

**IMPLEMENTATION OF SMARTLY CONTROLLING HOME DEVICES
FOR PHYSICALLY CHALLENGED PEOPLE USING RASPBERRY PI**

Submitted in partial fulfilment of the requirements of the award

of Bachelor of Engineering Degree in

Electronics and Communication Engineering

By

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SCHOOL OF ELECTRICAL AND ELECTRONICS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade “A” by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI- 600 119

MARCH 2021



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **BHARGAVI TIYYAGURA (37130056)** and **LIKITHA S (37130219)** who carried out the project entitled **“IMPLEMENTATION OF SMARTLY CONTROLLING HOME DEVICES FOR PHYSICALLY CHALLENGED PEOPLE USING RASPBERRY PI”** under our supervision from OCTOBER 2020 to MARCH 2021

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We **BHARGAVI TIYYAGURA (37130056)** and **LIKITHA S (37130219)** hereby declare that the Project Report entitled **“Implementation of smartly controlling home devices for physically challenged people using Raspberry Pi”** done by us under the guidance of **Dr.M.R.Ebenezar Jebarani M.E.,Ph.D.,** at SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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ABSTRACT

Smartly controlling home automation are increasingly used due to the wide manufacturer brands and various available technologies. From a social point of view, physically challenged people should be taken care humanly. Secondly, it is achieved using a single controller, monitoring and the controlling many interconnected appliances such as lights, power plugs, voltage system, humidity and temperature sensors, gas, smoke and fire detectors as well as security and emergency systems. Smart homes for physically challenged people are cheap, low-power, cost effective, efficient, and realize the automation of a variety of domestic appliances using user-friendly interface as remote control or any other handheld devices. We are presenting a proposed system for smartly controlling home automation for physically challenged people technique with Raspberry Pi and it is done by integrating sensors into a web application. To design this system, we are using a Raspberry Pi module with voice control. Using this, we can control home appliances connected through a monitor based on internet. Raspberry Pi operates and controls motion sensors and voice recognition for controlling.

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CHAPTER 1

INTRODUCTION

Home automation systems are becoming more popular every day because they are easy to use and deploy to a variety of applications. By combining speech recognition technology and home automation systems, the system is becoming more convenient and easier to use. Ordinary people need home automation for their needs and luxury, but it is a social problem for people with disabilities. This can be very helpful. There are several research and development projects for home automation systems. Because of the wireless communication, we had to use our mobile phone to remotely control our home appliances. In this prototype, we built a system that can control various household appliances using a mobile connection or a smartphone. It uses a microcontroller to control the device shutdown and closure, but there is no wired connection. Manual switches are not used here. Then the microcontroller controls the device and stores the information it receives. The proposed solution should be easy to use, simple, secure, reliable, and available on most smartphones.

Today's world can become a global hub with technological advances. The invention and advancement of technology made this possible. There is a big difference between traditional systems and smart home systems. There are many systems that are better than traditional systems today, but dealing with household appliances or machines with voice commands brings more luxury and usability. They knew that speech recognition is speech recognition, and it has also had good results. There are many processes and algorithms for transmitting micro signals from certain voice commands such as MFCC, HMM, etc. Emotion, voice identity, frequency, etc. This information can be obtained not only from a person's voice, but also from a person's voice frequency. Voice at about 300 and 3000 Hz.

Recently, home automation has appeared and has been developed on a large scale. Everything from gas lights and stoves to garage doors is often controlled by the central panel of the house or used wirelessly.

App or voice command. It has been a huge breakthrough in technology and has proven to be very useful for people with disabilities, such as large families or blind people.

It ranges from basic control of a switch that turns lights on and off, to creating a variety of home conditions supported by calls or moods, calling Uber taxis, handling HVAC systems at home, system audio visual entertainment and more. Advanced technical features.

Home automation isn't just a luxury, it's well worth it for some population groups such as paralysis, the elderly and the disabled. Home automation systems make them somewhat independent and self-sufficient. Current leaders in the home automation market are Google Home, Amazon Echo, Alexa, Wink Hub, Logitech Harmony and Apple Home Kit. These are all just control systems and you'll need to buy a device that's compatible with home automation to get the job done. Examples of such devices are Phillips Hue, Nest Thermostat, Canary, Sentry, Google Cast, and Avion. Studies have not used such devices. Instead, they built their own test network of devices with cost-effective components such as microcontrollers and relays that run their respective algorithms.

Home automation can be a new and relatively widespread concept using a variety of technologies. If you want to compare different ways of implementing the same module to each other, you need to have a well-defined performance metric and a way to measure it. The following performance metrics were selected for this evaluation.

Flexibility: Home automation systems need to be tailored to different users and their requirements. Be prepared to recognize voice commands from any user, regardless of age, gender, intonation or pitch. Be prepared to work with the equipment you already own, so you don't have to purchase any additional equipment. The system should have multiple interfaces so that users can choose the one that works best for them. The interface can include a simple voice command interface, a mobile device management application, or a central hub with one of these options.

2. Reliability: Home automation system must be solid. It should work even in ideal conditions. The speech recognition module should be ready to recognize commands even when the user is far away from the microphone. Ambient and background noise should minimize the impact on performance. Let's say a consumer wants to order by placing a microphone in a room with a high fan and TV turned on. Expecting a TV to migrate when a consumer wants to offer an order is inappropriate, so an honest home

automation system must take all these factors into account and find a way to deal with it.

3. Security: Modern home automation is also used to lock and unlock the doors of your home. Obviously, it can be a serious threat to owners if you don't take security into account when designing your system. If your system is on a wireless network, make sure the channel is secure before sending the transmission. It is best to use a bottom-up system that focuses on customer safety. This measure also considers systems that provide additional features such as intrusion detection, smart alerts, security lockout, and more.

4. Cost: The most important factor in determining the success or failure of a home automation system is the cost that users have to pay. The system may have both the latest bells and whistles, but if you can't afford it, you won't give up. The cost includes only the initial cost of the product and the long-term and installation costs. It may seem cheap, but add value when you think about the cost of an extra device you want to buy near the hub. In addition, if the system is wired, you need to take into account the work required for installation.

5. Response time: Nowadays everyone is used to getting immediate results, so for a home automation system to be very useful, it has to respond to inputs immediately. Some algorithms give excellent results in recognizing commands, but the timing is not perfect. The ideal algorithm is one that finds the perfect balance between processing power and response time.

CHAPTER 2

LITERATURE SURVEY

Mohamed S. Musbah [2016] uses a client/server model and is designed to regulate consumer electronics with speech recognition technology. There are three main components of the model. i) Front-end user device: Any mobile device, such as a laptop or smartphone, often with an honest microphone and voice recognition function. The device used in this Windows 7 computer has Windows 7 speech recognition software.

ii) Home Server: Refers to a laptop or computer with a Wi-Fi adapter and Windows operating system (Windows XP or later).

iii) User Unit: It consists of two parts: an Arduino Merge to process incoming orders and thus a home appliance. The devices involved are DC lighting and LED lighting. Basically, the interface device consists of two voice commands: start listening and turn on/off. The device application connects to the home server via a peer-to-peer wireless connection (TCP/IP transmission protocol). The home server gradually checks the connection, receives commands from the front interface, opens a connection to the microcontroller, and then passes the command. Now the Arduino merger does this command depending on the target device. The operation is shown in Figure 2.1.

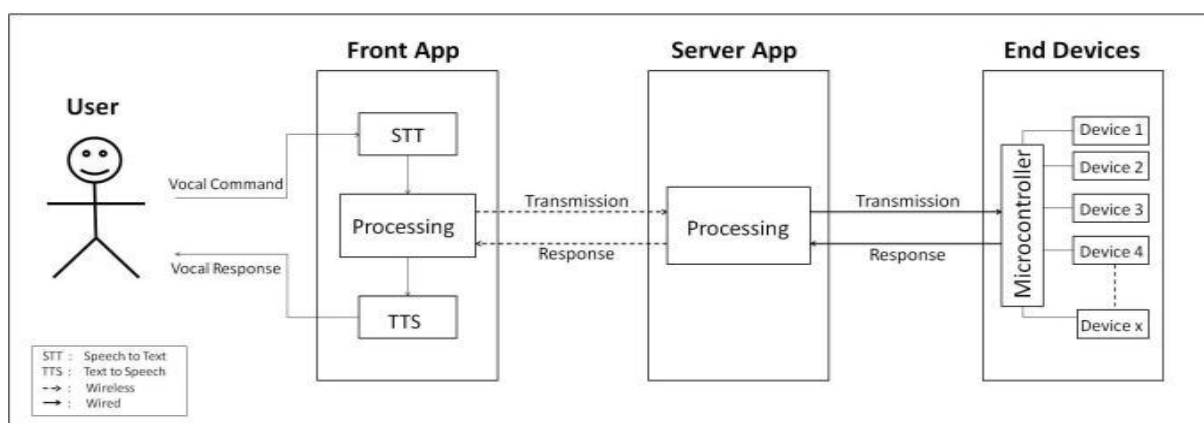


Fig:2.1: Working of client/server model

Sushant Kumar and S.S.Solanki [2016] approaches home automation through speech recognition and interface management. Both functions are covered by a smartphone. The interfaces communicate with each other via efficient Bluetooth wireless communication.

End-user controls include the Google Voice API and AMR voice applications that understand voice commands. Arduino Bluetooth Control is a touch sensitive application that supports up to 8 devices.

i) AMR negative:

- a) Connect Bluetooth via APP.
- b) Tap the microphone icon and choose a command.
- c) HC05 takes the order and sends it to the Arduino.
- d) Arduino does its work through relays.

ii) Arduino control application:

- a) Connect Bluetooth via APP.
- b) Press ON/OFF for the specified device.
- c) APP sends the correct command to HC05. Arduino processes and executes commands.

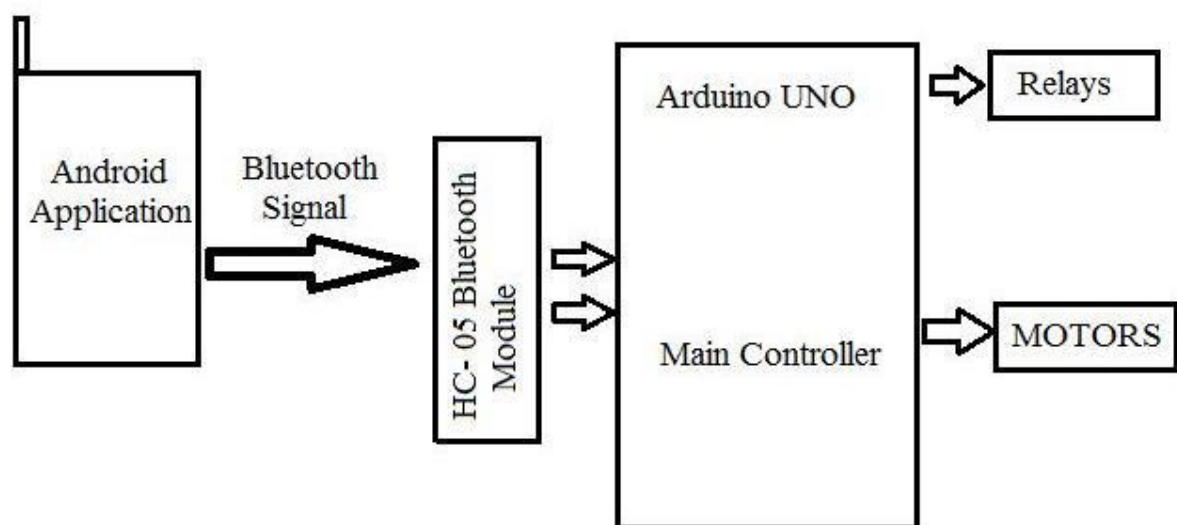


Fig:2.2: System Architecture

Yash Mittal and Sonal Sharma [2015] It describes the development of a home automation system that sends appropriate commands to the device using a speech recognition module and a special hardware module for the Arduino Uno microcontroller. Voice commands are divided into 5 groups with 7 commands in each group. Command group: access, security, fans, lighting and equipment. To register successfully, the user must enter the group name and then enter the command.

The speech recognition module was trained with the voices of 5 male and 5 female users. This allows the system to recognize voice commands regardless of the user's age, gender, accent and microphone distance.

To determine the simplest location to place an intermediate microphone, a histogram of the typical number of attempts required to successfully identify an order at a different distance from the microphone is generated.

Key steps for this Implementation:

- a) Speech recognition using special modules and microphones.
- b) Interpret the commands using a microcontroller that works with the speech recognition module.
- c) Send control signals to command-based devices.

Access groups are used to open or close doors and use NFC. Sunshine and Fan Group generally handle lighting and fans throughout the house. The utility group handles sprinklers and blinds. Security groups are used to trigger and activate alarms.

The main issue discussed at this event was how to adjust the bed in multiple places by voice command. People with disabilities couldn't afford a definitive label like Google Home, so the system described here used an easily accessible device like this:

- i) Arduino Uno microcontroller
- ii) relay circuit
- iii) adjustable wooden bed
- iv) Electronic speech recognition module

Home automation systems are mostly considered a luxury, and in addition to this particular demographic help, they help a lot because disabled people do not help

anyone and become a little more independent when adjusting their beds on their own. To maintain cost efficiency, an Arduino microcontroller is used instead of a computer.

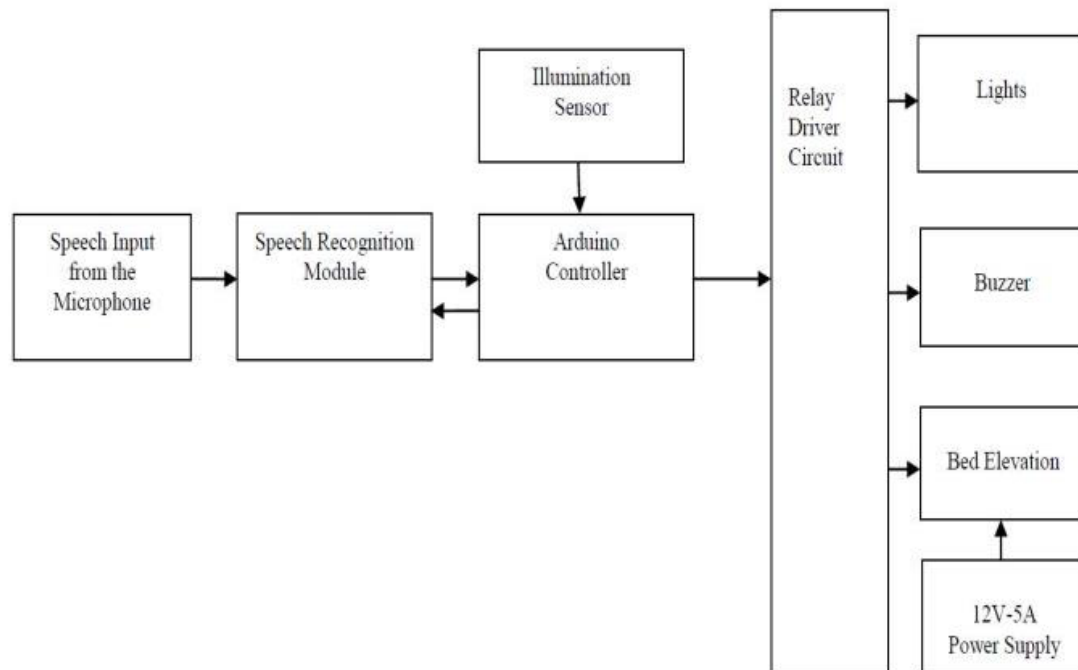


Fig:2.3: Block diagram of voice recognition based home automation system.

From figure 2.3 shows essential functioning of the system. The speech input is taken via a microphone with a 3.5mm jack. This input is then transported to the voice recognition module which is the Electro use Voice Recognition Module v3. The voice recognition module can't be used because it is and has got to be trained first. When this is detected, the voice input is compared to the previously saved example and then passed to the Arduino to execute the command. The module can store up to 80 commands (1500ms each).

Once transferred to the Arduino Uno, a valid operation will be performed and transferred to the required device via transfer. The Arduino has C++ instructions coded with the Arduino IDE. The switching circuit is connected to the lights, bed and buzzer. Light sensors are used to ensure that the room is properly lit and to take appropriate action. If you don't have adequate lighting, it will turn on, and if there is enough sunlight, it will change the lighting to save energy.

Since this system is specially designed for people with disabilities, the Arduino will contact the buzzer to inform the caregiver or anyone concerned about the individual what they need and more.

Because the bed is easy to lift, it is made of wood, not metal. Motor connections that require 12VDC and 5A AC power are used as shown. Beds are often adjusted to three positions.

- i) Sleeping position (180 degrees relative to the ground).
- ii) Idle position (150 degrees to the ground).
- iii) Sitting position (135 degrees to the ground).

Jack lift and engine weighing up to 1500 kg. Finally, they discussed the accuracy and recognition of voice commands. It was concluded that the accuracy is 80% in quiet conditions and 60% in noisy conditions.

Nguyen [2007] proposed a home appliance system, and the heating wires and power cables are often used to control the home appliance system. This method helps users to check device status and remote control from anywhere. And often this is done over the phone or the Internet. A simple way to retrofit home appliances is provided.

Haque [2006] proposed a system that handles home appliances with a personal computer. This technology was developed using Visual Basic 6.0 as the programming language and using the Microsoft speech recognition machine. Tools are often controlled by timers or voice commands.

Mohamed Sikander Hayat Khiyal et al. [2009] has developed a remote home appliance management system that is primarily useful for non-consignment caregivers. The main purpose of this system is to provide security and control of household appliances such as air conditioners, lights and alarms. The system implements SMS technology that cannot transmit data from sender to receiver over GSM network. One or more computers often control household appliances. The system sends a warning SMS message to the authenticated user when an intrusion is detected, and the user can consistently respond to victory. In addition, users can send SMS to the system to find and monitor the health of household appliances.

Jawarkar [2007] proposed software for mobile phone and computer communication. The UART 16550A is programmed with an appropriate control format to support AT commands. The system's mobile phone is used to receive and execute immediate user commands and notify the user of input changes via SMS. The system can also

send SMS to designated mobile users when the state of the input port changes. This method is not suitable for time-critical systems.

Prabhakar V. Mhadse et al. [2013] suggested building and implementing a home automation system with speech recognition support. Advanced prototypes can control electrical equipment in your home or office. The system implements automatic speech recognition through MATLAB speech processor and coding.

S.R. Suralkar [2013] Building and implementing a speech recognition automation system through speech recognition through wireless communication. Advanced prototypes can wirelessly control electrical appliances in your home or office. The system implements automatic speech recognition using a speech processor and speech recognition by encoding MATLAB with the MFCC algorithm.

2.1 Google features

2.1.1 Problems with Google Home Automation System:

John J. Greichen's article discussed the initial challenges of home automation systems. These include high manufacturing costs, high development costs, high installation costs, additional service and support costs, lack of home automation standards, and consumer ignorance of Google Home.

In recent years, wireless systems such as telecommunications have become more popular in home networks. In addition, the use of wireless technology in an automated system provides many benefits that can only be achieved through a wired network.

- Reduced installation costs.
- No cables are required, greatly reducing installation costs.
- Internet connection

Use your phone to manage your smart home and manage your devices from anywhere in the world.

- Scalability

The wireless comparison feature is especially useful when network expansion is critical due to new or changing requirements.

- security
- Easily add devices to create an integrated smart home security system, and the built-in security system ensures the integrity of your smart home.

CHAPTER 3

EXISTING SYSTEM

3.1 Bluetooth based home automation system using cell phones:

In a Bluetooth-based home automation system, appliances are connected to a BT Arduino board at an input port with a relay. BT's Arduino card program is based on an interactive C language for advanced microcontrollers. The connection is made via Bluetooth. Password protection is provided so that only authenticated users can access the device. A wireless Bluetooth connection is established between the BT's Arduino board and the phone. The system uses a python script that can be installed in any Symbian OS environment and is portable. The circuit is designed and implemented to receive phone feedback indicating device status.

3.2 Zigbee based home automation system using cell phones:

Designed and implemented a system using Zigbee for home appliance monitoring and management. Device performance is recorded and maintained by the network coordinator.

For this the Wi-Fi network is employed, which uses the four-switch port standard wireless ADSL modern router. SSID and Wi-Fi network security installation are pre-configured. The message is first processed by the virtual home algorithm for security purposes, and once declared secure, it is re-encrypted and sent to critical network devices in the home. Through the Zigbee network, Zigbee's puzzle sent a message to the top. Security for all messages received by the virtual house algorithm. Precise obsession with installing Zigbee communication system to reduce system cost.

3.3 GSM based home automation system using cell phones:

Thanks to mobile communications and GSM technology, GSM-based home automation is drawing attention from researchers. SMS-based home automation, GPRS-based home automation, and DTMF-based home automation are the options discussed here primarily for GSM communications. The figure 3.1 shows a logical diagram of A. Alheraish's work, showing how sensors and home devices interact with

the home network and exchange data via GSM and Subscriber Identification Module (SIM). The system uses a transformer that converts the functions of the machine into electrical signals that correspond to microcontrollers. The system's sensors convert physical properties such as sound, temperature, and humidity into different magnitudes, such as voltage. The microcontroller analyzes all signals and converts them into sequences recognized by the GSM module. Select the appropriate communication mode for SMS, GPRS and DTFC supported by commands received from the GSM module.

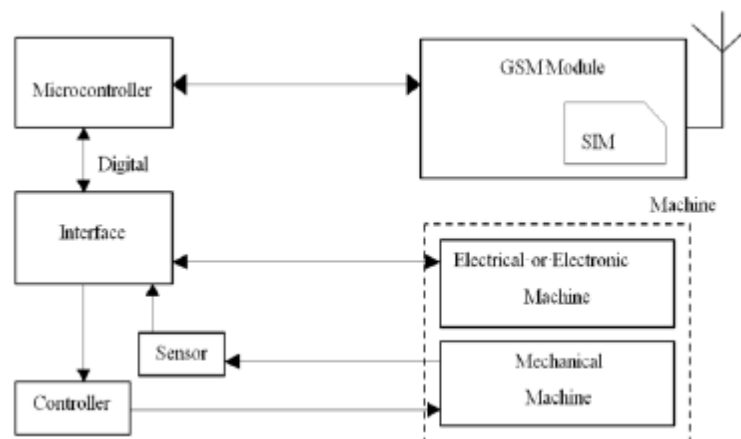


Fig:3.1: Mobile-based home automation

3.4 Wi-Fi based home automation system using cell phones:

As can be seen in Figure 3.2, a Wi-Fi based home automation system mainly consists of three modules: a server, a hardware interface module and a software package. The figure shows the layout of the system model. Wi-Fi technology is used on the server and hardware interface to communicate with each other, and that technology is used on the server side to log into web applications. Since the server is connected to the internet, remote users can access the web server application over the internet using a compatible web browser. The latest home automation software is divided into server application software and microcontroller firmware (Arduino). The Arduino software, built using C language, using IDE comes with the microcontroller itself. Arduino software is culpable for gathering events from connected sensors, then applies action to actuators and pre-programed within the server. Another job is to report the and record the history within the server DB. The server application software package for

the proposed home automation system, may be a web based application built using asp.net. The server application software is often accessed from internal network or from internet if the server has real IP on the web using any internet navigator supports asp.net technology. Server application software is culpable of, maintain the entire home automation system, setup, configuration. Server use database to stay log of home automation system components, elect to use XML files to save lots of system log.

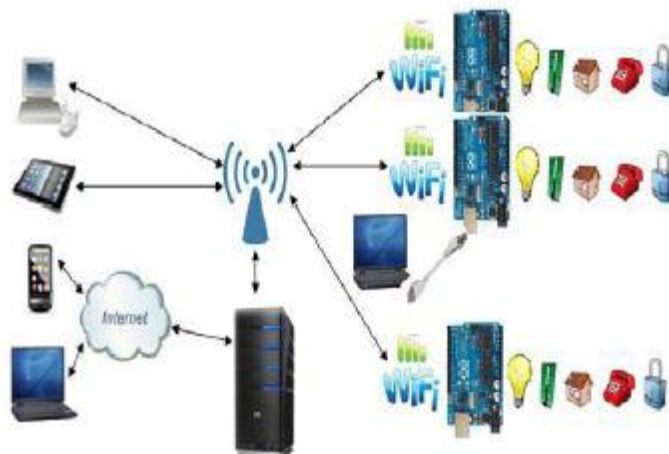


Fig :3.2: Wi-fi based home automation

3.5 Home automation using RF module:

An important goal of a home automation system is to create a home automation system using radio frequency remote control tools. Technology is now accelerating, so homes are getting smarter. Modern homes are deliberately moving from switches to centralized systems containing RF controlled switches. Traditional wall switches placed in different parts of the home today make it difficult for major consumers to move around and adapt and use. It is also a bigger problem for the elderly or disabled. Home automation with the help of a remote controller realizes a cleaner solution with the help of RF technology. To do this, the RF remote control is integrated with the microcontroller on the transmitter side, turning the signal on or off to the receiver to which the device is connected. When using the transmitter's dedicated remote shutter, it is often turned on and off using hundreds of wireless technologies around the world.

3.6 Home automation with Android ADK:

The home device is connected to the ADK, so a connection is established between the Android device and the ADK. The home appliance is connected to the I/O board (EMBEDDED SYSTEM) port and the current status is transmitted to the ADK. The microcontroller card (Arduino ADK) is based on the ATmega2560. This is a USB host connection for Android phones based on the MAX3421e chip. The two main features of the Android 2.0 Open Access Protocol (AOAP) are audio output from Android devices to components and component support. Sent from one or more HID (Human Interface Device) devices to your Android device. It depends on the Android and Arduino platforms, both are FOSS (Free Open Source Software). When you activate the security system motion sensor, it detects unauthorized activity and automatically detects you by the phone or security system.

3.7 Cloud Based home automation system:

Home automation with a cloud system focuses on designing and implementing a home portal that triggers to collect data from consumer electronics and then send the data to a cloud server and store it in the Hadoop distributed file system. This is a non-process using MapReduce. Perform monitoring tasks for remote users. Today's home automation systems are constantly developing resilience using existing features that meet the growing interests of people. This is the design and development of a home automation system that uses cloud computing as a service. The current system consists of three important blocks. The main part is the cloud server that processes and monitors the client and user information and information, and thus the state of the device. The hardware interface module is the second part that activates that connection to the actuator. Sensory devices that provide physical services. The last part is a home server that creates hardware devices and provides interfaces. This focus is on building online services into the cloud you need to ensure the security, storage and availability of your information. This system is cost-effective, reliable and expensive, which ensures the security of home automation systems for the whole family. The system contains different client modules for different platforms.

3.8 Cloud server:

The cloud server can be a dedicated central server that implements services as opposed to sub-modules. The central server is the information system, respiratory protection and brain. Works three-module system, web configuration tool and three connections for mobile devices. The server evaluates the information it fetches from home, sends its presence to the mobile device, and vice versa.

1. A database is managing by the server and its status gets updated as per the changes done reception end.
2. Embedded Program for Hardware Circuit Microcontroller, and
3. Internet client for each desktop or mobile phone.

3.9 Raspberry pie home automation with wireless sensors using smart phone:

Home Automation System has been developed with Raspberry Pi by reading the algorithm and subject of E-mail. The Raspberry Pi is an efficient platform for implementing powerful and cost-effective smart home automation. Home automation with the Raspberry Pi is superior to other home automation methods for a number of reasons. For example, DTMF (Dual Tone Frequency) using home automation can be a major drawback regardless of how the fare solution provides. In home automation using a web server, scheduling of the web server is rejected, and the already installed web server service provided by Gmail is used, so the necessary memory space is required by this method. LEDs are used to recognize switching behaviour. This method is effective and versatile online.

3.10 Sending Commands to the Raspberry Pi:

A script running on the server side of a laptop or internet server receives commands for user input and sends them to the client (raspberry pi) accordingly. In this case, we use these input commands to display the lighting on/off pressure. When the server script issues a command to display the ON light, the information and data are sent to the Raspberry Pi, and the GPIO output activates the relay. The system can send continuous updates to the server to see if the sunlight is on or off.

All you have to do is run a script that can use a PIR motion sensor to send an information signal to the Raspberry Pi, read the sensor using the GPIO pins, and send the information to a public system via IoT platform. The IoT console will then see it.

3.11 Wireless Home Automation system using IoT:

This technology automatically adjusts basic controls and home performance over the Internet from anywhere in the world using a mobile device or computer. Automatic homes are sometimes referred to as smart homes. Designed to save electricity and human energy. The proposed system may be a decentralized home automation system, and includes a server. Wi-Fi module, sensor. The server monitors and monitors various sensors and can be easily configured to handle multiple hardware interface modules (sensors). The Arduino card with built-in Wi-Fi module acts as a web server. The automation system can be accessed from an online browser on the local computer, often using the server's IP address, or remotely from any computer or mobile device connected to the Internet with the correct browser through the server. Network infrastructure that connects servers and sensors with Wi-Fi technology. Wi-Fi was chosen to improve system security (using a secure Wi-Fi connection) and increase the mobility and scalability of the system.

CHAPTER 4

PROPOSED SYSTEM

The main purpose of this project is to create a Raspberry Pi voice home automation system that listens, responds and controls AC power based on voice commands. Here, the app and phone connect to the Raspberry Pi. So the device is often controlled through one of the inputs. Also, you can always turn on the system while waiting for a specific voice command. Where pi is programmed to respond to the keyword "hello", then turns the light on or off.

4.1 PROPOSED METHODOLOGY:

This prototype created a Raspberry-Pi-based voice management home automation system that can listen, respond and control AC power based on voice commands. Here, the app and phone connect to the Raspberry Pi. Devices are often controlled through one of the inputs. Also, the system often always stops and waits for certain voice commands. Where pi is programmed to respond to the keyword "hello", then turns the light on or off.

A prototype of the proposed home automation system was implemented and tested on equipment and provided accurate and expected results. Pressing the microphone button gives you voice commands to turn that device on or off. The speech recognizer listens to what you say and translates it into the most appropriate word or text. Figure 4.1 below shows the proposed system.

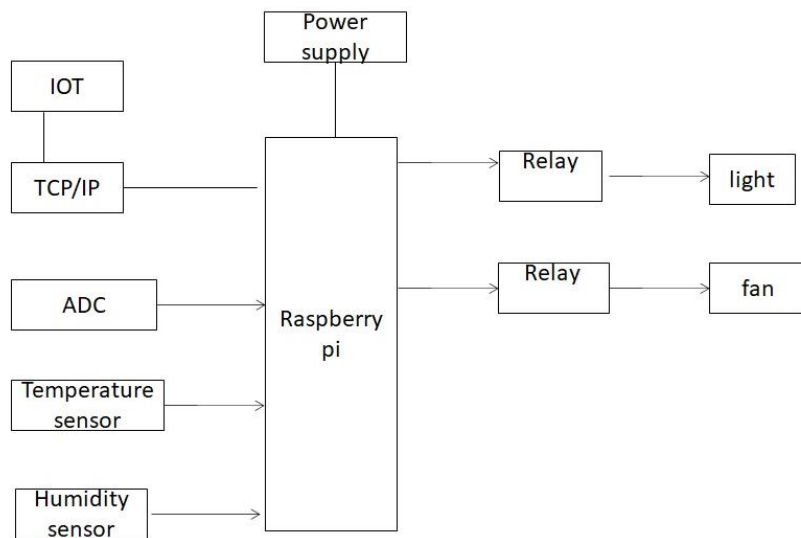


Fig:4.1: Block diagram of proposed system

Wireless sensor (WSN) networks offer great advantages in modern life. It has been distributed worldwide in recent years. Wireless networks replace networks of things. Internet of Things(IoT) can be things or things like RFID tags, sensors, actuators, mobile phones, etc. These objects will be surrounded within a network where information and communication are not visible from the environment. ... Since the introduction of IoT technology for smart home implementation, smart home research has undergone major changes. Smart homes include security, treatment, treatment, entertainment and business receptions. When equipment prices drop, you can create a smarter home with the help of sensors. At the same time, more and more people consider home security more important than others. Some of the work has been created by various research groups that can be applied in several fields. Some of the comparable operations are described below. Research provides help and support to people with disabilities through the Internet of Things (IoT). In a smart home architecture, all IoT data is in the cloud, so the cloud must be large enough, so the wireless environment must be stable. This application requires high quality hardware and internet. It is an intelligent video analysis system for home security. The biggest achievement of this technology is behavioural awareness. In this case, we can only analyse the video, but our goal is to trigger an alarm based on the information collected by the sensor. This video is just a record of the evidence. In fact, the alarm is different

from the above system. The system is building a new architecture and communication model to meet the requirements of smart home monitoring systems. Our systems work as connected media connecting internal and external networks. It's asynchronous when the server is there. The requirements for hardware and internet quality are as follows. Our cloud service requires less space and only alarm data is sent to the server.

4.2 System model:

Calculating the environment around the individual on the day of the gift can broaden and calm your professional skills. There have been tremendous advances in the field of human standards and people are often under construction. Now you know that the majority of the population will be obsessed with smartphones and devices all day long. After that, using the phone to a friend often improves everyday family problems using a mobile phone. The Home Automation System (HAS) is designed for Android devices and acts as a mechanization environment for an 8-bit microcontroller with a Bluetooth Pi interface, Arduino, and Raspberry Pi. It is programmed to control various household appliances such as lamps and fans with an on/off switch. It shows an accounting methodology for managing a suite of equipment that can replace traditional switches. It uses the most well-known and efficient innovations for long distance communication. Bluetooth is used to computerize the framework. The HAS framework for Raspberry Pi clients can be a step in simplifying allocation by managing one or more individual computers in each home environment. Throughout the study, a home automation system (HAS) with Raspberry pi Studio was built, and now there is an updated Android UI (User Interface) application based on a Bluetooth-enabled Android smartphone and a microcontroller-based transfer driver 8-bit that supports Bluetooth. There is. Serial module that can communicate with household appliances via Bluetooth. The structure depends on serial communication.

Remote communication via Bluetooth as a query environment to enable post-machine control. This structure ensures secure data transactions by remote communication. This is also a typical ON/OFF arrangement for the motor under the pin.

The Raspberry Pi can be a cheap credit card computer that connects to a computer or TV screen and uses a standard keyboard and mouse. It's a compact device that allows people of all ages to learn a computer and find a way to program in languages like Scratch and Python. From web browsing and HD video playback to spreadsheets, word processing and gaming, you can do everything you would expect from a desktop

computer. Powers the microcontroller, connects to a computer with a USB cable, or connects to an AC-DC adapter. The Raspberry Pi circuit acts as an interface between the software and the project hardware. The speech module sends text to the Raspberry Pi interface. Text is mapped to various combinations of predefined text to turn the device on or off. The device name and on/off commands are saved as predefined commands. For example, to change love, the user has to say "fan on", to change, the user has to say "fan off". The device connects to the Raspberry Pi pins through a swap card. When matching personally identifiable text, the number is output high or low to turn the device on and off.

In order to download software from the computer, the card has a serial communication interface including USB. The Raspberry Pi platform allows the Raspbian OS environment to interact with the device. The hardware design specifications are widely available, so anyone can program a Raspberry Pi card.

4.3 Micro Controller:

A microcontroller can be a computer with a dedicated chip that performs tasks and runs specific applications. Raspberry Pi is used as a microcontroller to feed the signal to the relay and receive the signal from an external voice device. A 5V DC power supply is required.



Fig:4.2: Microcontroller

4.4 DC RELAYS:

Relays are mechanical devices that are usually driven by electric current. Current flowing in one circuit opens or closes the other. Introducing a voice-controlled wireless smart home system for the elderly and disabled. The concept of handling household appliances with human voices is interesting. The proposed system

consists of two main components: (a) a speech recognition system and (b) a wireless system. This home appliance management tool uses a voice-controlled Android app. With the increasing use of PCs, computers, Internet, mobile and wireless technologies, it has become easier for users to access and control devices remotely. Much research has been conducted and many solutions have been proposed for remote access to household appliances. Some used the Internet, wireless technology to talk and control home appliances, while others used Bluetooth and GSM technologies to handle them. The biggest goal of our system is to create the perfect companion for someone. In general, home automation research focuses on a number of needs, such as applications that provide smart and insightful needs, some highlighting special needs such as the elderly and the disabled. This system can turn any device on and off. Arduino-based home appliances with voice control using Bluetooth reports aims to create a system that can respond to voice commands in the home and check the on/off status of home appliances such as lamps, fans, and televisions. The system should be relatively inexpensive and easy to install and use. Users should be ready to use any equipment anywhere in the house, so a wireless controller should be provided. This report shows a system that can be integrated into a single portable device to wirelessly control lights, fans, air conditioners, TVs, and more, and turn all connected devices on and off. It is an integrated platform for home security, monitoring and automation with microcontrollers. The Bluetooth model connects to the control device and receives the signal sent by the Android app. Voice commands are freely transmitted to the control unit with on/off loads. The transmitted voice commands are converted to binary on the microcontroller. The microcontroller block makes decisions and executes them.

4.5WORKING PRINCIPLE:

4.5.1ARCHITECTURE OF IOT:

As can be seen in Figure 4.3, the IoT architecture is represented by three layers: i) the awareness layer, ii) the network layer, and iii) the application layer. The perception layer is two-dimensional and can generally be divided into ". Both. "The

perception of control and sublimation perception level function depends on the squadron. Perceptual control enables intelligent perception of the physical world with automatic recognition, data collection, processing, and control using a second board. It is better to communicate with the application and boards connected to the network layer for physical objects. Layer by communication module. The network layer includes all forms of communication and core networks. If information transmission, routing, and control are often implemented in the core network, the communication network is tested as an access network. The device layer offers many intelligent definition applications that are active in the industry. As a result, IoT technology is often combined with all kinds of economic activity. The device layer contains intermediate application/software infrastructure and terminal blocks. The close integration of IoT technology and industry through the solidarity layer will have a major impact on the economy and society.

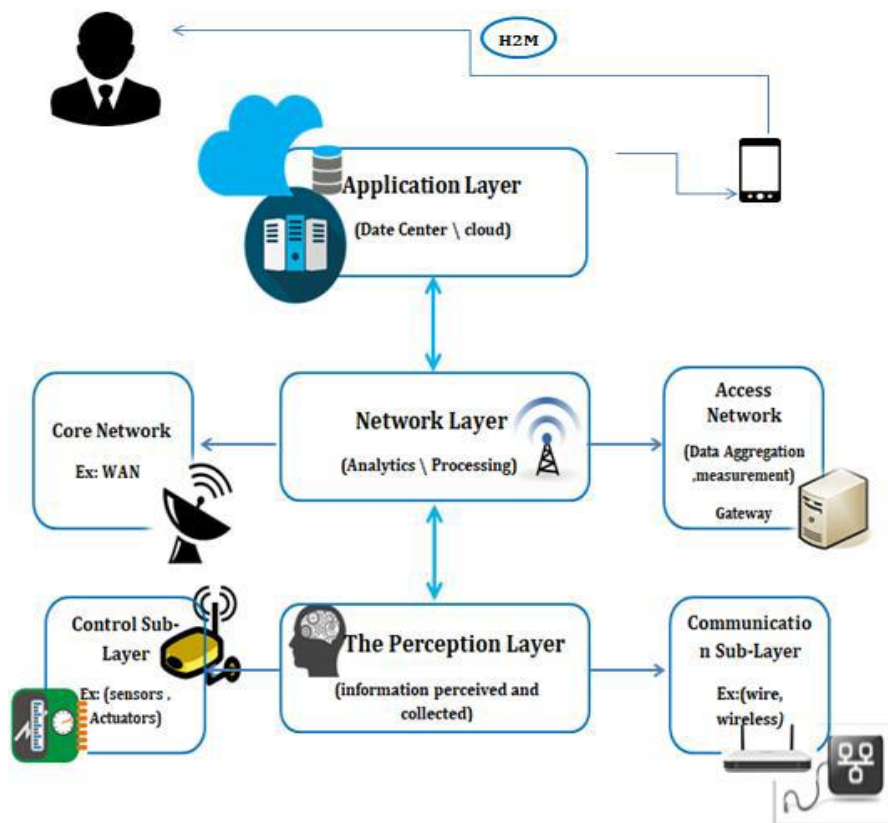


Fig: 4.3: Architecture of IOT

4.6 ARCHITECTURE OF RASPBERRY PI 3:

The Raspberry Pi 3 Model B+ is that the final revision within the Raspberry Pi 3 range.

- Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC, 1.4GHz
- 1GB LPDDR2 SDRAM
- 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE
- Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)
- Extended 40-pin GPIO header
- Full-size HDMI
- 4 USB 2.0 ports
- CSI camera port for connecting a Raspberry Pi camera
- DSI display port for connecting a Raspberry Pi touchscreen display
- 4-pole stereo output and composite video port
- Micro SD port for loading your OS and storing data
- 5V/2.5A DC power input

Power-over-Ethernet(PoE) support (requires separate PoE HAT).

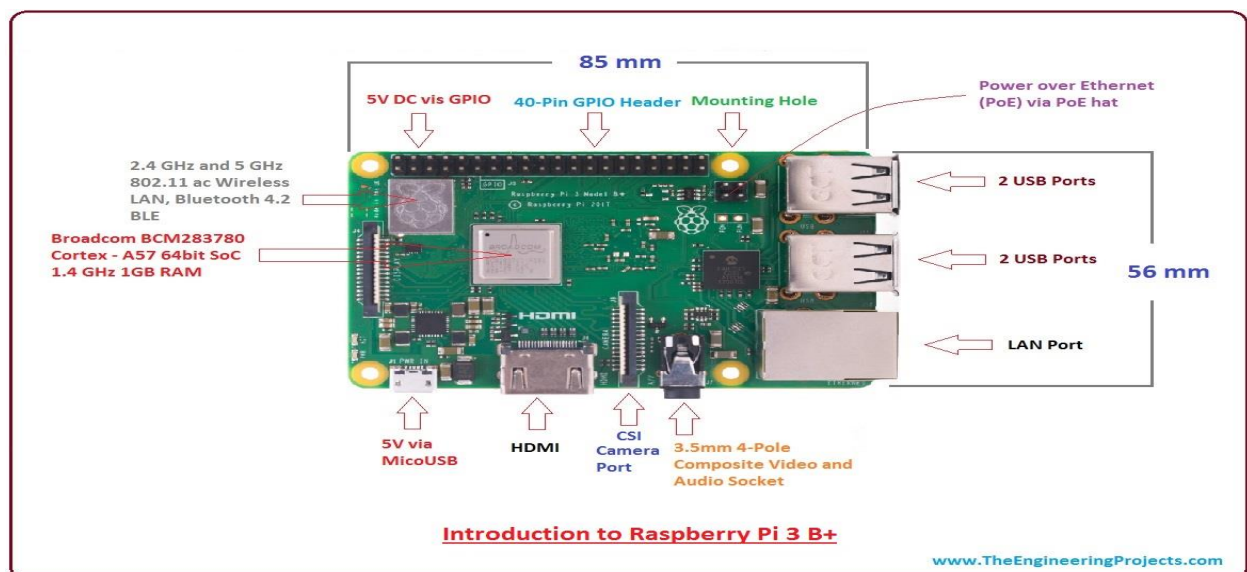


Fig :4.4: Architecture of raspberry pi 3 B+

4.7 Big Analog Data:

Analog data represents the natural and physical worlds and exists everywhere. In other words, it's part of everything. Light, sound, temperature, voltage, radio signal, humidity, vibration, speed, wind, motion, video, acceleration, particles, magnetism, current, pressure, time and place. It's the oldest, fastest, and largest of all big data, but it's an IT problem because digital data has two meanings.

Simply put, analog data should be treated differently than digital data. The question is how to effectively capitalize on the business value of massive analog data.

4.8 Perpetual Connectivity:

IoT is usually connected, always on, and always provides three important benefits to products and consumers.

- **Monitoring:** Continuous monitoring that provides continuous real-time information on the condition and use of a product or consumer in a market or industrial environment.
- **Support:** Thanks to continuous monitoring, you can now send updates, fixes, fixes and confirmations as needed.
- **Motivation:** Continuous and continuous communication with customers or employees provides an opportunity for organizations to motivate or motivate others to take action and purchase products.

Asking these because the Three M's, and therefore the notion that a corporation are often perpetually connected to consumers and products is sort of profound, with far-reaching implications and opportunities. For example, if a washing machine is connected to the IoT, predictive analytics can determine when a machine will fail and schedule repairs, such as 10 days before a devastating event. So you are not standing in front of the enclosed washing machine with a basket of dirty laundry.

4.9 Real Time:

Real-time definition is different from defining someone who doesn't or understand the IoT. Real-time starts from the moment a sensor or information is actually received. Real-time Internet of Things doesn't start when information enters a network switch or computer system, and it's already too old. How quickly do you want to understand if you want to understand if your home can catch fire? Or, if a crime can happen, the moment matters. So, you need to trigger an alarm in real time before information reaches the cloud or data centre. Otherwise, it won't help.

The point is, seeking to blend the planet of operational technology (OT), sensors, and data measurement with the planet of IT. The IoT blends these two worlds for the primary time during a major way, and therefore the results are going to be profound.

4.10 The Spectrum of Insight:

Derived from IoT data, the "spectrum of understanding" represents its place in the five-phase data flow: real-time, motion, youth, relaxation and archive. Sensors or data collection sites require real-time analysis and analysis to provide an immediate response from the percussion system and adjust accordingly, such as in military or precision robotic applications. At the other end of the spectrum, historical data is often retrieved from the data centre or cloud and benchmarked against the latest operational data, such as understanding the seasonal behaviour of power generation turbines. So understanding big data in IoT is often obsolete over time and space.

4.11 Immediacy versus Depth:

With today's existing computing and IoT solutions, you have to find a compromise between speed and depth. This means you can use basic analytic data such as temperature or FFT comparisons to get instant "time to insight" to see if turning a wheel on a tram causes life-threatening accidents. This is where immediate information becomes paramount. The other end of the spectrum is the time it takes to realize a deep understanding.

This example comes from one of our previous customers, CERN's giant Hadron inverter in Europe. Here they push subatomic particles together to get an idea of the composition of such particles. The information gathered here takes a long time to explore on a large farm of server computers. This in-depth understanding has recently led to the discovery of a new elemental particle called Higgs boson.

4.12 Shift Left:

Think about the mutually exclusive goal of gaining direct and deep insights, as discussed above. It is very difficult to argue for both today. However, engineers are good at solving conflicting problems and getting both results. James Collins called this phenomenon the genius of AND.

Driving in-depth and in-depth data analysis usually shifts the left side of HPC analytics and complex data (called Tier 4 in IoT solutions) stored in the cloud or data center. Complex IoT solution infrastructure as shown in the figure 4.5. In other words, deep computers are closer to sources of information to receive and collect information from sensors (TIER 1) and network gateways (TIER 2).



Fig :4.5: the end-to end lot solution architecture

4.13 subsequent 'V':

Big data is usually characterized by the famous V (volume, speed, volatility and value). The fifth "V"-suggests visibility. Once the information is collected, computer researchers around the world should be ready to see and work as needed. Visibility is the advantage of not having to transmit large amounts of information to people or places far away. I really like the concept of data access and applications "regardless

of time or place". Mark Templeton, CEO of Citrix, adds a third, device independence. Our team and I work closely with our partner Citrix to deploy time, space and device visibility solutions.

As familiar with the IoT and the profound consequences of these 7 principles. I currently lead a team promoting HP's contribution to the IoT and will discuss the path forward as HP plays an increasingly important role in the evolving IoT.



Fig :4.6: Model of smart home

4.14 VOICE RECOGNITION:

Speech recognition has been a stimulating study in recent decades and still poses many unresolved issues.

Speech recognition and voice control are basically speech recognition. Speech recognition is the process of verifying that a registered voice provides speech input, and verification is the act of automatically verifying the identity of the person you claim to be. Speech recognition is often used to use voice to verify identities and to control access to services such as phone banking, database access services, voice dialing

for purchases, information services, and voicemail. Another important application of speech recognition technology is for legal purposes.

Speech recognition is often characterized by text-dependent or text-independent techniques. In text dependent mode, the voice needs to speak a keyword or sentence along with the matching text for learning and recognition testing. Given that the text is independent, it means that the system can recognize your speech no matter what you say. The goal of our project is to identify real-time speech independent of text. That is, it compares the speech signal of an unknown speech to a database of known speeches. The system operates in two modes: learning mode and recognition mode. Training mode allows users to record voices and create functional models. Popular mode uses user-provided information in training mode and is intended to separate and identify speech. Mel's cepstral frequency coefficient and vector quantization algorithm are used to run the project in a programming language.

Basically, wavelet transform can decompose a signal space A_i into a lower resolution (approximation) space A_{i+1} and a detailed space D_{i+1} by dividing the orthogonal basis $(\phi_i(t-2^i n))_{n \in \mathbb{Z}}$ of A_i into two new orthogonal bases, namely $(\phi_{i+1}(t-2^{i+1} n))_{n \in \mathbb{Z}}$ of A_{i+1} and $(\psi_{i+1}(t-2^{i+1} n))_{n \in \mathbb{Z}}$ of D_{i+1} where z is a set of integers, and $\phi(t)$ and $\psi(t)$ are scaling and wavelet functions respectively.

The WPs decomposes the approximate space as well as the detailed space. Each subspace in the tree is indexed by its depth i and the number of subspaces p below it. The two WPs orthogonal bases at a parent node (i, p) are defined by

$$\psi_{i+1}^{2p}(k) = \sum_{n=-\infty}^{\infty} h[n] \psi_i^p(k-2_n^i) \dots\dots\dots 1$$

and
$$\psi_{i+1}^{2p+1}(k) = \sum_{n=-\infty}^{\infty} g[n] \psi_i^p(k-2_n^i) \dots\dots\dots 2$$

where $h[n]$ is a low-pass filter and $g[n]$ is a high-pass filter given by

$$h[n] = \langle \psi_{i+1}^{2p}(u), \psi_i^p(u-2_n^i) \rangle \dots\dots\dots 3$$

And
$$g[n] = \langle \psi_{i+1}^{2p+1}(u), \psi_i^p(u-2_n^i) \rangle \dots\dots\dots 4$$

Thus, by using full i level WPs decomposition, a balanced binary tree structure is formed having more than $2^{2^{i-1}}$ orthogonal bases. Decomposition by WPs helps to partition the frequency axis at the higher frequency side into smaller bands that cannot be achieved by using discrete wavelet transform. WPs decomposition gives an over-complete set of basis, and the problem is to select the best set of basis for a given signal (in other words, selecting the best partitioning of the frequency axis).

For the Mel scale, the edge bandwidths were calculated based on [4]

$$y = 2595 \log_{10} \left(1 + \frac{f}{700} \right) \dots\dots\dots 5$$

where y is the Mel scale value and f is the bandwidth frequency.

Voice from the Texas Instruments TI46 database is sampled at 11,025 kHz, resulting in a 5.512 kHz bandwidth signal. Following a method similar to the Mel filter [3], a complete two-stage WP digestion is carried out first. This divides the frequency axis into 4 bands each with a bandwidth of 1378 Hz. The lower band from 0 to 1378 Hz is further decomposed by reapplying the full 3-step WP drop. This divides the 0 to 1378 Hz bandwidth into 8 subbands each 172 Hz wide. The 1378 to 2756 Hz waveband is further decomposed by applying WP decomposition at both levels, resulting in four 344 Hz subbands. Then select 2756 to 4134 Hz to complete the decomposition at one level. It provides two bands of 689 Hz each. The frequencies between 4134 and 5512 are further decomposed into a single level WP. In summary

4.15 Sub-Band Wavelet Packets Decomposition:

The frequency range sensitive to the human ear is registered as 1 kHz to 6 kHz, so the most sensitive frequency range is 1 kHz to 3 kHz. First, the frequency band is divided into three main bands. The main band is 0 to 1 kHz, so the third band is a wide frequency separation band of 3-5.5 kHz. The second band from 1 to 3 kHz is divided into a range of precise frequency bands very similar to the Mel scale.

First, a complete analysis of WP is carried out in step 4. This divides the frequency axis into 16 bands. For further decomposition, we select the frequency range 1034 to 3101 Hz, which is most sensitive to the human ear in this range. The 1034 to 1378 Hz band is further decomposed by reusing the complete WP drop of WP. This divides the 1034-1378 Hz band into two subbands each 172 Hz wide. The 1034 to 1207 Hz

frequency band is further decomposed by applying WP decomposition at one level, resulting in two 87 Hz subbands. Select the 1378 to 1723 Hz band, the 1723 to 2067 Hz band, and thus the 2067 to 2412 Hz band to complete the decomposition at one level. This provides 6 bands of 172Hz each. We select only the 3101 to 4134 Hz wavelength range in the 3101 to 5512 Hz wavelength range, which is relatively insensitive to the human ear, so we select the 4134 to 5512 Hz wavelength range due to the function indication. As a result, the following table is obtained. After performing decomposition from WP into a Mel filter and a WP subband, energy is calculated in each frequency band. Then the logarithm of the energy is calculated, giving a total of 16 coefficients as properties.

In order to induce a more robust acoustic function that is effective for automatic speech recognition systems, the static WP coefficient and the dynamic WP coefficient are identified as delta WP + WP. Where WP is the 16th order WP decomposition factor applied to the window number. Delta WP coefficients are calculated using the classical regression method. It is now a 32-dimensional vector space representing spoken language signals. LDA transformation with little loss information allows the use of a 16-dimensional functional space.

Modifications of the standard MFCC-based algorithm were aimed at improving performance by increasing the reliability, speed and efficiency of calculations. So this is an attempt to reduce the number of MIPs so that the algorithm is often considered for real-time applications. The failure of the speaker recognition system is that it is not robust enough to be considered commercially and its reliability must be established.

4.16 MODIFICATIONS:

Windowing instead of using the hamming window a more efficient Kaiser window is employed that's supported the concept of minimizing the mean square error rather than maximum error. Explanation of the kaiser window is given below. The Kaiser window has an adjustable parameter alpha which controls how quickly it approaches zero at the sides . it's defined by

$$\text{Kaiser}(x, \tau, \alpha) = \begin{cases} \frac{I_0(\alpha\sqrt{1-(x/\tau)^2})}{I_0(\alpha)} & |x| \leq \tau \\ 0 & \text{else} \end{cases}$$

where $I_0(x)$ is that the (for a definition, and a more detailed discussion. The upper alpha the narrower gets the window and thus, thanks to the not so severe truncation then, the less severe are the bumps above.

Goss used this window to get an adjustable gradient filter, but he used it only on sample points in order that, in between sample points, some quite interpolation has got to be performed, which he doesn't state explicitly. during this work, the Kaiser windowed cosec function are going to be wont to reconstruct gradients at arbitrary positions, which is, of course, more costly.

4.17 CHOICE OF INPUT REPRESENTATION

This section describes the various introductory explanations reviewed in this work. The basic assumption of the sample-based method is that speech and noise are almost additive in the sampled space. The technology chain for obtaining linked copies is generalized.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 SOFTWARE

Python may be a fantastic language for programming the Pi, because of its simple use and access to hardware, including GPIO.

Things you need are:

- Raspberry Pi
- Raspbian OS on SD card
- HDMI monitor
- Keyboard and mouse

5.1.1 Notes About Python Libraries

On Raspbian, Python programs that require external libraries may not work in all methods below. Additional libraries are often installed with the PIP, but are only displayed for programs running in a terminal window. This may be because the Python IDE program has its own local copy of Python. So, it's a good idea to use a terminal window to run Python programs that require external libraries installed along with the PIP.

5.1.2 Running Program via Terminal

As shown in fig 5.1, Python programs are often implemented using a terminal window, but if want to understand complete path about Python programs before opening the terminal. In this case open Python program is in Documents> Python> Main.py.

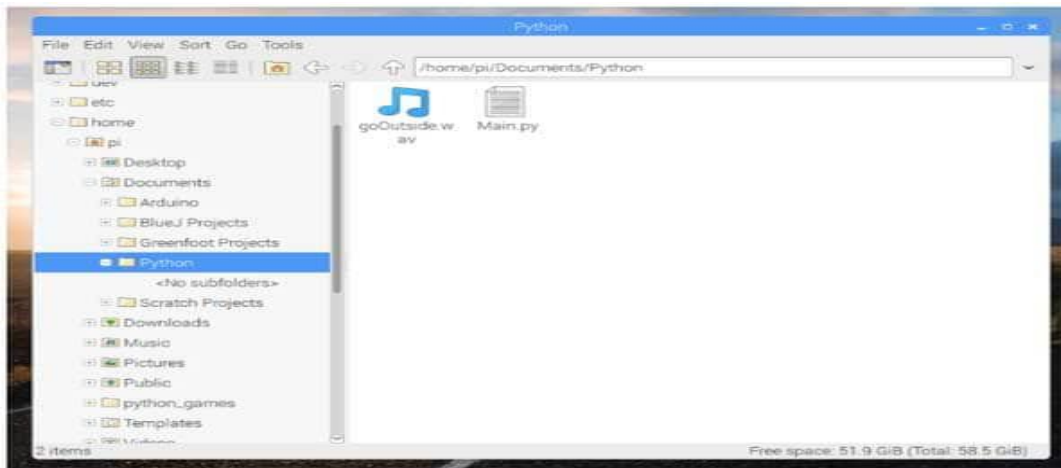


Fig 5.1 Terminal window

Open a terminal window and use the “cd” command to vary the working directory to the directory that contains your Python program. I used the subsequent command:

```
cd Documents/Python
```

To get a Python program from this directory, use the “dir.” command which can display all files and folders in this directory. If your Python program isn't in the list of files, you'll need to go back and find out where your Python program is.

Now start the Python program with the “python” command. This command runs the specified Python file after the command shown here. `python yourfilename.py`

Or, if your file contains spaces, it will be `python “your file name.py”`.

Raspbian comes with several IDEs for programming, and one of these IDEs is the official Python IDE. To open this, click the Raspbian logo and then navigate to Programming > Python 3 (IDLE).



Fig: 5.2 Opening a IDE

The fig 5.2 and 5.3 shows, with the IDE loaded, click File > Open and then navigate to your Python program

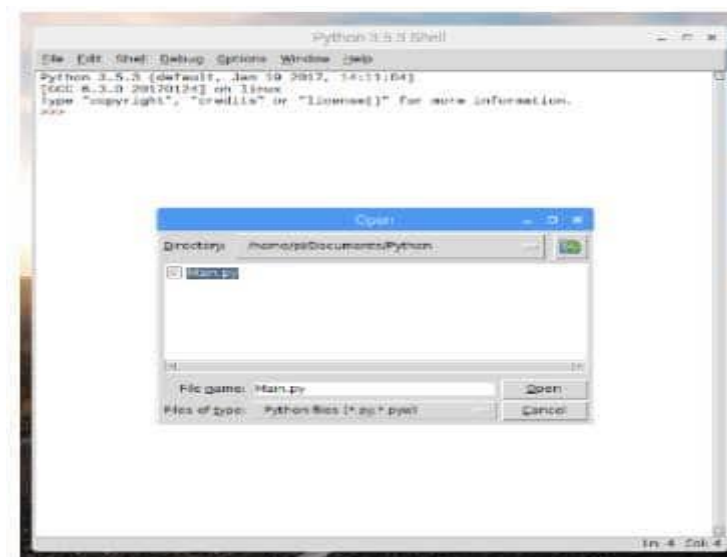


Fig: 5.3. Navigate to python program

When the file opens, you can run the program by clicking Run > Run Module or by pressing F5 on the keyboard.

Thonny is another Python development environment that includes several features, including a powerful debugger that you can use to walk through your code and keep track of variables. You can also use this IDE to run Python programs. First click on the Raspbian logo, then go to Programming> Thonny Python IDE.

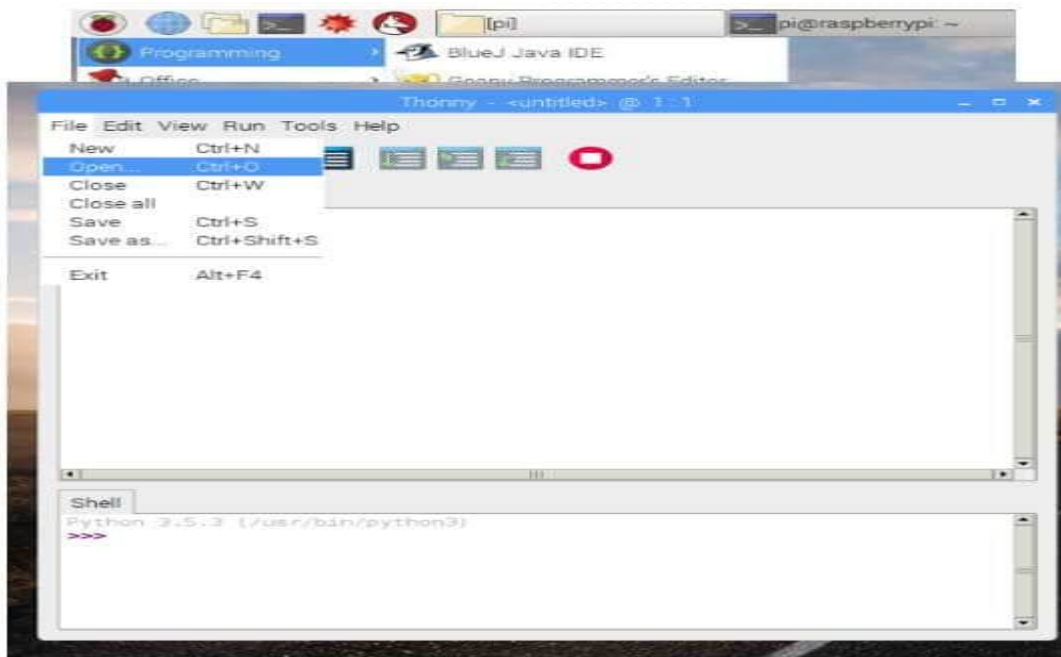


Fig :5.4 Environment to run the program

within the IDE, click File > Open then navigate to your Python program. With the program loaded, click Run > Run current script.

5.2 HARDWARE:

The results obtained using our proposed system and the pictures are also been mentioned

Figure 5.5 represents the prototype of smart controlling home appliances using raspberry pi.

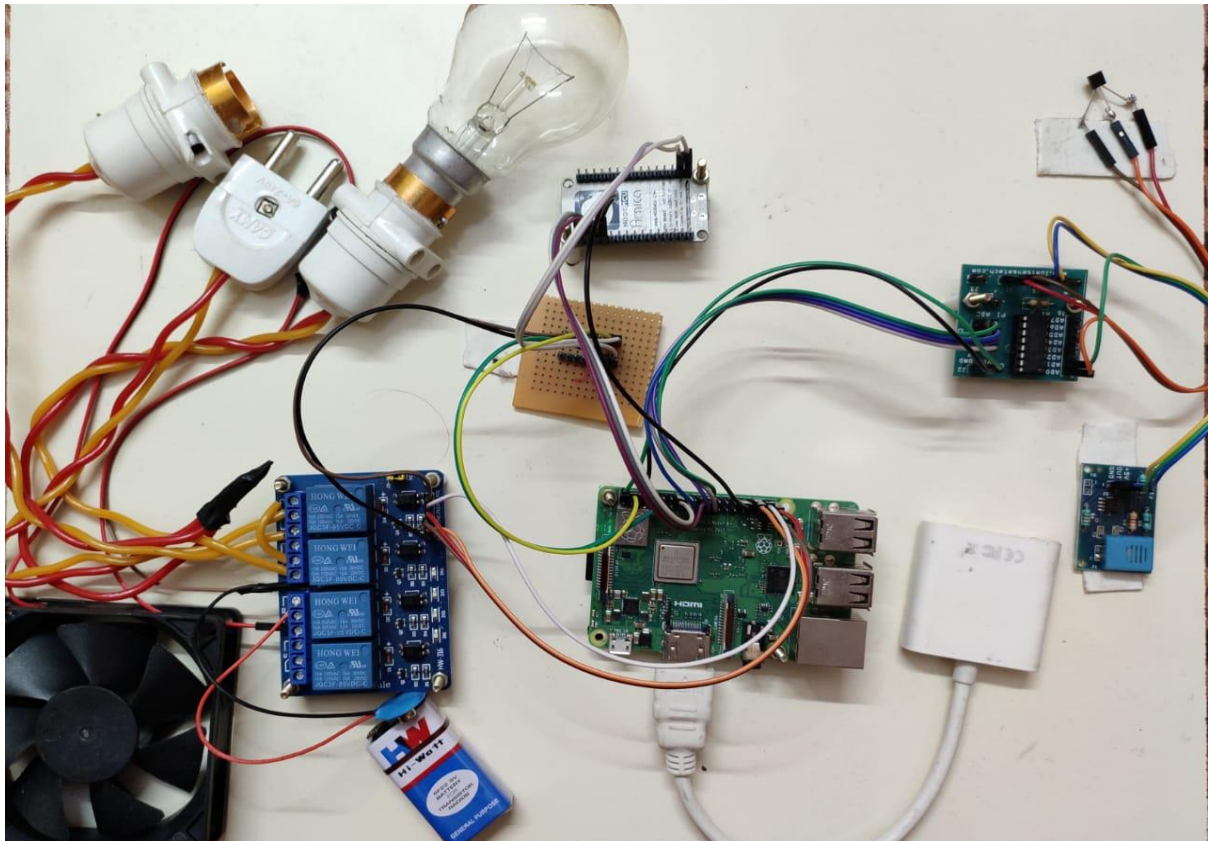


Fig.5.5 Hardware Equipment of Smartly Controlling Home Devices

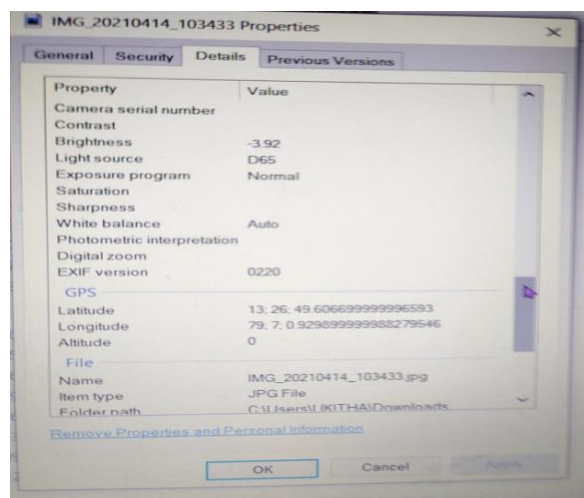


Fig: 5.6: Geotagged location

Home automation means controlling of home functions and features automatically and sometimes remotely using one or more computers. An automated home is also called as a smart home. Speech based home automation uses human voice commands to operate the electrical appliances in the home. It is very useful for human beings especially for elderly and physically handicapped people.

5.2.1 Raspberry Pi: The main technology is Raspberry Pi it is a credit sized computer in which main programming of automation is done using the powerful language of python. Here the inputs from NodeMCU is connected to raspberry pi GPIO PINS 23,24,25,12. fig 5.7 shows the GPIO pins of Pi and fig 5.8 shows the pin diagram of pi

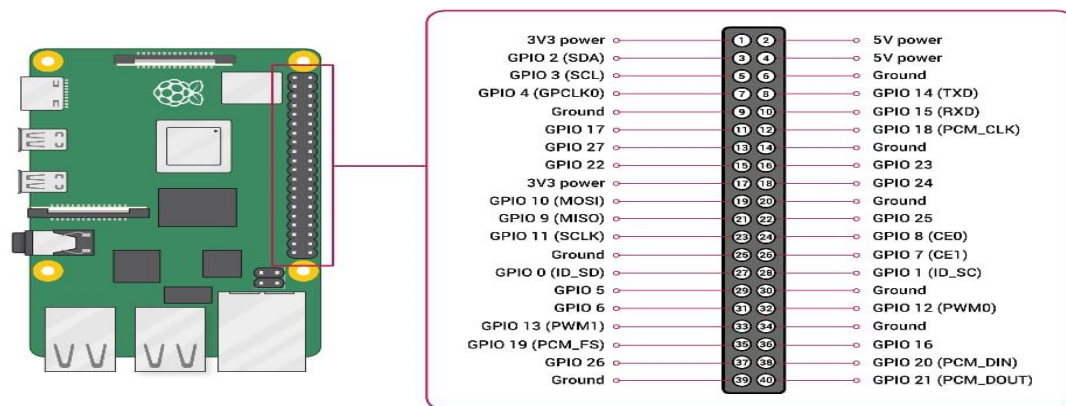


Fig:5.7: GPIO Pins of Raspberry Pi

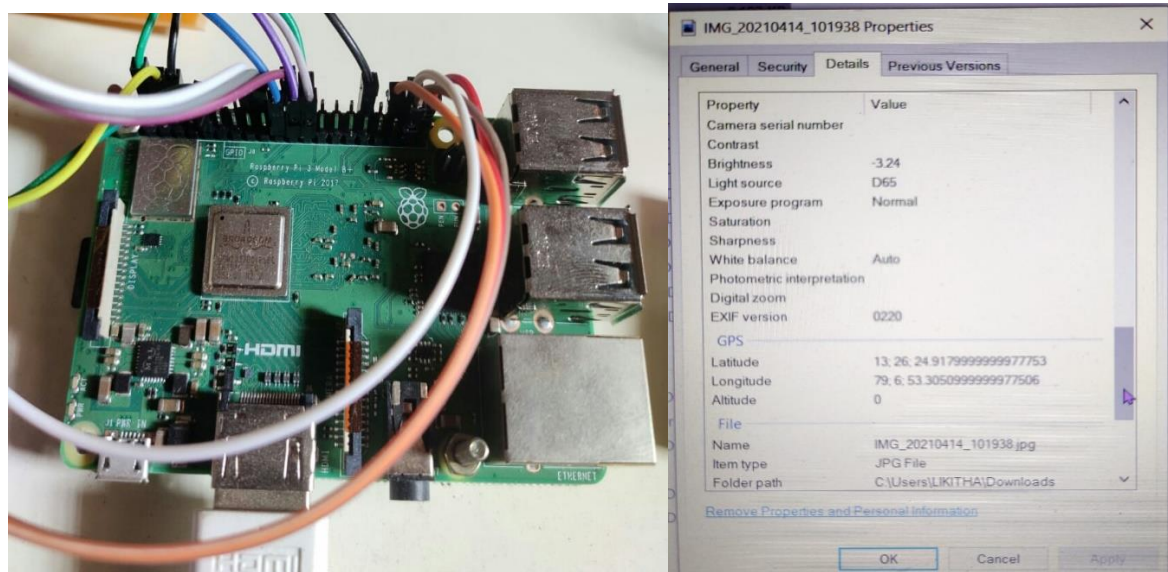


Fig: 5.8: pin diagram of Raspberry pi

5.2.2 channel 5v Relay Module: 2-Channel 4 Relay Module is a relay interface board, it can be controlled directly by a wide range of microcontrollers such as Arduino, Raspberry PI and ARM. We are connecting the output GPIO PINS 20,21,26,16 from Raspberry Pi to Relay IN1, IN2, IN3, IN4. Relay gives the indication when the outputs get turned on or off. The below fig 5.9 shows the four channel relay

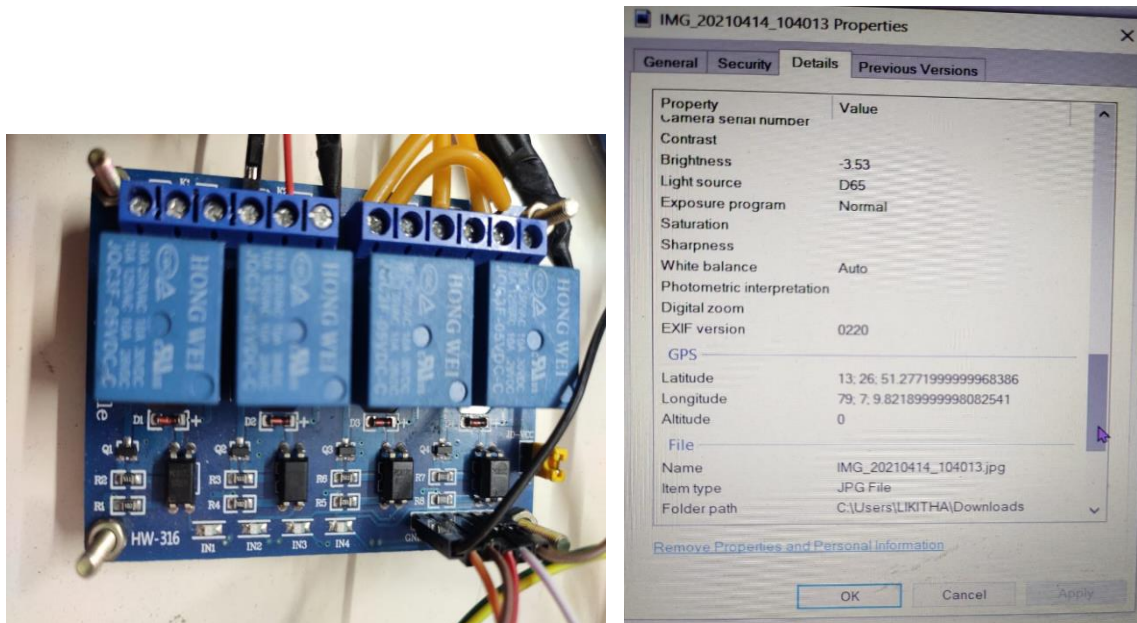


Fig :5.9: four channel relay

5.2.3 MCP3008 ADC: The MCP3008 is a low cost 8-channel 10-bit analog to digital converter. The precision of this ADC is like that of an Arduino Uno, and with 8 channels you can read quite a few analog signals from the Pi. This chip is a great option if you just need to read simple analog signals, like from a temperature or light sensor.

Here the pins are connected from temperature sensor and humidity sensor to ADC. Because at the initial stage sensors will be at analog state. So, converting into the digital form. The below fig 5.10 shows the ADC

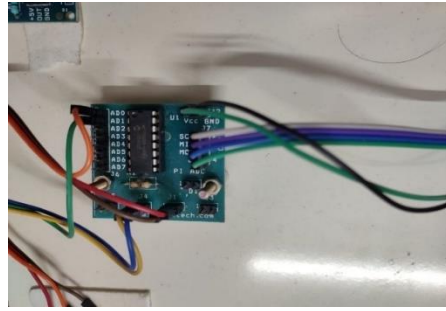


Fig :5.10: MCP3008 ADC

The Vcc from sensors is connected to ADC vcc and output is connected to DO, D1 pins. From ADC pins are connecting to Raspberry pi i.e. from SCLK to PI SCLK(GPIO PIN 11),MISO to PI MISO(GPIO PIN 9) ,MOSI to PI MOSI (GPIO PIN 10), CE to GPIO PIN 8.

5.2.4 NODEMCU: Pins from Node MCU are inputs pins. Node MCU is used for the purpose of controlling the outputs. The pins from Node MCU are connected to Raspberry Pi GPIO PINS 23,24,25,12.

5.3 STEPS OF OUTPUTS

5.3.1 VOICE REGONITION:

By giving the voice commands to the external devices like mobile phone the instructions will be taken by the raspberry pi. and then the output load ex: fan and light will get turned on as shown in fig 5.11 and 5.12

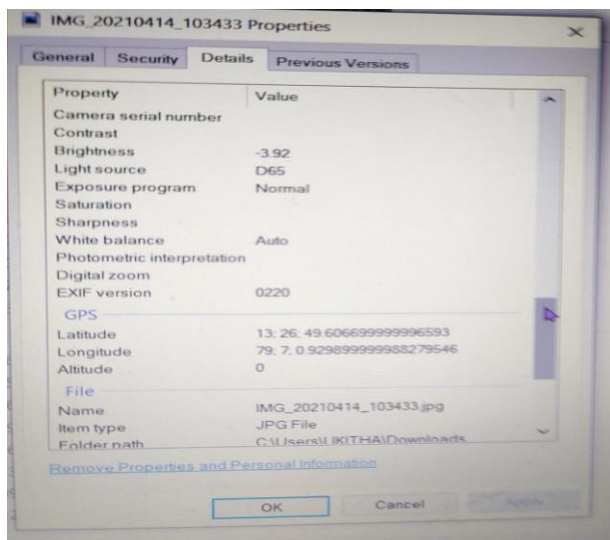


FIG:5.11: GEOTAGGED LOCATION

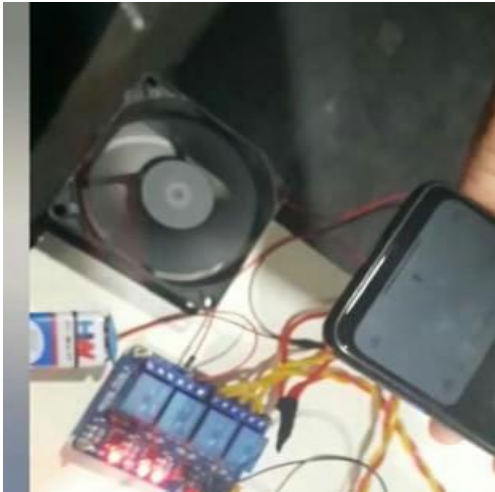


Fig:5.12: Fan gets turned on

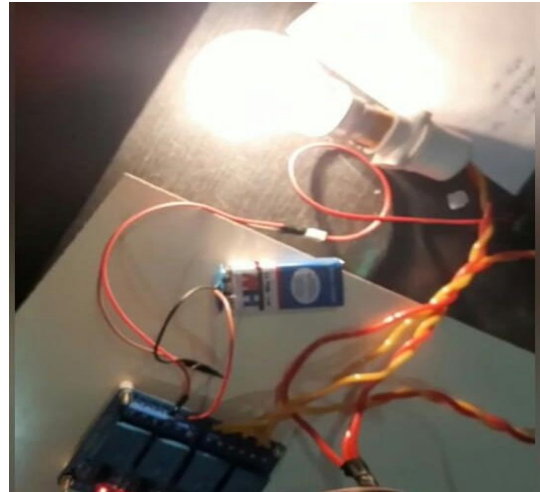


Fig:5.13: Bulb gets turned on

CHAPTER 6

CONCLUSIONS AND FUTURE SCOPE

6.1 CONCLUSIONS:

The home automation segment is still in its infancy and is growing in popularity, as all methods are cost-effective compared to regular products in the Google Home market and can be easily implemented with easily accessible hardware. Home automations is being popular every day. There are many possibilities that are discussed in full by four people below this thread. The biggest problems we faced were speech recognition in a noisy environment, training the speech recognition module, the number of commands stored in the speech recognition module database, and thus the response time or latency that the module and device inserted the code into. In general, these wrinkles are often corrected with further research, so the system is often made faster and more intuitive.

6.2 FUTURE SCOPE:

With the increasing demand for convenience and entertainment, home automation has moved one step further from becoming the most popular technology in the near future. We will now develop a wireless home automation system that receives voice commands from users and handles various devices in the house. Instead of buying the unique equipment needed for a variety of existing home automation systems, we decided to apply the system to the most important appliances in our home. The main purpose of this project is to make this technology more economical, making it more accessible to the public. In this project, we will be using the Raspberry Pie 3, which will help make the system wireless.

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IMPLEMENTATION OF SMARTLY CONTROLLING HOME DEVICES FOR PHYSICALLY CHALLENGED PEOPLE USING RASPBERRY PI

by Ss Qqq

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CHAPTER 1

INTRODUCTION

Home automation systems are becoming more popular every day because they are easy to use and deploy to a variety of applications. By combining speech recognition technology and home automation systems, the system is becoming more convenient and easier to use. Ordinary people need home automation for their needs and luxury, but it is a social problem for people with disabilities. This can be very helpful. There are several research and development projects for home automation systems. Because of the wireless communication, we had to use our mobile phone to remotely control our home appliances. In this prototype, we built a system that can control various household appliances using a mobile connection or a smartphone. It uses a microcontroller to control the device shutdown and closure, but there is no wired connection. Manual switches are not used here. Then the microcontroller controls the device and stores the information it receives. The proposed solution should be easy to use, simple, secure, reliable, and available on most smartphones.

Today's world can become a global hub with technological advances. The invention and advancement of technology made this possible. There is a big difference between traditional systems and smart home systems. There are many systems that are better than traditional systems today, but dealing with household appliances or machines with voice commands brings more luxury and usability. They knew that speech recognition is speech recognition, and it has also had good results. There are many processes and algorithms for transmitting micro signals from certain voice commands such as MFCC, HMM, etc. Emotion, voice identity, frequency, etc. This information can be obtained not only from a person's voice, but also from a person's voice frequency. Voice at about 300 and 3000 Hz.

Recently, home automation has appeared and has been developed on a large scale. Everything from gas lights and stoves to garage doors is often controlled by the central panel of the house or used wirelessly.

App or voice command. It has been a huge breakthrough in technology and has proven to be very useful for people with disabilities, such as large families or blind people.

It ranges from basic control of a switch that turns lights on and off, to creating a variety of home conditions supported by calls or moods, calling Uber taxis, handling HVAC systems at home, system audio visual entertainment and more. Advanced technical features.

Home automation isn't just a luxury, it's well worth it for some population groups such as paralysis, the elderly and the disabled. Home automation systems make them somewhat independent and self-sufficient. Current leaders in the home automation market are Google Home, Amazon Echo, Alexa, Wink Hub, Logitech Harmony and Apple Home Kit. These are all just control systems and you'll need to buy a device that's compatible with home automation to get the job done. Examples of such devices are Phillips Hue, Nest Thermostat, Canary, Sentry, Google Cast, and Avion. Studies have not used such devices. Instead, they built their own test network of devices with cost-effective components such as microcontrollers and relays that run their respective algorithms.

Home automation can be a new and relatively widespread concept using a variety of technologies. If you want to compare different ways of implementing the same module to each other, you need to have a well-defined performance metric and a way to measure it. The following performance metrics were selected for this evaluation.

Flexibility: Home automation systems need to be tailored to different users and their requirements. Be prepared to recognize voice commands from any user, regardless of age, gender, intonation or pitch. Be prepared to work with the equipment you already own, so you don't have to purchase any additional equipment. The system should have multiple interfaces so that users can choose the one that works best for them. The interface can include a simple voice command interface, a mobile device management application, or a central hub with one of these options.

2. Reliability: Home automation system must be solid. It should work even in ideal conditions. The speech recognition module should be ready to recognize commands even when the user is far away from the microphone. Ambient and background noise should minimize the impact on performance. Let's say a consumer wants to order by placing a microphone in a room with a high fan and TV turned on. Expecting a TV to migrate when a consumer wants to offer an order is inappropriate, so an honest home

automation system must take all these factors into account and find a way to deal with it.

3. Security: Modern home automation is also used to lock and unlock the doors of your home. Obviously, it can be a serious threat to owners if you don't take security into account when designing your system. If your system is on a wireless network, make sure the channel is secure before sending the transmission. It is best to use a bottom-up system that focuses on customer safety. This measure also considers systems that provide additional features such as intrusion detection, smart alerts, security lockout, and more.

4. Cost: The most important factor in determining the success or failure of a home automation system is the cost that users have to pay. The system may have both the latest bells and whistles, but if you can't afford it, you won't give up. The cost includes only the initial cost of the product and the long-term and installation costs. It may seem cheap, but add value when you think about the cost of an extra device you want to buy near the hub. In addition, if the system is wired, you need to take into account the work required for installation.

5. Response time: Nowadays everyone is used to getting immediate results, so for a home automation system to be very useful, it has to respond to inputs immediately. Some algorithms give excellent results in recognizing commands, but the timing is not perfect. The ideal algorithm is one that finds the perfect balance between processing power and response time.

CHAPTER 2

LITERATURE SURVEY

Mohamed S. Musbah [2016] uses a client/server model and is designed to regulate consumer electronics with speech recognition technology. There are three main components of the model. i) Front-end user device: Any mobile device, such as a laptop or smartphone, often with an honest microphone and voice recognition function. The device used in this Windows 7 computer has Windows 7 speech recognition software.

ii) Home Server: Refers to a laptop or computer with a Wi-Fi adapter and Windows operating system (Windows XP or later).

iii) User Unit: It consists of two parts: an Arduino Merge to process incoming orders and thus a home appliance. The devices involved are DC lighting and LED lighting. Basically, the interface device consists of two voice commands: start listening and turn on/off. The device application connects to the home server via a peer-to-peer wireless connection (TCP/IP transmission protocol). The home server gradually checks the connection, receives commands from the front interface, opens a connection to the microcontroller, and then passes the command. Now the Arduino merger does this command depending on the target device. The operation is shown in Figure 2.1.

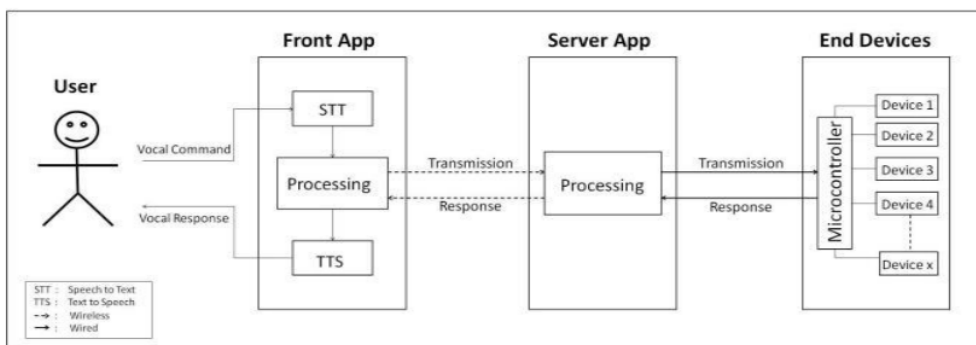


Fig:2.1: Working of client/server model

Sushant Kumar and S.S.Solanki [2016] approaches home automation through speech recognition and interface management. Both functions are covered by a smartphone. The interfaces communicate with each other via efficient Bluetooth wireless communication.

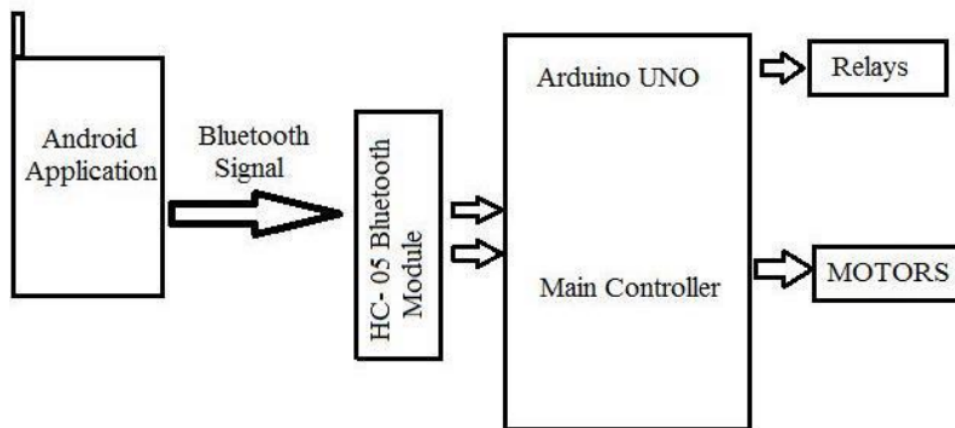
End-user controls include the Google Voice API and AMR voice applications that understand voice commands. Arduino Bluetooth Control is a touch sensitive application that supports up to 8 devices.

i) AMR negative:

- a) Connect Bluetooth via APP.
- b) Tap the microphone icon and choose a command.
- c) HC05 takes the order and sends it to the Arduino.
- d) Arduino does its work through relays.

ii) Arduino control application:

- a) Connect Bluetooth via APP.
- b) Press ON/OFF for the specified device.
- c) APP sends the correct command to HC05. Arduino processes and executes commands.



7

Fig:2.2: System Architecture

Yash Mittal and Sonal Sharma [2015] It describes the development of a home automation system that sends appropriate commands to the device using a speech recognition module and a special hardware module for the Arduino Uno microcontroller. Voice commands are divided into 5 groups with 7 commands in each group. Command group: access, security, fans, lighting and equipment. To register successfully, the user must enter the group name and then enter the command.

The speech recognition module was trained with the voices of 5 male and 5 female users. This allows the system to recognize voice commands regardless of the user's age, gender, accent and microphone distance.

To determine the simplest location to place an intermediate microphone, a histogram of the typical number of attempts required to successfully identify an order at a different distance from the microphone is generated.

Key steps for this Implementation:

- a) Speech recognition using special modules and microphones.
- b) Interpret the commands using a microcontroller that works with the speech recognition module.
- c) Send control signals to command-based devices.

Access groups are used to open or close doors and use NFC. Sunshine and Fan Group generally handle lighting and fans throughout the house. The utility group handles sprinklers and blinds. Security groups are used to trigger and activate alarms.

The main issue discussed at this event was how to adjust the bed in multiple places by voice command. People with disabilities couldn't afford a definitive label like Google Home, so the system described here used an easily accessible device like this:

- i) Arduino Uno microcontroller
- ii) relay circuit
- iii) adjustable wooden bed
- iv) Electronic speech recognition module

Home automation systems are mostly considered a luxury, and in addition to this particular demographic help, they help a lot because disabled people do not help

anyone and become a little more independent when adjusting their beds on their own. To maintain cost efficiency, an Arduino microcontroller is used instead of a computer.

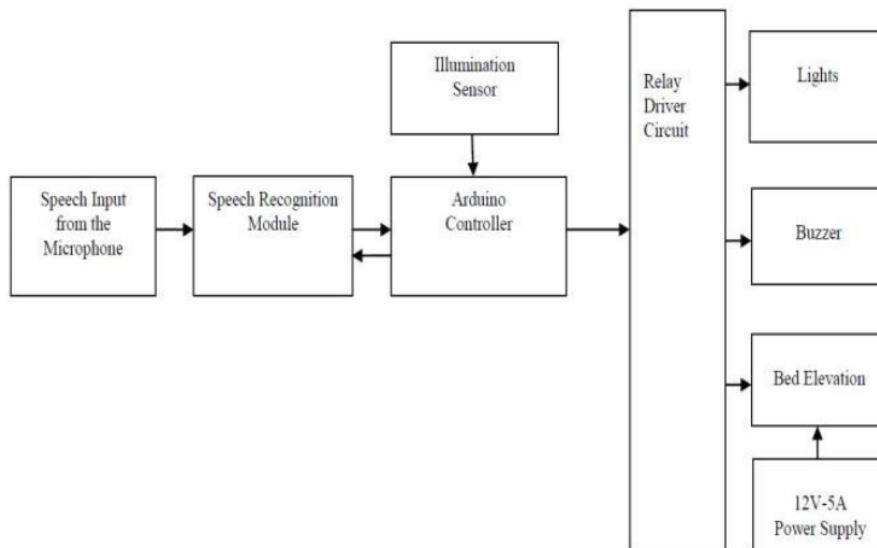


Fig:2.3: Block diagram of voice recognition based home automation system.

From figure 2.3 shows essential functioning of the system. The speech input is taken via a microphone with a 3.5mm jack. This input is then transported to the voice recognition module which is the Electro use Voice Recognition Module v3. The voice recognition module can't be used because it is and has got to be trained first. When this is detected, the voice input is compared to the previously saved example and then passed to the Arduino to execute the command. The module can store up to 80 commands (1500ms each).

Once transferred to the Arduino Uno, a valid operation will be performed and transferred to the required device via transfer. The Arduino has C++ instructions coded with the Arduino IDE. The switching circuit is connected to the lights, bed and buzzer. Light sensors are used to ensure that the room is properly lit and to take appropriate action. If you don't have adequate lighting, it will turn on, and if there is enough sunlight, it will change the lighting to save energy.

Since this system is specially designed for people with disabilities, the Arduino will contact the buzzer to inform the caregiver or anyone concerned about the individual what they need and more.

Because the bed is easy to lift, it is made of wood, not metal. Motor connections that require 12VDC and 5A AC power are used as shown. Beds are often adjusted to three positions.

i) Sleeping position (180 degrees relative to the ground).

ii) Idle position (150 degrees to the ground).

iii) Sitting position (135 degrees to the ground).

Jack lift and engine weighing up to 1500 kg. Finally, they discussed the accuracy and recognition of voice commands. It was concluded that the accuracy is 80% in quiet conditions and 60% in noisy conditions.

Nguyen [2007] proposed a home appliance system, and the heating wires and power cables are often used to control the home appliance system. This method helps users to check device status and remote control from anywhere. And often this is done over the phone or the Internet. A simple way to retrofit home appliances is provided.

Haque [2006] proposed a system that handles home appliances with a personal computer. This technology was developed using Visual Basic 6.0 as the programming language and using the Microsoft speech recognition machine. Tools are often controlled by timers or voice commands.

Mohamed Sikander Hayat Khiyal et al. [2009] has developed a remote home appliance management system that is primarily useful for non-consignment caregivers. The main purpose of this system is to provide security and control of household appliances such as air conditioners, lights and alarms. The system implements SMS technology that cannot transmit data from sender to receiver over GSM network. One or more computers often control household appliances. The system sends a warning SMS message to the authenticated user when an intrusion is detected, and the user can consistently respond to victory. In addition, users can send SMS to the system to find and monitor the health of household appliances.

Jawarkar [2007] proposed software for mobile phone and computer communication. The UART 16550A is programmed with an appropriate control format to support AT commands. The system's mobile phone is used to receive and execute immediate user commands and notify the user of input changes via SMS. The system can also

send SMS to designated mobile users when the state of the input port changes. This method is not suitable for time-critical systems.

Prabhakar V. Mhadse et al. [2013] suggested building and implementing a home automation system with speech recognition support. Advanced prototypes can control electrical equipment in your home or office. The system implements automatic speech recognition through MATLAB speech processor and coding.

S.R. Suralkar [2013] Building and implementing a speech recognition automation system through speech recognition through wireless communication. Advanced prototypes can wirelessly control electrical appliances in your home or office. The system implements automatic speech recognition using a speech processor and speech recognition by encoding MATLAB with the MFCC algorithm.

2.1 Google features

2.1.1 Problems with Google Home Automation System:

John J. Greichen's article discussed the initial challenges of home automation systems. These include high manufacturing costs, high development costs, high installation costs, additional service and support costs, lack of home automation standards, and consumer ignorance of Google Home.

In recent years, wireless systems such as telecommunications have become more popular in home networks. In addition, the use of wireless technology in an automated system provides many benefits that can only be achieved through a wired network.

- Reduced installation costs.
- No cables are required, greatly reducing installation costs.
- Internet connection

Use your phone to manage your smart home and manage your devices from anywhere in the world.

- Scalability

The wireless comparison feature is especially useful when network expansion is critical due to new or changing requirements.

- security
- Easily add devices to create an integrated smart home security system, and the built-in security system ensures the integrity of your smart home.

CHAPTER 3

EXISTING SYSTEM

3.1 Bluetooth based home automation system using cell phones:

In a Bluetooth-based home automation system, appliances are connected to a BT Arduino board at an input port with a relay. BT's Arduino card program is based on an interactive C language for advanced microcontrollers. The connection is made via Bluetooth. Password protection is provided so that only authenticated users can access the device. A wireless Bluetooth connection is established between the BT's Arduino board and the phone. The system uses a python script that can be installed in any Symbian OS environment and is portable. The circuit is designed and implemented to receive phone feedback indicating device status.

3.2 Zigbee based home automation system using cell phones:

Designed and implemented a system using Zigbee for home appliance monitoring and management. Device performance is recorded and maintained by the network coordinator.

For this the Wi-Fi network is employed, which uses the four-switch port standard wireless ADSL modern router. SSID and Wi-Fi network security installation are pre-configured. The message is first processed by the virtual home algorithm for security purposes, and once declared secure, it is re-encrypted and sent to critical network devices in the home. Through the Zigbee network, Zigbee's puzzle sent a message to the top. Security for all messages received by the virtual house algorithm. Precise obsession with installing Zigbee communication system to reduce system cost.

3.3 GSM based home automation system using cell phones:

Thanks to mobile communications and GSM technology, GSM-based home automation is drawing attention from researchers. SMS-based home automation, GPRS-based home automation, and DTMF-based home automation are the options discussed here primarily for GSM communications. The figure 3.1 shows a logical diagram of A. Alheraish's work, showing how sensors and home devices interact with

the home network and exchange data via GSM and Subscriber Identification Module (SIM). The system uses a transformer that converts the functions of the machine into electrical signals that correspond to microcontrollers. The system's sensors convert physical properties such as sound, temperature, and humidity into different magnitudes, such as voltage. The microcontroller analyzes all signals and converts them into sequences recognized by the GSM module. Select the appropriate communication mode for SMS, GPRS and DTFC supported by commands received from the GSM module.

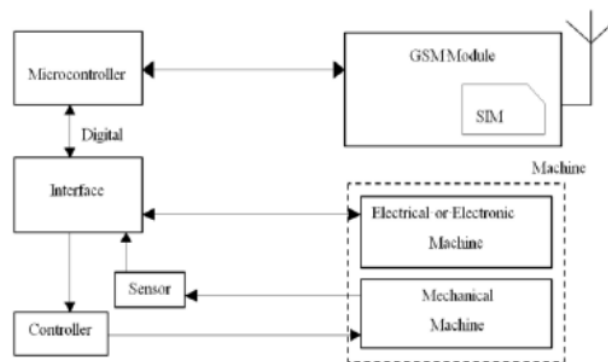


Fig:3.1: Mobile-based home automation

3.4 Wi-Fi based home automation system using cell phones:

As can be seen in Figure 3.2, a Wi-Fi based home automation system mainly consists of three modules: a server, a hardware interface module and a software package. The figure shows the layout of the system model. Wi-Fi technology is used on the server and hardware interface to communicate with each other, and that technology is used on the server side to log into web applications. Since the server is connected to the internet, remote users can access the web server application over the internet using a compatible web browser. The latest home automation software is divided into server application software and microcontroller firmware (Arduino). The Arduino software, built using C language, using IDE comes with the microcontroller itself. Arduino software is culpable for gathering events from connected sensors, then applies action to actuators and pre-programed within the server. Another job is to report the and record the history within the server DB. The server application software package for

the proposed home automation system, may be a web based application built using asp.net. The server application software is often accessed from internal network or from internet if the server has real IP on the web using any internet navigator supports asp.net technology. Server application software is culpable of, maintain the entire home automation system, setup, configuration. Server use database to stay log of home automation system components, elect to use XML files to save lots of system log.



2 Fig :3.2: Wi-fi based home automation

3.5 Home automation using RF module:

An important goal of a home automation system is to create a home automation system using radio frequency remote control tools. Technology is now accelerating, so homes are getting smarter. Modern homes are deliberately moving from switches to centralized systems containing RF controlled switches. Traditional wall switches placed in different parts of the home today make it difficult for major consumers to move around and adapt and use. It is also a bigger problem for the elderly or disabled. Home automation with the help of a remote controller realizes a cleaner solution with the help of RF technology. To do this, the RF remote control is integrated with the microcontroller on the transmitter side, turning the signal on or off to the receiver to which the device is connected. When using the transmitter's dedicated remote shutter, it is often turned on and off using hundreds of wireless technologies around the world.

3.6 Home automation with Android ADK:

The home device is connected to the ADK, so a connection is established between the Android device and the ADK. The home appliance is connected to the I/O board (EMBEDDED SYSTEM) port and the current status is transmitted to the ADK. The microcontroller card (Arduino ADK) is based on the ATmega2560. This is a USB host connection for Android phones based on the MAX3421e chip. The two main features of the Android 2.0 Open Access Protocol (AOAP) are audio output from Android devices to components and component support. Sent from one or more HID (Human Interface Device) devices to your Android device. It depends on the Android and Arduino platforms, both are FOSS (Free Open Source Software). When you activate the security system motion sensor, it detects unauthorized activity and automatically detects you by the phone or security system.

3.7 Cloud Based home automation system:

Home automation with a cloud system focuses on designing and implementing a home portal that triggers to collect data from consumer electronics and then send the data to a cloud server and store it in the Hadoop distributed file system. This is a non-process using MapReduce. Perform monitoring tasks for remote users. Today's home automation systems are constantly developing resilience using existing features that meet the growing interests of people. This is the design and development of a home automation system that uses cloud computing as a service. The current system consists of three important blocks. The main part is the cloud server that processes and monitors the client and user information and information, and thus the state of the device. The hardware interface module is the second part that activates that connection to the actuator. Sensory devices that provide physical services. The last part is a home server that creates hardware devices and provides interfaces. This focus is on building online services into the cloud you need to ensure the security, storage and availability of your information. This system is cost-effective, reliable and expensive, which ensures the security of home automation systems for the whole family. The system contains different client modules for different platforms.

3.8 Cloud server:

The cloud server can be a dedicated central server that implements services as opposed to sub-modules. The central server is the information system, respiratory protection and brain. Works three-module system, web configuration tool and three connections for mobile devices. The server evaluates the information it fetches from home, sends its presence to the mobile device, and vice versa.

1. A database is managing by the server and its status gets updated as per the changes done reception end.
2. Embedded Program for Hardware Circuit Microcontroller, and
3. Internet client for each desktop or mobile phone.

3.9 Raspberry pie home automation with wireless sensors using smart phone:

Home Automation System has been developed with Raspberry Pi by reading the algorithm and subject of E-mail. The Raspberry Pi is an efficient platform for implementing powerful and cost-effective smart home automation. Home automation with the Raspberry Pi is superior to other home automation methods for a number of reasons. For example, DTMF (Dual Tone Frequency) using home automation can be a major drawback regardless of how the fare solution provides. In home automation using a web server, scheduling of the web server is rejected, and the already installed web server service provided by Gmail is used, so the necessary memory space is required by this method. LEDs are used to recognize switching behaviour. This method is effective and versatile online.

3.10 Sending Commands to the Raspberry Pi:

A script running on the server side of a laptop or internet server receives commands for user input and sends them to the client (raspberry pi) accordingly. In this case, we use these input commands to display the lighting on/off pressure. When the server script issues a command to display the ON light, the information and data are sent to the Raspberry Pi, and the GPIO output activates the relay. The system can send continuous updates to the server to see if the sunlight is on or off.

All you have to do is run a script that can use a PIR motion sensor to send an information signal to the Raspberry Pi, read the sensor using the GPIO pins, and send the information to a public system via IoT platform. The IoT console will then see it.

3.11 Wireless Home Automation system using IoT:

This technology automatically adjusts basic controls and home performance over the Internet from anywhere in the world using a mobile device or computer. Automatic homes are sometimes referred to as smart homes. Designed to save electricity and human energy. The proposed system may be a decentralized home automation system, and includes a server. Wi-Fi module, sensor. The server monitors and monitors various sensors and can be easily configured to handle multiple hardware interface modules (sensors). The Arduino card with built-in Wi-Fi module acts as a web server. The automation system can be accessed from an online browser on the local computer, often using the server's IP address, or remotely from any computer or mobile device connected to the Internet with the correct browser through the server. Network infrastructure that connects servers and sensors with Wi-Fi technology. Wi-Fi was chosen to improve system security (using a secure Wi-Fi connection) and increase the mobility and scalability of the system.

CHAPTER 4

PROPOSED SYSTEM

The main purpose of this project is to create a Raspberry Pi voice home automation system that listens, responds and controls AC power based on voice commands. Here, the app and phone connect to the Raspberry Pi. So the device is often controlled through one of the inputs. Also, you can always turn on the system while waiting for a specific voice command. Where pi is programmed to respond to the keyword "hello", then turns the light on or off.

4.1 PROPOSED METHODOLOGY:

This prototype created a Raspberry-Pi-based voice management home automation system that can listen, respond and control AC power based on voice commands. Here, the app and phone connect to the Raspberry Pi. Devices are often controlled through one of the inputs. Also, the system often always stops and waits for certain voice commands. Where pi is programmed to respond to the keyword "hello", then turns the light on or off.

A prototype of the proposed home automation system was implemented and tested on equipment and provided accurate and expected results. Pressing the microphone button gives you voice commands to turn that device on or off. The speech recognizer listens to what you say and translates it into the most appropriate word or text. Figure 4.1 below shows the proposed system.

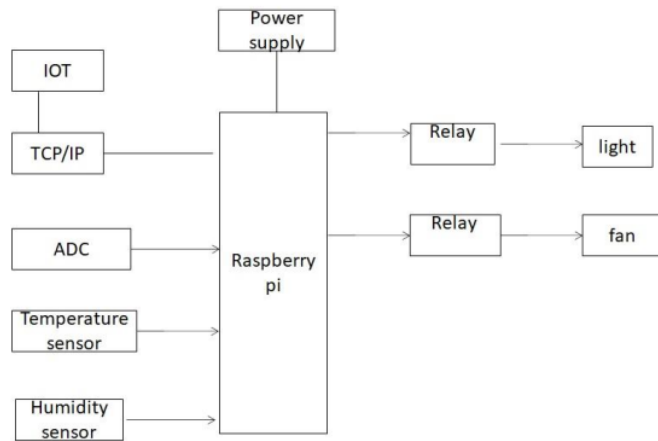


Fig:4.1 : Block diagram of proposed system

Wireless sensor (WSN) networks offer great advantages in modern life. It has been distributed worldwide in recent years. Wireless networks replace networks of things. Internet of Things(IoT) can be things or things like RFID tags, sensors, actuators, mobile phones, etc. These objects will be surrounded within a network where information and communication are not visible from the environment. ... Since the introduction of IoT technology for smart home implementation, smart home research has undergone major changes. Smart homes include security, treatment, treatment, entertainment and business receptions. When equipment prices drop, you can create a smarter home with the help of sensors. At the same time, more and more people consider home security more important than others. Some of the work has been created by various research groups that can be applied in several fields. Some of the comparable operations are described below. Research provides help and support to people with disabilities through the Internet of Things (IoT). In a smart home architecture, all IoT data is in the cloud, so the cloud must be large enough, so the wireless environment must be stable. This application requires high quality hardware and internet. It is an intelligent video analysis system for home security. The biggest achievement of this technology is behavioural awareness. In this case, we can only analyse the video, but our goal is to trigger an alarm based on the information collected by the sensor. This video is just a record of the evidence. In fact, the alarm is different

from the above system. The system is building a new architecture and communication model to meet the requirements of smart home monitoring systems. Our systems work as connected media connecting internal and external networks. It's asynchronous when the server is there. The requirements for hardware and internet quality are as follows. Our cloud service requires less space and only alarm data is sent to the server.

4.2 System model:

Calculating the environment around the individual on the day of the gift can broaden and calm your professional skills. There have been tremendous advances in the field of human standards and people are often under construction. Now you know that the majority of the population will be obsessed with smartphones and devices all day long. After that, using the phone to a friend often improves everyday family problems using a mobile phone. The Home Automation System (HAS) is designed for Android devices and acts as a mechanization environment for an 8-bit microcontroller with a Bluetooth Pi interface, Arduino, and Raspberry Pi. It is programmed to control various household appliances such as lamps and fans with an on/off switch. It shows an accounting methodology for managing a suite of equipment that can replace traditional switches. It uses the most well-known and efficient innovations for long distance communication. Bluetooth is used to computerize the framework. The HAS framework for Raspberry Pi clients can be a step in simplifying allocation by managing one or more individual computers in each home environment. Throughout the study, a home automation system (HAS) with Raspberry pi Studio was built, and now there is an updated Android UI (User Interface) application based on a Bluetooth-enabled Android smartphone and a microcontroller-based transfer driver 8-bit that supports Bluetooth. There is. Serial module that can communicate with household appliances via Bluetooth. The structure depends on serial communication.

Remote communication via Bluetooth as a query environment to enable post-machine control. This structure ensures secure data transactions by remote communication. This is also a typical ON/OFF arrangement for the motor under the pin.

The Raspberry Pi can be a cheap credit card computer that connects to a computer or TV screen and uses a standard keyboard and mouse. It's a compact device that allows people of all ages to learn a computer and find a way to program in languages like Scratch and Python. From web browsing and HD video playback to spreadsheets,

word processing and gaming, you can do everything you would expect from a desktop computer. Powers the microcontroller, connects to a computer with a USB cable, or connects to an AC-DC adapter. The Raspberry Pi circuit acts as an interface between the software and the project hardware. The speech module sends text to the Raspberry Pi interface. Text is mapped to various combinations of predefined text to turn the device on or off. The device name and on/off commands are saved as predefined commands. For example, to change love, the user has to say "fan on", to change, the user has to say "fan off". The device connects to the Raspberry Pi pins through a swap card. When matching personally identifiable text, the number is output high or low to turn the device on and off.

In order to download software from the computer, the card has a serial communication interface including USB. The Raspberry Pi platform allows the Raspbian OS environment to interact with the device. The hardware design specifications are widely available, so anyone can program a Raspberry Pi card.

4.3 Micro Controller:

A microcontroller can be a computer with a dedicated chip that performs tasks and runs specific applications. Raspberry Pi is used as a microcontroller to feed the signal to the relay and receive the signal from an external voice device. A 5V DC power supply is required.



Fig:4.2: Microcontroller

4.4 DC RELAYS:

Relays are mechanical devices that are usually driven by electric current. Current flowing in one circuit opens or closes the other. Introducing a voice-controlled wireless smart home system for the elderly and disabled. The concept of handling

household appliances with human voices is interesting. The proposed system consists of two main components: (a) a speech recognition system and (b) a wireless system. This home appliance management tool uses a voice-controlled Android app. With the increasing use of PCs, computers, Internet, mobile and wireless technologies, it has become easier for users to access and control devices remotely. Much research has been conducted and many solutions have been proposed for remote access to household appliances. Some used the Internet, wireless technology to talk and control home appliances, while others used Bluetooth and GSM technologies to handle them. The biggest goal of our system is to create the perfect companion for someone. In general, home automation research focuses on a number of needs, such as applications that provide smart and insightful needs, some highlighting special needs such as the elderly and the disabled. This system can turn any device on and off. Arduino-based home appliances with voice control using Bluetooth reports aims to create a system that can respond to voice commands in the home and check the on/off status of home appliances such as lamps, fans, and televisions. The system should be relatively inexpensive and easy to install and use. Users should be ready to use any equipment anywhere in the house, so a wireless controller should be provided. This report shows a system that can be integrated into a single portable device to wirelessly control lights, fans, air conditioners, TVs, and more, and turn all connected devices on and off. It is an integrated platform for home security, monitoring and automation with microcontrollers. The Bluetooth model connects to the control device and receives the signal sent by the Android app. Voice commands are freely transmitted to the control unit with on/off loads. The transmitted voice commands are converted to binary on the microcontroller. The microcontroller block makes decisions and executes them.

4.5 WORKING PRINCIPLE:

4.5.1 ARCHITECTURE OF IOT:

As can be seen in Figure 4.3, the IoT architecture is represented by three layers: i) the awareness layer, ii) the network layer, and iii) the application layer. The

perception layer is two-dimensional and can generally be divided into ". Both. "The perception of control and sublimation perception level function depends on the squadron. Perceptual control enables intelligent perception of the physical world with automatic recognition, data collection, processing, and control using a second board. It is better to communicate with the application and boards connected to the network layer for physical objects. Layer by communication module. The network layer includes all forms of communication and core networks. If information transmission, routing, and control are often implemented in the core network, the communication network is tested as an access network. The device layer offers many intelligent definition applications that are active in the industry. As a result, IoT technology is often combined with all kinds of economic activity. The device layer contains intermediate application/software infrastructure and terminal blocks. The close integration of IoT technology and industry through the solidarity layer will have a major impact on the economy and society.

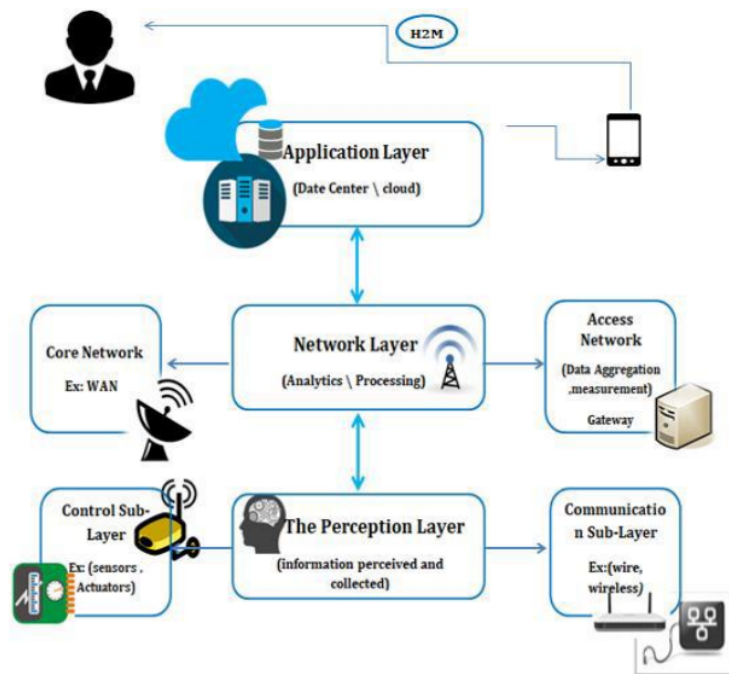
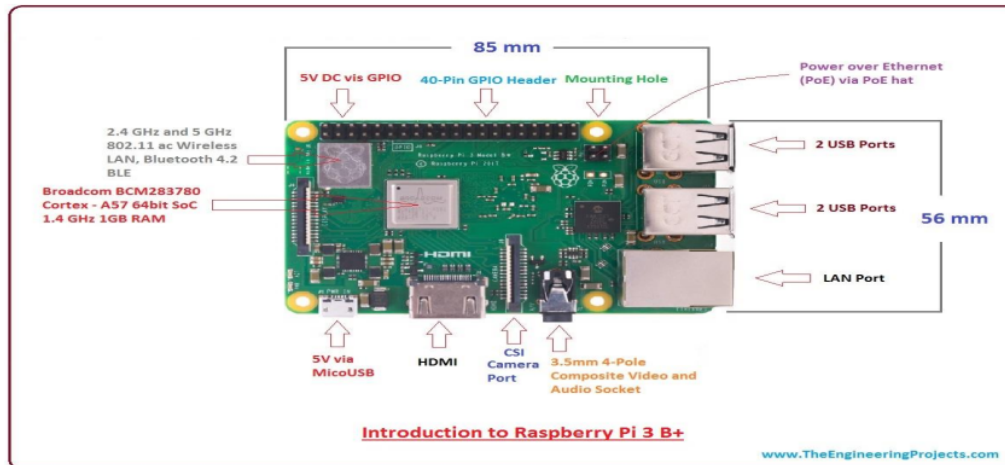


Fig: 4.3: Architecture of IOT

4.6 ARCHITECTURE OF RASPBERRY PI 3:

¹⁴ The Raspberry Pi 3 Model B+ is that the final revision within the Raspberry Pi 3 range.

- ⁴ Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC, 1.4GHz
- 1GB LPDDR2 SDRAM
- 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE
- Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)
- Extended 40-pin GPIO header
- Full-size HDMI
- 4 USB 2.0 ports
- CSI camera port for connecting a Raspberry Pi camera
- DSI display port for connecting a Raspberry Pi touchscreen display
- 4-pole stereo output and composite video port
- Micro SD port for loading your OS and storing data
- 5V/2.5A DC power input
- Power-over-Ethernet(PoE) support (requires separate PoE HAT).



5

Fig :4.4: Architecture of raspberry pi 3 B+

4.7 Big Analog Data:

Analog data represents the natural and physical worlds and exists everywhere. In other words, it's part of everything. Light, sound, temperature, voltage, radio signal, humidity, vibration, speed, wind, motion, video, acceleration, particles, magnetism, current, pressure, time and place. It's the oldest, fastest, and largest of all big data, but it's an IT problem because digital data has two meanings.

Simply put, analog data should be treated differently than digital data. The question is how to effectively capitalize on the business value of massive analog data.

4.8 Perpetual Connectivity:

IoT is usually connected, always on, and always provides three important benefits to products and consumers.

- **Monitoring:** Continuous monitoring that provides continuous real-time information on the condition and use of a product or consumer in a market or industrial environment.
- **Support:** Thanks to continuous monitoring, you can now send updates, fixes, fixes and confirmations as needed.

- **Motivation:** Continuous and continuous communication with customers or employees provides an opportunity for organizations to motivate or motivate others to take action and purchase products.

Asking these because the Three M's, and therefore the notion that a corporation are often perpetually connected to consumers and products is sort of profound, with far-reaching implications and opportunities. For example, if a washing machine is connected to the IoT, predictive analytics can determine when a machine will fail and schedule repairs, such as 10 days before a devastating event. So you are not standing in front of the enclosed washing machine with a basket of dirty laundry.

4.9 Real Time:

Real-time definition is different from defining someone who doesn't or understand the IoT. Real-time starts from the moment a sensor or information is actually received. Real-time Internet of Things doesn't start when information enters a network switch or computer system, and it's already too old. How quickly do you want to understand if you want to understand if your home can catch fire? Or, if a crime can happen, the moment matters. So, you need to trigger an alarm in real time before information reaches the cloud or data centre. Otherwise, it won't help.

The point is, seeking to blend the planet of operational technology (OT), sensors, and data measurement with the planet of IT. The IoT blends these two worlds for the primary time during a major way, and therefore the results are going to be profound.

4.10 The Spectrum of Insight:

Derived from IoT data, the "spectrum of understanding" represents its place in the five-phase data flow: real-time, motion, youth, relaxation and archive. Sensors or data collection sites require real-time analysis and analysis to provide an immediate response from the percussion system and adjust accordingly, such as in military or

precision robotic applications. At the other end of the spectrum, historical data is often retrieved from the data centre or cloud and benchmarked against the latest operational data, such as understanding the seasonal behaviour of power generation turbines. So understanding big data in IoT is often obsolete over time and space.

4.11 Immediacy versus Depth:

With today's existing computing and IoT solutions, you have to find a compromise between speed and depth. This means you can use basic analytic data such as temperature or FFT comparisons to get instant "time to insight" to see if turning a wheel on a tram causes life-threatening accidents. This is where immediate information becomes paramount. The other end of the spectrum is the time it takes to realize a deep understanding.

This example comes from one of our previous customers, CERN's giant Hadron inverter in Europe. Here they push subatomic particles together to get an idea of the composition of such particles. The information gathered here takes a long time to explore on a large farm of server computers. This in-depth understanding has recently led to the discovery of a new elemental particle called Higgs boson.

4.12 Shift Left:

Think about the mutually exclusive goal of gaining direct and deep insights, as discussed above. It is very difficult to argue for both today. However, engineers are good at solving conflicting problems and getting both results. James Collins called this phenomenon the genius of AND.

Driving in-depth and in-depth data analysis usually shifts the left side of HPC analytics and complex data (called Tier 4 in IoT solutions) stored in the cloud or data center. Complex IoT solution infrastructure as shown in the figure 4.5. In other words, deep computers are closer to sources of information to receive and collect information from sensors (TIER 1) and network gateways (TIER 2).



Fig :4.5: the end-to end lot solution architecture

4.13 subsequent 'V':

Big data is usually characterized by the famous V (volume, speed, volatility and value). The fifth "V"-suggests visibility. Once the information is collected, computer researchers around the world should be ready to see and work as needed. Visibility is the advantage of not having to transmit large amounts of information to people or places far away. I really like the concept of data access and applications "regardless of time or place". Mark Templeton, CEO of Citrix, adds a third, device independence. Our team and I work closely with our partner Citrix to deploy time, space and device visibility solutions.

As familiar with the IoT and the profound consequences of these 7 principles. I currently lead a team promoting HP's contribution to the IoT and will discuss the path forward as HP plays an increasingly important role in the evolving IoT.



Fig :4.6: Model of smart home

4.14 VOICE RECOGNITION:

Speech recognition has been a stimulating study in recent decades and still poses many unresolved issues.

Speech recognition and voice control are basically speech recognition. Speech recognition is the process of verifying that a registered voice provides speech input, and verification is the act of automatically verifying the identity of the person you claim to be. Speech recognition is often used to use voice to verify identities and to control access to services such as phone banking, database access services, voice dialing for purchases, information services, and voicemail. Another important application of speech recognition technology is for legal purposes.

Speech recognition is often characterized by text-dependent or text-independent techniques. In text dependent mode, the voice needs to speak a keyword or sentence along with the matching text for learning and recognition testing. Given that the text is independent, it means that the system can recognize your speech no

matter what you say. The goal of our project is to identify real-time speech independent of text. That is, it compares the speech signal of an unknown speech to a database of known speeches. The system operates in two modes: learning mode and recognition mode. Training mode allows users to record voices and create functional models. Popular mode uses user-provided information in training mode and is intended to separate and identify speech. Mel's cepstral frequency coefficient and vector quantization algorithm are used to run the project in a programming language.

Basically, wavelet transform can decompose a signal space A_i into a lower resolution (approximation) space A_{i+1} and a detailed space D_{i+1} by dividing the orthogonal basis $(\phi_i(t - 2^i n))_{n \in \mathbb{Z}}$ of A_i into two new orthogonal bases, namely $(\phi_{i+1}(t - 2^{i+1} n))_{n \in \mathbb{Z}}$ of A_{i+1} and $(\psi_{i+1}(t - 2^{i+1} n))_{n \in \mathbb{Z}}$ of D_{i+1} where z is a set of integers, and $\phi(t)$ and $\psi(t)$ are scaling and wavelet functions respectively.

The WPs decomposes the approximate space as well as the detailed space. Each subspace in the tree is indexed by its depth i and the number of subspaces p below it.

The two WPs orthogonal bases at a parent node (i, p) are defined by

$$\psi_{i+1}^{2^p}(k) = \sum_{n=-\infty}^{\infty} h[n] \psi_i^p(k - 2^n) \dots\dots\dots 1$$

and

$$\psi_{i+1}^{2^{p+1}}(k) = \sum_{n=-\infty}^{\infty} g[n] \psi_i^p(k - 2^n) \dots\dots\dots 2$$

where $h[n]$ is a low-pass filter and $g[n]$ is a high-pass filter given by

$$h[n] = \langle \psi_{i+1}^{2^p}(u), \psi_i^p(u - 2^n) \rangle \dots\dots\dots 3$$

And $g[n] = \langle \psi_{i+1}^{2^{p+1}}(u), \psi_i^p(u - 2^n) \rangle \dots\dots\dots 4$

Thus, by using full i level WPs decomposition, a balanced binary tree structure is formed having more than $2^{2^{i-1}}$ orthogonal bases. Decomposition by WPs helps to partition the frequency axis at the higher frequency side into smaller bands that cannot be achieved by using discrete wavelet transform. WPs decomposition gives an over-complete set of basis, and the problem is to select the best set of basis for a given signal (in other words, selecting the best partitioning of the frequency axis).

For the Mel scale, the edge bandwidths were calculated based on [4]

$$y = 2595 \log_{10} \left(1 + \frac{f}{700} \right) \dots\dots\dots 5$$

where y is the Mel scale value and f is the bandwidth frequency.

Voice from the Texas Instruments TI46 database is sampled at 11,025 kHz, resulting in a 5.512 kHz bandwidth signal. Following a method similar to the Mel filter [3], a complete two-stage WP digestion is carried out first. This divides the frequency axis into 4 bands each with a bandwidth of 1378 Hz. The lower band from 0 to 1378 Hz is further decomposed by reapplying the full 3-step WP drop. This divides the 0 to 1378 Hz bandwidth into 8 subbands each 172 Hz wide. The 1378 to 2756 Hz waveband is further decomposed by applying WP decomposition at both levels, resulting in four 344 Hz subbands. Then select 2756 to 4134 Hz to complete the decomposition at one level. It provides two bands of 689 Hz each. The frequencies between 4134 and 5512 are further decomposed into a single level WP. In summary

4.15 Sub-Band Wavelet Packets Decomposition:

The frequency range sensitive to the human ear is registered as 1 kHz to 6 kHz, so the most sensitive frequency range is 1 kHz to 3 kHz. First, the frequency band is divided into three main bands. The main band is 0 to 1 kHz, so the third band is a wide frequency separation band of 3-5.5 kHz. The second band from 1 to 3 kHz is divided into a range of precise frequency bands very similar to the Mel scale.

First, a complete analysis of WP is carried out in step 4. This divides the frequency axis into 16 bands. For further decomposition, we select the frequency range 1034 to 3101 Hz, which is most sensitive to the human ear in this range. The 1034 to 1378 Hz band is further decomposed by reusing the complete WP drop of WP. This divides the 1034-1378 Hz band into two subbands each 172 Hz wide. The 1034 to 1207 Hz frequency band is further decomposed by applying WP decomposition at one level, resulting in two 87 Hz subbands. Select the 1378 to 1723 Hz band, the 1723 to 2067 Hz band, and thus the 2067 to 2412 Hz band to complete the decomposition at one level. This provides 6 bands of 172Hz each. We select only the 3101 to 4134 Hz wavelength range in the 3101 to 5512 Hz wavelength range, which is relatively insensitive to the human ear, so we select the 4134 to 5512 Hz wavelength range due to the function

indication. As a result, the following table is obtained. After performing decomposition from WP into a Mel filter and a WP subband, energy is calculated in each frequency band. Then the logarithm of the energy is calculated, giving a total of 16 coefficients as properties.

In order to induce a more robust acoustic function that is effective for automatic speech recognition systems, the static WP coefficient and the dynamic WP coefficient are identified as delta WP + WP. Where WP is the 16th order WP decomposition factor applied to the window number. Delta WP coefficients are calculated using the classical regression method. It is now a 32-dimensional vector space representing spoken language signals. LDA transformation with little loss information allows the use of a 16-dimensional functional space.

Modifications of the standard MFCC-based algorithm were aimed at improving performance by increasing the reliability, speed and efficiency of calculations. So this is an attempt to reduce the number of MIPs so that the algorithm is often considered for real-time applications. The failure of the speaker recognition system is that it is not robust enough to be considered commercially and its reliability must be established.

4.16 MODIFICATIONS:

Windowing instead of using the hamming window a more efficient Kaiser window is employed that's supported the concept of minimizing the mean square error rather than maximum error. Explanation of the kaiser window is given below. The Kaiser window has an adjustable parameter alpha which controls how quickly it approaches zero at the sides . it's defined by

$$\text{Kaiser}(x, \tau, \alpha) = \begin{cases} \frac{I_0(\alpha \sqrt{1-(x/\tau)^2})}{I_0(\alpha)} & |x| \leq \tau \\ 0 & \text{else} \end{cases}$$

where $I_0(x)$ is that the (for a definition, and a more detailed discussion. The upper alpha the narrower gets the window and thus, thanks to the not so severe truncation then, the less severe are the bumps above.

Goss used this window to get an adjustable gradient filter, but he used it only on sample points in order that, in between sample points, some quite interpolation has got

to be performed, which he doesn't state explicitly. during this work, the Kaiser windowed cosec function are going to be wont to reconstruct gradients at arbitrary positions, which is, of course, more costly.

4.17 CHOICE OF INPUT REPRESENTATION

This section describes the various introductory explanations reviewed in this work. The basic assumption of the sample-based method is that speech and noise are almost additive in the sampled space. The technology chain for obtaining linked copies is generalized.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 SOFTWARE

Python may be a fantastic language for programming the Pi, because of its simple use and access to hardware, including GPIO.

Things you need are:

- Raspberry Pi
- Raspbian OS on SD card
- HDMI monitor
- Keyboard and mouse

5.1.1 Notes About Python Libraries

On Raspbian, Python programs that require external libraries may not work in all methods below. Additional libraries are often installed with the PIP, but are only displayed for programs running in a terminal window. This may be because the Python IDE program has its own local copy of Python. So, it's a good idea to use a terminal window to run Python programs that require external libraries installed along with the PIP.

5.1.2 Running Program via Terminal

As shown in fig 5.1, Python programs are often implemented using a terminal window, but if want to understand complete path about Python programs before opening the terminal. In this case open Python program is in Documents> Python> Main.py.



Fig 5.1 Terminal window

Open a terminal window and use the "cd" command to vary the working directory to the directory that contains your Python program. I used the subsequent command:

```
cd Documents/Python
```

To get a Python program from this directory, use the "dir." command which can display all files and folders in this directory. If your Python program isn't in the list of files, you'll need to go back and find out where your Python program is.

Now start the Python program with the "python" command. This command runs the specified Python file after the command shown here. `python yourfilename.py`

Or, if your file contains spaces, it will be `python "your file name.py"`.

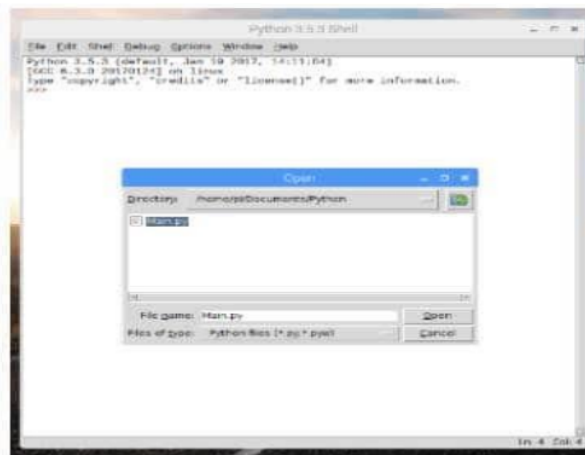
Raspbian comes with several IDEs for programming, and one of these IDEs is the official Python IDE. To open this, click the Raspbian logo and then navigate to Programming > Python 3 (IDLE).



2

Fig: 5.2 Opening a IDE

The fig 5.2 and 5.3 shows, with the IDE loaded, click File > Open and then navigate to your Python program



1

Fig: 5.3. Navigate to python program

When the file opens, you can run the program by clicking Run > Run Module or by pressing F5 on the keyboard.

Thonny is another Python development environment that includes several features, including a powerful debugger that you can use to walk through your code and keep track of variables. You can also use this IDE to run Python programs. First click on the Raspbian logo, then go to Programming> Thonny Python IDE.

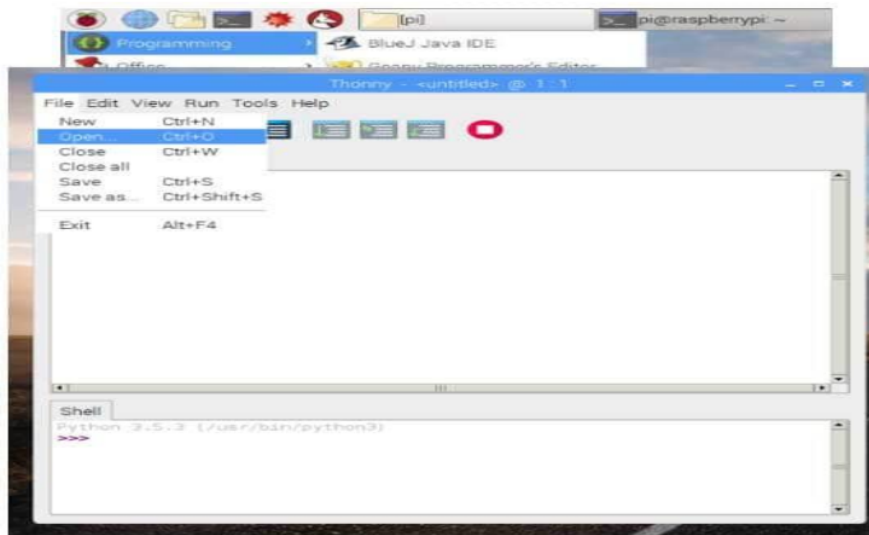


Fig :5.4 Environment to run the program

within the IDE, click File > Open then navigate to your Python program. With the program loaded, click Run > Run current script.

5.2 HARDWARE:

The results obtained using our proposed system and the pictures are also been mentioned

Figure 5.5 represents the prototype of smart controlling home appliances using raspberry pi.

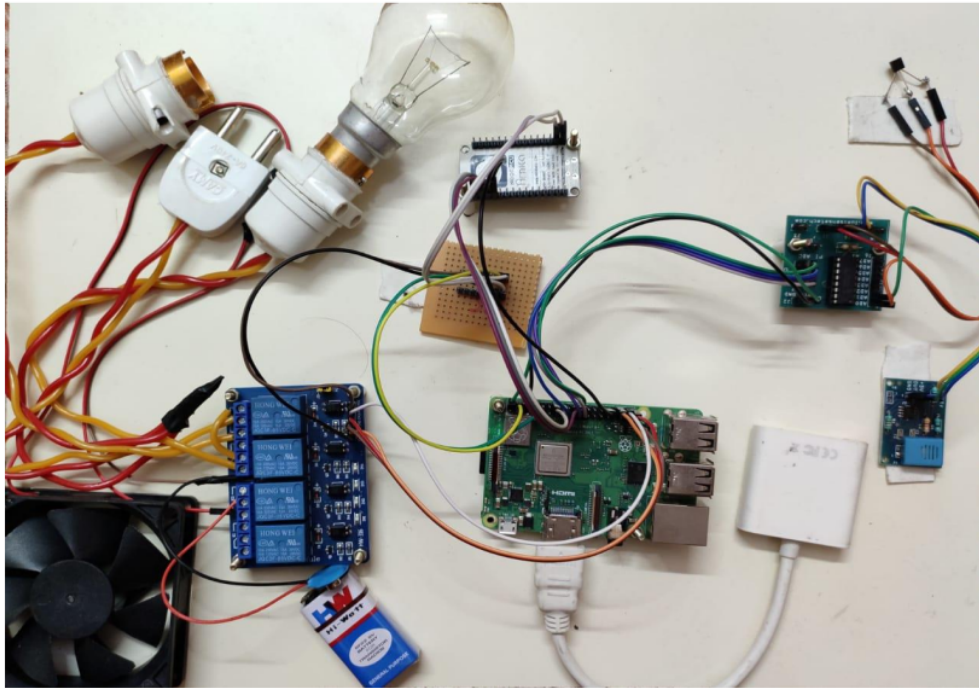


Fig.5.5 Hardware Equipment of Smartly Controlling Home Devices

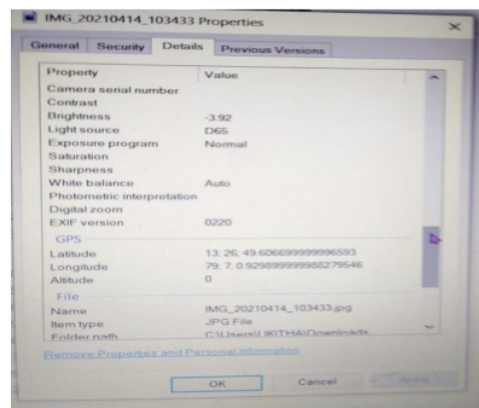


Fig: 5.6: Geotagged location

Home automation means controlling of home functions and features automatically and sometimes remotely using one or more computers. An automated home is also called as a smart home. Speech based home automation uses human voice commands to operate the electrical appliances in the home. It is very useful for human beings especially for elderly and physically handicapped people.

5.2.1 Raspberry Pi: The main technology is Raspberry Pi it is a credit sized computer in which main programming of automation is done using the powerful language of python. Here the inputs from NodeMCU is connected to raspberry pi GPIO PINS 23,24,25,12. fig 5.7 shows the GPIO pins of Pi and fig 5.8 shows the pin diagram of pi

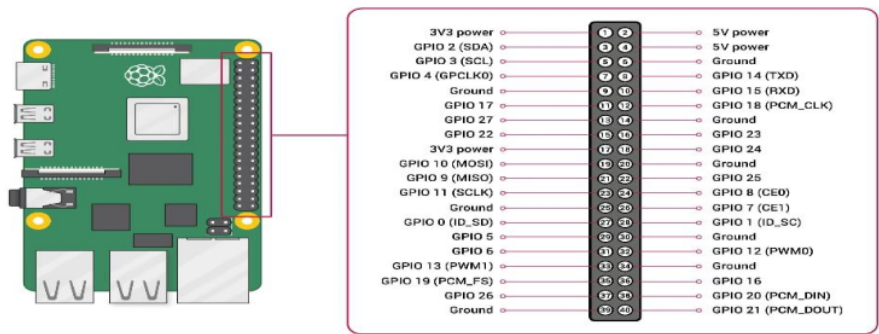


Fig:5.7: GPIO Pins of Raspberry Pi

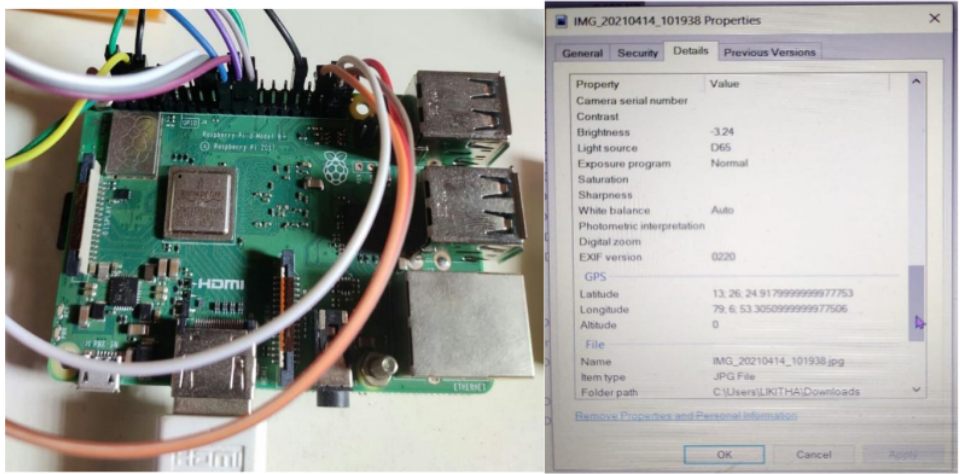


Fig: 5.8: pin diagram of Raspberry pi

5.2.2 channel 5v Relay Module: 2-Channel 4 Relay Module is a relay interface board, it can be controlled directly by a wide range of microcontrollers such as Arduino, Raspberry Pi and ARM. We are connecting the output GPIO PINS 20,21,26,16 from Raspberry Pi to Relay IN1, IN2, IN3, IN4. Relay gives the indication when the outputs get turned on or off. The below fig 5.9 shows the four channel relay

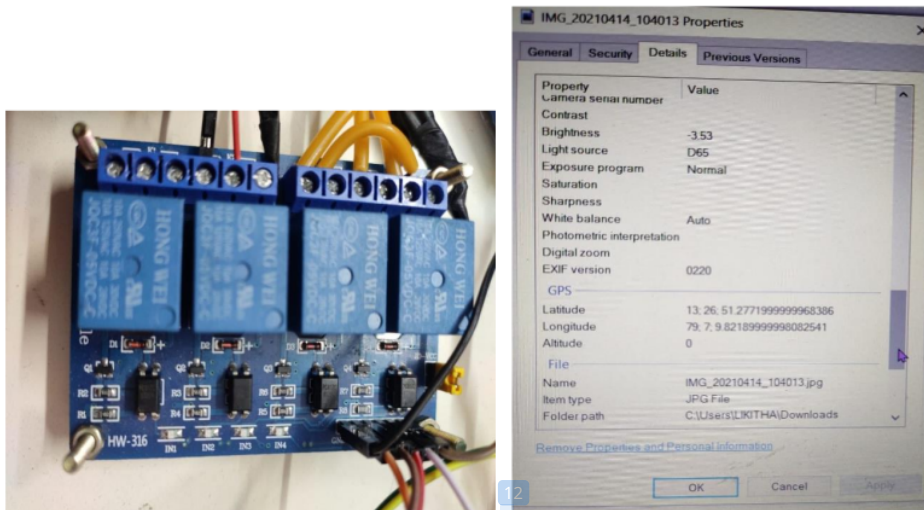


Fig :5.9: four channel relay

5.2.3 MCP3008 ADC: The MCP3008 is a low cost 8-channel 10-bit analog to digital converter. The precision of this ADC is like that of an Arduino Uno, and with 8 channels you can read quite a few analog signals from the Pi. This chip is a great option if you just need to read simple analog signals, like from a temperature or light sensor.

Here the pins are connected from temperature sensor and humidity sensor to ADC. Because at the initial stage sensors will be at analog state. So, converting into the digital form. The below fig 5.10 shows the ADC

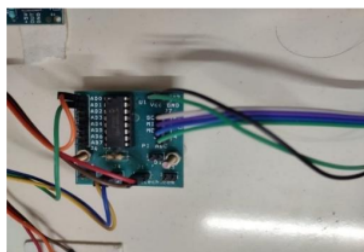


Fig :5.10: MCP3008 ADC

The Vcc from sensors is connected to ADC vcc and output is connected to DO, D1 pins. From ADC pins are connecting to Raspberry pi i.e. from SCLK to PI SCLK(GPIO PIN 11),MISO to PI MISO(GPIO PIN 9) ,MOSI to PI MOSI (GPIO PIN 10), CE to GPIO PIN 8.

5.2.4 NODEMCU: Pins from Node MCU are inputs pins. Node MCU is used for the purpose of controlling the outputs. The pins from Node MCU are connected to Raspberry Pi GPIO PINS 23,24,25,12.

5.3 STEPS OF OUTPUTS

10

5.3.1 VOICE REGONITION:

By giving the voice commands to the external devices like mobile phone the instructions will be taken by the raspberry pi. and then the output load ex: fan and light will get turned on as shown in fig 5.11 and 5.12

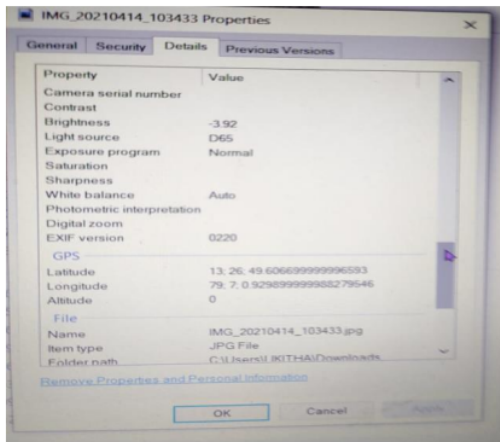


FIG:5.11: GEOTAGGED LOCATION



Fig:5.12: Fan gets turned on

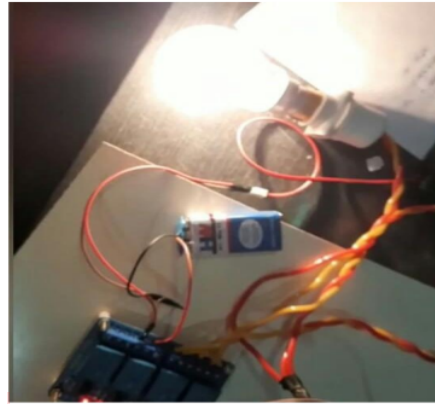


Fig:5.13: Bulb gets turned on

CONCLUSIONS AND FUTURE SCOPE

6.1 CONCLUSIONS:

The home automation segment is still in its infancy and is growing in popularity, as all methods are cost-effective compared to regular products in the Google Home market and can be easily implemented with easily accessible hardware. Home automations is being popular every day. There are many possibilities that are discussed in full by four people below this thread. The biggest problems we faced were speech recognition in a noisy environment, training the speech recognition module, the number of commands stored in the speech recognition module database, and thus the response time or latency that the module and device inserted the code into. In general, these wrinkles are often corrected with further research, so the system is often made faster and more intuitive.

6.2 FUTURE SCOPE:

With the increasing demand for convenience and entertainment, home automation has moved one step further from becoming the most popular technology in the near future. We will now develop a wireless home automation system that receives voice commands from users and handles various devices in the house. Instead of buying the unique equipment needed for a variety of existing home automation systems, we decided to apply the system to the most important appliances in our home. The main purpose of this project is to make this technology more economical, making it more accessible to the public. In this project, we will be using the Raspberry Pie 3, which will help make the system wireless.

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