environment.

CHAPTER 6

RESULT AND DISCUSSION

6.1 Results

This chapter provides the results of the Voice Controlled Lighting System tests which was evaluated using different methods. The discussion attempts to highlight the results, the benefits and shortcomings of the results obtained, and the implications of those results towards performance of the system. Four persons with different accents and from different age groups were used to evaluate the effectiveness of the voice (speech) recognition application and the switching mechanism. Each person said the controlling command for switching the specific lighting point four times (twice ON, twice OFF).

The commands correspond to the various lighting points that can be turned on or off by using voice. Give the command that switches on or off any lighting point, the point's name is called and the word "On" or "Off" is spoken immediately after. This can be seen from the way the items (speech commands) are written under the 'command' column. The other columns, namely, A, B, C, D, tracks the number of times out of four (4), that the corresponding lighting being controlled responded (by switching on or off).

6.2 Discussion

The study was successfully designed and evaluated. Four people with four different accents participated in the tests (A, B, C, D). The purpose of having these people to evaluate the software was to see how well the system performs or responds to differences in accents and pitches when voice commands are issued to it. The optimum distance of the user should stay from the microphone (phone) when issuing speech commands is eighteen inches. When the voice commands were issued for the first time, it was discovered that it was very vital for users to speak slowly. In all, the success rate was 95%. This was gotten from expressing the successful commands as a ratio of the total number of commands issued across all persons who conducted the tests.

This ratio was then expressed as a percentage. During system testing, when it comes to processing time, the Google Speech Recognition Engine took a while to

deal with the voice requests. In addition, there were a few instances that the user voice could not be recognized. Under the noisy condition out of five trials only four were correctly recognized thus the accuracy of the voice recognition module under noisy condition is 80%. Nevertheless, the system reached the expectations, by demonstrating a relevant flexibility in adapting to different scenarios and ascents while properly responding to the user voice requests.

6.3 Benefits

From the results obtained above, it is evident that the system can simplify controlling of lighting system in aa home using our voice. The user need not to have an immense knowledge over the language of English. Just by saying the lighting point name and the corresponding command assigned to that point, and telling it to turn on or off will enable the user to have complete control over the lighting system without any effort. This system, though primarily aimed to reduce human effort, will be of much importance to the elderly and persons with disabilities. It will enable them to control their lighting system with ease, without going through much pressure or stress of moving about.

Android applications are quite simple and user friendly allowing the user to understand its functionalities in truly little time. Hence, the use of android application in this system allows a user to easily learn the process and get accustomed to the functions. Moreover, the entire system is very flexible and scalable. Any number of lighting points can be added as and when required. Due to the inexpensive materials used in the construction and further cost optimization if the device is taken to the market, it finds application in a wide area. Scalability of the project would be easier as the device can be used in every building using electrical appliances and devices.

6.4 Challenges

There were a few challenges that we faced during this project's implementation. While speaking to the voice application, it produced wrong voice commands in response to environmental noise, and it was noted that absolute silence and solitude could enable it work properly. Also, there was a delay between the transmission and reception of the voice command

CHAPTER 7

CONCLUSION

7.1 Conclusion

The following conclusion is a commentary of what extent the objectives were achieved.

Conclusion 1: The first objective of the study was to implement the voice user as an input to microcontroller to always control the lighting system. From the results, the AMR voice application was used successfully to capture the voice commands. The voice recognition APIs in the application could identify the specific commands used except for a few instances. The commands were used to activate the respective relays thereby controlling the lighting system.

Conclusion 2: The second objective was to use Bluetooth connection to control the lights via a phone from anywhere in a room. Bluetooth technology was effectively used to send the voice commands to the microcontroller. Based on the results, it is evident that the Bluetooth module was able to connect to the phone and transmit the voice input to the microcontroller successfully.

Conclusion 3: The third objective of the study was to use a relay board to control the switching on and off specific bulbs. The 4-channel relay used in the project controlled the four lighting points according to the voice commands efficiently. From the results, the lighting points, that is, room, table, bedroom, and security, was turned on and off respectively as per the user input hence this objective was achieved. The Voice Controlled Lighting System was built and implemented successfully.

In this project we have successfully implemented voice-controlled home automation system controlling relays using Arduino with Bluetooth module HC-05. This project can be used for controlling 'four' number of input controls i.e., by extending number of relays. Our implemented module is more dependable and flexible to control any loads and the coverage area for wireless control is 10 meters. Hence this project can be useful for a real time voice-controlled home automation. Thus, Arduino based voice-controlled home appliances proves to be a better remote-controlled operation on home appliances using Bluetooth module HC-05. This project can be extended

for many automation applications such as industrial automation, automotive, military, healthcare, transportation and so on. Further the coverage area can also be increased using GSM modules.

7.2 Future work

The future work for the voice controlled home automation project could involve various areas of improvement and expansion. Here are some directions for future work:

1. **Integration with smart home devices:** The voice-controlled home automation system could be further integrated with a wider range of smart home devices, such as smart thermostats, smart locks, and smart speakers. This would require expanding the system's capabilities to recognize and respond to more complex commands.
2. **Machine learning algorithms:** The system's speech recognition capabilities could be improved using machine learning algorithms, which can adapt and learn from user behaviour over time. This would require collecting and analysing enormous amounts of speech data to train the algorithms.
3. **User interface improvements:** The system's user interface could be improved to make it more intuitive and user-friendly. This could involve redesigning the system's mobile app or creating a web interface for controlling the system remotely.
4. **Security enhancements:** The system's security could be strengthened to prevent unauthorized access or hacking. This could involve implementing stronger authentication mechanisms or encrypting data transmissions.
5. **Voice recognition accuracy:** Improving the accuracy of voice recognition would be a critical area of focus for the future. This could be done by increasing the vocabulary and commands the system can recognize, improving noise-cancellation technology, and incorporating machine learning algorithms to enhance speech recognition.
6. **Integration with other AI technologies:** The system could be integrated with other artificial intelligence technologies, such as natural language processing or computer vision, to enable more advanced features and functionality.

7. Energy efficiency: Future work could also focus on improving the energy efficiency of the system. This could involve optimizing the system's hardware components or developing algorithms to minimize energy consumption.

Overall, the future work for the voice-controlled home automation system would focus on expanding its capabilities and improving its functionality, usability, and security. The advancements in technology and increasing demand for smart homes and IoT devices will continue to drive innovation and development in this area.

7.3 Research issues

One potential research issue for a voice-controlled home automation project is the accuracy and reliability of the speech recognition system. While speech recognition technology has come a long way in recent years, it is not yet perfect and can struggle with accents, background noise, and other factors that can affect speech clarity. This can lead to frustration for users if their commands are not accurately recognized or the system does not respond as expected.

Another research issue is the security and privacy of the system. Voice commands can potentially be overheard by others, so it is important to ensure that the system is secure and only responds to authorized users. Additionally, the system may collect personal information or data about users, so it is important to have appropriate privacy measures in place to protect this information.

A third research issue is the interoperability of different home automation devices and platforms. Home automation systems can involve a variety of devices from different manufacturers, and ensuring that they all work together seamlessly can be a challenge.

Lastly, a research issue is the user experience of the voice-controlled home automation system. The system must be intuitive and easy to use, and should not require extensive training or technical knowledge to operate. Conducting research on user preferences and behaviours can help ensure that the system is designed in a way that meets the needs and expectations of its users.

7.4 Implementation issues

Implementing a voice-controlled home automation project can come with various challenges. Here are some potential implementation issues that may arise:

1. Integration of hardware and software: The voice-controlled home automation system requires the integration of hardware and software components. Integrating these components can be challenging, especially when dealing with different hardware and software vendors. A team of experts should be assembled to ensure the hardware and software components work together seamlessly.
2. Speech recognition accuracy: The accuracy of speech recognition is critical to the success of the project. The system needs to be trained to recognize different accents, dialects, and pronunciations accurately. Factors like background noise, speech volume, and other environmental variables can affect speech recognition accuracy. Continuous monitoring and adjustments should be made to ensure optimal performance.
3. Security and privacy concerns: Home automation systems require the collection of personal data, and this can raise privacy and security concerns. The system should be designed with security features such as authentication, encryption, and data protection. The system should also comply with relevant data protection regulations.
4. Scalability and maintainability: The system should be scalable and maintainable. As the system expands, it should be able to accommodate new devices and features. The system should be designed in such a way that upgrades and maintenance are easy to perform.
5. Power consumption: The voice-controlled home automation system may require a considerable amount of power to operate. This can result in increased energy consumption and costs. The system should be designed to minimize power consumption while maintaining optimal performance.

In conclusion, the implementation of a voice-controlled home automation system can be a challenging endeavour. Ensure success, the project team should identify potential implementation issues and develop strategies to mitigate them. The team should also ensure that the system is scalable, maintainable, and user-friendly. Finally, the system should comply with relevant regulations and address security and privacy concerns.

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APPENDIX

A. SOURCE CODE

```
//libraries for LCD Display
#include <LiquidCrystal.h>

#include <Servo.h>

// Define LCD display pins
const int rs = 12, en = 11, d4 = 10, d5 = 9, d6 = 8, d7 = 7;

// Define 4 channel relay pins
const int Light = 6; // Relay pin 1 (IN1)
const int Fan = 5; // Relay pin 2 (IN2)
const int Door = 4; // Relay pin 3 (IN3)
const int Pump = 3; // Relay pin 4 (IN4)

int servoPin = 3;
Servo servo;
int angle = 0;

String data; //Variable for storing received data

void setup()
{
  Serial.begin(9600); //Sets the baud for serial data transmission
  // Set Relay pins as OUTPUT
  pinMode(Light, OUTPUT);
  pinMode(Fan, OUTPUT);
  pinMode(Door, OUTPUT);
```

```

//pinMode(Pump, OUTPUT);
// Print message on LCD Display
lcd.begin(16, 2);
lcd.setCursor(0,0);
lcd.print("Voice Controlled");
lcd.setCursor(0,1);
lcd.print("Home Automation");
delay(2000);
// All devices are Off when system is on
digitalWrite(Light, LOW);
digitalWrite(Fan, LOW);
digitalWrite(Door, LOW);
//digitalWrite(Pump, LOW);

servo.attach(servoPin);
// Print Device status (all Off) on LCD Display
lcd.clear();
lcd.setCursor(0,0);
lcd.print("LIT FAN DOR BED");
lcd.setCursor(0,1);
lcd.print("OFF OFF LOC DWN");

}

void loop()
{
    // Read data from Bluetooth Module
    char ch=0;
    data="";
    while(1)

```

```

{
  while(Serial.available()<=0);
  if(ch=='#')
    break;
  data+=ch;
}

// Print Bluetooth Module data on serial monitor
Serial.print(data);
Serial.print("\n");

// Control the devices using voice command
if (data == "*turn on light") // turn on Device1
{
  digitalWrite(Light, HIGH);
  lcd.setCursor(0,1);
  lcd.print(" ON");
  delay(200);
}

else if (data== "*turn off light") // turn off Device1
{
  digitalWrite(Light, LOW);
  lcd.setCursor(0,1);
  lcd.print("OFF");
  delay(200);
}

else if (data== "*turn on fan" ) // turn on Device2
{

```

```

    digitalWrite(Fan, HIGH);
    lcd.setCursor(4,1);
    lcd.print(" ON");
    delay(200);
}

else if (data== "*turn off fan" ) // turn off Device2
{
    digitalWrite(Fan, LOW);
    lcd.setCursor(4,1);
    lcd.print("OFF");
    delay(200);
}

else if (data== "*turn on door" ) // turn on Device3
{
    digitalWrite(Door, HIGH);
    lcd.setCursor(8,1);
    lcd.print("OPN");
    delay(200);
}

else if (data== "*turn off door" ) // turn off Device3
{
    digitalWrite(Door, LOW);
    lcd.setCursor(8,1);
    lcd.print("LOC");
    delay(200);
}

else if (data== "*turn on bed" ) // turn on Device4
{
    //digitalWrite(Pump, LOW);

```

```

    for(angle = 0; angle < 180; angle++) {
        servo.write(angle);
        delay(15);
    }
    lcd.setCursor(12,1);
    lcd.print(" UP");
    delay(200);
}
else if (data== "*turn off bed" ) // turn off Device4
{
    //digitalWrite(Pump, HIGH);
    for(angle = 180; angle > 0; angle--) {
        servo.write(angle);
        delay(15);
    }
    lcd.setCursor(12,1);
    lcd.print("DWN");
    delay(200);
}

else if (data== "*turn on all" ) // turn on all Device
{
    digitalWrite(Light, HIGH);
    digitalWrite(Fan, HIGH);
    digitalWrite(Door, HIGH);
    //digitalWrite(Pump, LOW);
    for(angle = 0; angle < 180; angle++) {
        delay(15);
    }
    lcd.setCursor(0,1);

```

```

    lcd.print(" ON  ON OPN  UP");
    delay(200);
}
else if (data== "*turn off all" ) // turn off all Device
{
    digitalWrite(Light, LOW);
    digitalWrite(Fan, LOW);
    digitalWrite(Door, LOW);
    //digitalWrite(Pump, HIGH);
    for(angle = 180; angle > 0; angle--) {
        delay(15);
    }

    lcd.setCursor(0,1);
    lcd.print("OFF OFF OPN DWN");
    delay(200);
}
}

```

B. SCREENSHOTS

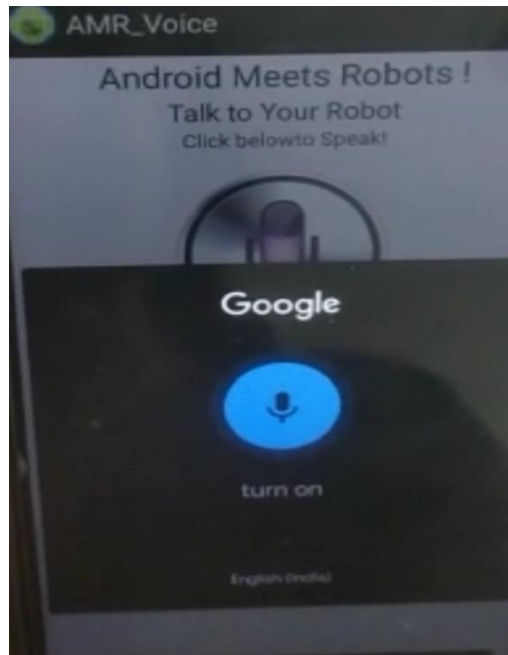


Fig: Voice commands to application

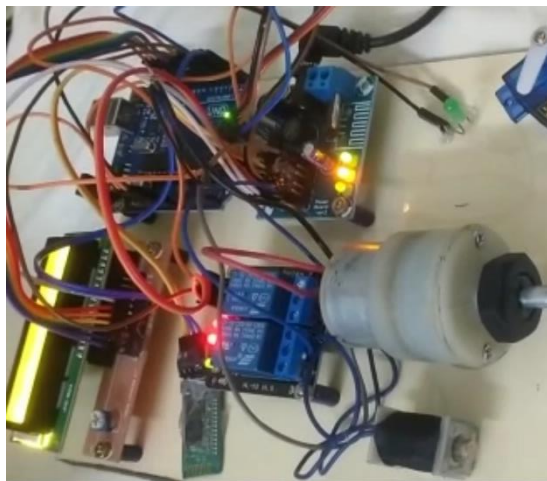


Fig: Testing at All appliances ON

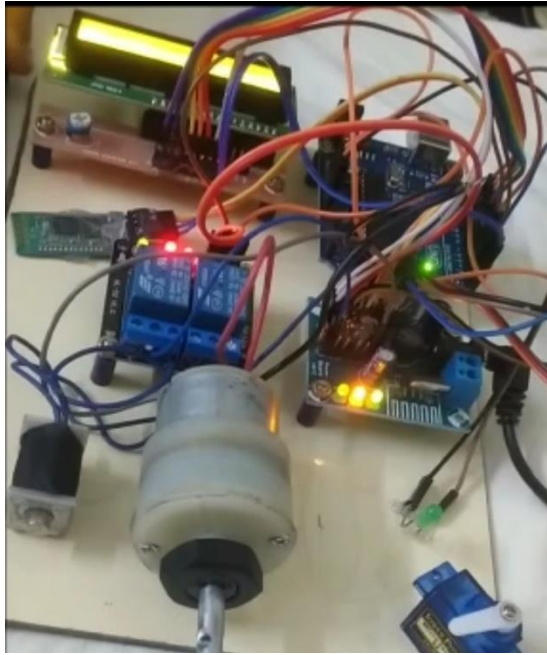


Fig: Model view of project

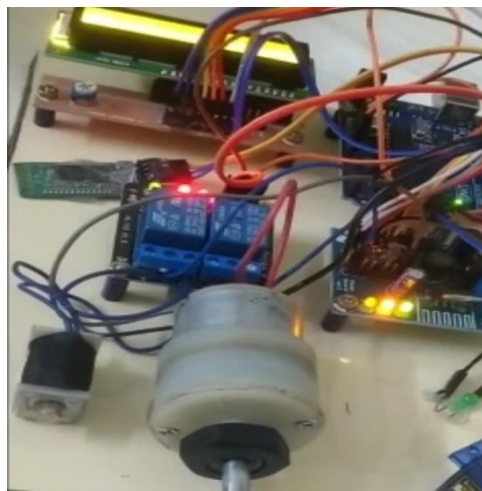


Fig: Testing will appliances OFF

C. RESEARCH PAPER

VOICE ACTIVATED AUTOMATION SYSTEM FOR ELDERLY AND DISABLED PEOPLE

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ABSTRACT

Automated systems have become increasingly popular due to their ability to reduce human error and stress. There is a growing trend towards remote control switches, as traditional wall switches can be difficult to operate for certain individuals. With the rise of mobile smart phones, Android applications are being developed that provide various functions, including natural language processing for voice control. This research project focuses on the implementation of a Voice Activated Automation System, it gives users access to the ability to control all their home's appliances by use of voice commands. This system is composed of an Arduino Uno microcontroller, a relay circuit for device switching, and a Bluetooth module that creates a wireless communication channel that connects the microcontroller to the user's smartphone. The user can control the system by issuing voice commands through the "AMR voice" application on their Android smartphone. This technology has potential applications in various areas such as transportation, healthcare, process control, industrial automation, and military.

Keyword: - Arduino Uno, Voice Activated Automation, 2-Channel Relays, Wireless Bluetooth Module, Android Smartphone.

1.INTRODUCTION

The user-friendliness of a remote-control system for household appliances has increased in popularity. The idea of controlling appliances with voice commands is also intriguing and many researchers have explored this area. Various technologies like internet, wireless and remote

control have been used for this purpose. The major objective of this system

is to offer a wireless control unit that can receive and execute voice instructions. The system will integrate as a single unit and enables wireless control of home electrical appliances, such as turning them on and off with voice commands. The microcontroller unit converts the voice commands to binary sequence and switches the load on/off as required.

2.LITERATURE REVIEW

2.1 Home Automation Using the Internet of Things

The deployment of the Internet of Things (IoT) for home-controlled automation was the subject of this research by the authors of [1]. Their study focused on the extensive usage of IoT to link distinct items, including as smartphones, tablets, sensors, and digital cameras, and enable the transfer of a lot of data and information. To improve connections and access to other items at a certain time and location, they also investigated cloud computing. By providing a prototype model, the authors are illustrated how cloud-based services for sensing may be used for a variety of applications, including augmented reality, farming, and environmental monitoring. The study focuses on Wi-Fi Wireless safety and security measures and the necessity for creative IoT management solutions.

2.2 Home Automation for Visually Impaired People Using Hand Gestures:

In their paper, M. Smitha et al [2] presented a system designed for visually impaired individuals to easily operate home appliances using hand gestures. The system utilizes MEMS accelerometer to detect hand movements and radio frequency to transmit signals wirelessly. The microcontroller

compares the received gesture with the stored templates and accordingly controls the home appliances. The system is also suitable for the elderly. However, the need to store gestures in the microcontroller is becoming less relevant as similar applications are now available in Android-based systems. An automated system that does not require gestures would be more appropriate.

2.3 Bluetooth-based wireless home automation system built on FPGA technology:

In their study, B. M. Krishna, et al. [3] discussed a Bluetooth-based FPGA-based wireless home automation system. They emphasized the usage of Bluetooth and how they used an Android smartphone and the HC-05 Bluetooth module to operate various household appliances. This system is particularly beneficial for the elderly and physically challenged individuals as it reduces their physical effort, saves time, and conserves energy. Future research, according to the authors, should focus on creating a more sophisticated home automation control system.

3. BACKGROUND OF STUDY

The advancement of technology has led to the development of modern electronic devices that can be remotely controlled. The "Voice Control Automation System" is a home automation system that is presented in this article. It allows users to operate appliances by speaking commands into an Android app that communicates wirelessly with an Arduino microcontroller via Bluetooth. The Arduino is interfaced with the main circuit that includes two relays which can be connected to various electronic appliances. This system replaces conventional wall switches with a central control system that can be accessed using smartphones, especially for elderly or physically challenged individuals who may have difficulty accessing switches which were in various parts of the office or house.

3.1 Statement of problem

Nowadays, automation through robots is becoming increasingly important for improving our living standards. The use of voice control in automation offers a modern way of controlling all appliances in a home or office. Several research studies have been conducted in this area, but there is a lack of clear information about the circuit diagrams, schematics, and microcontroller (Arduino) coding,

which makes it difficult to fully understand these systems.

3.2 Aims and Objectives

The objective of this research is to create a robust and adaptable voice-controlled automation system prototype that can remotely turn on or off electronic equipment in a house or company. The system will use a microcontroller, and voice commands transmitted through a Bluetooth-based Android application. The system will be capable of controlling appliances such as bulbs, fans, and televisions.

3.3 Significance of Study

The development of software tools that offer protection and comfort to the elderly and disabled has been the focus of recent home automation research. Such research has a high degree of scalability because every structure with electrical appliances and equipment can use the created gadget.

4. THEORY FRAMEWORK

Bluetooth wireless technology is used in this paper as a method of wireless communication. The smartphone's Android software can be used to remotely operate various electrical appliances. The Arduino then delivers the signal to the relay circuit after receiving the order from the smartphone through the Bluetooth module. Wireless Bluetooth technology is used for delivering the appropriate scope and viability. The relay circuit, Bluetooth module, and microcontroller device are all linked to the breadboard. The microcontroller is told to turn an appliance ON or OFF when the Android-based software "Smart Voice" is activated. The speech recognizer is made available once the android application looks for relevant Bluetooth device that is currently available. The application transforms the audio signal into a string. For each appliance, a value is generated and delivered to the microcontroller, which after reading and decoding the input data, activates the relay circuit by sending a signal to the parallel port.

4.1 Android Based Smart Phone

The Google-developed Android operating system, which is based on the Linux Kernel, offers a user-friendly interface that enables direct manipulation using touch commands. This operating system has

a wide range of global applications and is suitable for the development of mobile applications using the programming in embedded C using a software development kit (SDK). One of the inherent capabilities of Android phones is the voice recognizer, which can be utilized to create an application for automating the control of household or office appliances.

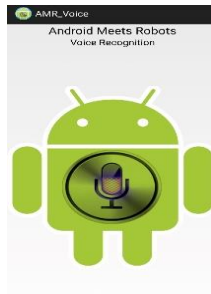


Fig 1: Voice Application Interface

In this research, an Android-based application called "AMR Voice" was used to control the voice-activated home automation system. For speech recognition, the application makes use of the Google voice recognition technology, making it easier for users to control their appliances using voice commands. This approach offers a more user-friendly experience and adds to the convenience of the voice-controlled automation system.

4.2 Bluetooth Module

A wireless approach for sending data over short distances is Bluetooth technology. Personal area networks (PANs) and mobile devices frequently use this UHF radio frequency, which operates between 2.4 and 2.485 GHz. In this project, a user-friendly serial port protocol module with a 9-meter range called the HC-05 Bluetooth module is employed. It is a fully qualified Bluetooth V2.0+EDR single chip system with an adaptive frequency hopping function. The pairing pin code is "1234", and the slave default baud rate is 9600. It automatically connects to the last device on power. Using an Android smartphone, the text that the Arduino microcontroller's serial port receives is sent via Bluetooth.



Fig 2 Bluetooth module

4.3 Arduino Uno

The Arduino micro controller board is a popular option for engineering and physical computing applications. Beginners will find it simple to use, while expert users will find it versatile enough. The Arduino Uno is the model of Arduino microcontroller utilized in this study owing of its affordability and capability. There are several varieties of Arduino microcontrollers available. It contains several input/output pins, a USB connection connector, and may be powered by either an AC-to-DC converter or a USB cable. In this project, the Arduino Uno is utilized to supply the relays with signal power and receive signals from the HC-05 Bluetooth module. The Bluetooth module sends text to the Arduino Uno serial port, where it is matched against different combinations of texts to turn the appliances ON and OFF. The two-channel relay device is employed for this project, and the appliances are connected to pins 4 and 7 of the Arduino Uno through relay boards. The relevant pin receives a high or low output signal to turn on or off the associated appliance if the matching text is found.



Fig 3 Arduino Uno Microcontroller

4.4 2-Channel Relay Module

Relays are electromechanical switches that have traditionally been employed in early computers and long-distance telegraph networks to conduct logical processes. While constructing circuits, it is important to take the trigger voltage into account since several types of relays function at various voltages. The high and low voltage signals required by the relay to turn appliances ON and OFF are

provided by the Arduino Uno microcontroller in this experiment. Whether an appliance is turned ON or OFF depends on the signal that the relay receives. The voice-controlled automation system's relay circuit powers two appliances, but the designer can change the number of loads that are coupled to the relays. A visual illustration of the relay circuit is shown in Figure.



Fig 4: 2-Channel Relay Module

5. BLOCK DIAGRAM AND WORKING PRINCIPLE

5.1 BLOCK DIAGRAM

The block diagram of project is shown in below diagram:

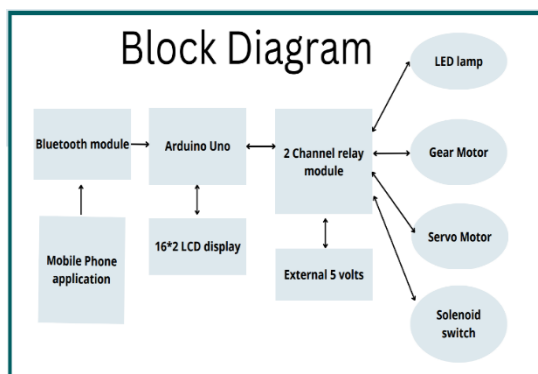


Fig 6: Block Diagram

5.2 Working Principle

The Arduino Uno with Atmega 328p microprocessor, a 9V adapter power supply, and relay circuits utilized as switches for loads make up the system's many parts. The 'voice recognizer' capability of an Android-based mobile operating system is utilized to operate an appliance. Fig 8: Model View of Project. The Android device and the control unit communicate wirelessly thanks to a Bluetooth module (HC-05). Relay circuit and Bluetooth module are both connected to the microcontroller, which is also receiving signals from

the Android application to regulate the loads. The Android app searches for and establishes a wireless connection with the Bluetooth device, then reads the user's voice commands and sends the appropriate signals to the microcontroller to activate the relays and switch the loads on/off.

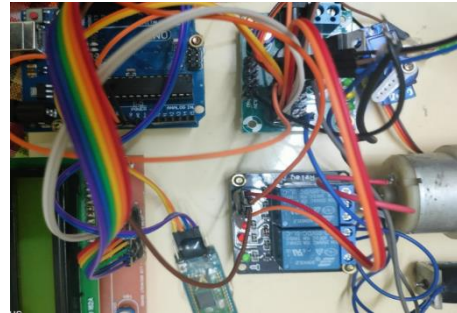


Fig 7: Model View of Project

6. TESTING, CONSTRUCTION, AND RESULTS

6.1 Testing and Construction

Every step of the system's creation included a performance test and measurement on a breadboard. This process involved mounting all the components onto their respective circuit positions on the breadboard. The microcontroller's configured output to input was also considered when mounting it. The microcontroller was examined after programming, and it was discovered to be functioning properly. After completing the component mounting, the entire system was evaluated, and the outcomes were measured. A digital multimeter was used to verify that the battery power source of 9V was adequate to power the Arduino Uno. The complete system was built in this manner during the laboratory installation.

Table 1: Comments for application

Comments for Application	Description of comment
Turn ON Light	Light will ON
Turn ON Door	DOOR will Open
Turn ON Fan	FAN will ON
Turn ON Bed	BED will bend
Turn ON ALL	ALL appliances will TURN ON
Turn OFF ALL	ALL appliances will TRUN OFF

6.2 Results

Several words have been used to teach this gadget. The Arduino Micro controller can interact with the relay to either switch any connected appliance ON or OFF since each word is saved through programming. List of Comments used for controlling appliances is shown in Table 1.

7. CONCLUSION

The HC-05 Bluetooth module, Microcontroller Arduino Uno, and 2-Channel Relay Circuits were used by the authors to successfully build a voice-controlled automation system. By increasing number of 2-Channel relays, system can control any number of input controls. This system is low-cost, secure, flexible, and dependable, and can even be used to remotely control the home appliances. The project uses Bluetooth technology to connect the system parts and meet the user's needs. The paper's approach is innovative and achieves the target of remote-control automation. The study is relevant to many automating applications in industries such as transportations, health care, process of control, and industrial automation.

8. REFERENCES

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