

Home Automation Using Raspberry Pico Through Voice Control

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Abstract---Wireless Voice-Controlled Automation of the Home Based on internet, Bluetooth, and wi-fi, this project integrates a mobile phone (application) with an integrated system to provide the elderly and disabled with the ability to fully control their home utilities using voice commands on their phone. The non-technical individual will find it easy to carry, install, configure, run, and maintain this device due to its design. Connecting specific electrical equipment that are used in a home is known as home automation.

Keywords- *Raspberry, Micro controller.*

I. INTRODUCTION

These days, individuals want to do jobs with the least amount of effort and as quickly, efficiently, and easily as possible. This need can be simply satisfied by adding a home automation system and turning "normal" homes into "smart" ones. The phrase "smart home" is not new to the scientific community; it has been in use for many years. Home automation is becoming a fast-expanding sector as electronic technology continue to progress.

Numerous smart systems with internet, Bluetooth, and other control mechanisms have been proposed. Homeowners find the idea of using a Raspberry Pi for speech recognition control of appliances and security to be appealing.

Automation is becoming more and more prevalent in the industrial and economic spheres as well as in day-to-day life. Cost and simplicity of installation and use, however, continue to be obstacles to wider adoption. This study aims to create an open source, low-cost, and adaptable system that can handle a growing number of devices that need to be controlled. Voice recognition-based home automation systems have the potential to improve user friendliness and ease of use for elderly and disabled individuals. A home automation system will improve the quality of life for elderly or disabled people.

We employ the Raspberry Pi, a low-cost, high-performance computer, in our system. Several generations of Raspberry Pi computing devices feature distinct arrangement. The Raspberry Pi 3, the most recent model, comes equipped with built-in Bluetooth and Wi-Fi. This project will create a number of standard home security peripherals based on

Raspberry Pi. There will be a thermostat provided for temperature monitoring. The voice commands are recognized via Google APIs. After receiving the commands, it instructs the system to use the selected equipment to carry out the requested function. The system keeps track of the appliances' present conditions and may be expanded with basic codes and gadgets to offer new features. The primary programming language is Python. This solution offers security in addition to home automation. Motion sensors are used to identify human movement, while camera modules are used to take pictures.

of the unauthorized individual, sends it online to the owner's phone, and uses a GSM module to deliver an offline message. Due to the quick advancement of new technologies, monitoring and control services as well as the internet are now offered as a tool for interacting with machinery and other devices. The technology is applicable in various settings, including banks, laboratories, hospitals, and other advanced automated systems, thereby mitigating the risks associated with unlawful access. This technique was developed primarily for security and convenience reasons, but also to save time and labour.

II. LITERATURE SURVEY

It provides a quick overview of the literature on intelligent home network systems and attempts to categorise the works into three main types: decision support, service provision, and real implementation. The classification is based on the authors' primary contributions. First, efforts have been made to improve the efficiency of the decision-making process for residential networks. As an illustration, the intelligent house control [1] project concentrated on developing home control systems that offer users intelligent services via active sensor networks. Second, the Home Automation with Raspberry Pi [2] project focuses on leveraging any mobile device with Wi-Fi capability to remotely control household equipment. The Arduino-based smart house system [3] project suggested a system that manages security and home appliances.

Increased home automation features, such as alarm-based smart locks, smart water tanks, and mosquito detection, are made possible by the smart home project [4], which is based on sensing mechanisms.

III. EXISTING SYSTEM

A microcontroller-based voice-activated home automation system is an advanced combination of hardware and software intended to simplify home administration with voice commands. The microcontroller platform, such as Arduino, Raspberry Pi, or ESP32/ESP8266, which serves as the central processing unit, is the foundation of the system. This microcontroller coordinates the operation of several household gadgets and interprets voice commands that are received. The HM-10 and EasyVR voice recognition modules are integrated to precisely understand spoken instructions and convert them into commands that the microcontroller can follow.

The efficiency of the system depends on its capacity to communicate with tangible objects, which is accomplished by actuators or relays. These parts act as a conduit between the physical world of fixtures and appliances and the digital world of the microcontroller. The microcontroller may carry out commands to control lights, temperature, and other electronic gadgets in the home by turning on relays or actuators.

The system may be equipped with optional sensors to improve responsiveness and functionality. These sensors collect environmental data and, in response to preset parameters, initiate automatic operations. Motion sensors, for example, can identify movement within a space and trigger the system to change temperature control settings or turn on lights appropriately. In a similar vein, light sensors optimise comfort and energy economy by adjusting lighting levels based on ambient brightness.

IV. PROPOSED SYSTEM

Fig (1) shows the block diagram of Voice Recognition based home automation and Security using Raspberry Pi. The project deals with both Software and Hardware components. The hardware part consists of input command is voice, it means controlling home appliances by voice. The block diagram consists of a Raspberry Pi, Bluetooth module, temperature sensor, motion sensor, Gas sensor, Ethernet cable, Wi-Fi router, Relay circuit board, 5v power supply and android mobile. Python is used as a main programming language provided by Raspberry pi.

The voice recognition-based home automation and security utilising Raspberry Pi block diagram is displayed in Fig. (1). Both hardware and software components are covered under the project. The hardware component comprises of voice input command, which allows speech control of household appliances. The Raspberry Pi, Bluetooth module, temperature sensor, motion sensor, gas sensor, Ethernet cable, Wi-Fi router, relay circuit board, 5-volt power supply and Android mobile phone are all shown in the block diagram. Python is the primary programming language that Raspberry Pi offers.

A microcontroller-based voice control and home automation system that integrates appliances and other household items with a central microcontroller unit—such as an Arduino or Raspberry Pi—that acts as the automation system's brain is being proposed. With voice recognition built

into the system, users could communicate with their smart home by only speaking commands to it. These commands might be used to manage security cameras, turn on and off lights, change thermostats, operate entertainment systems, and more.

Using suitable interfaces like Wi-Fi, Bluetooth, or Zigbee, the microcontroller would receive voice commands, process them using logic that had been preprogrammed, and then carry out the necessary operations by sending signals to the associated devices. To collect information about the home environment and enable automation depending on variables like occupancy, temperature, and light levels, the system may also include sensors. All things considered, this suggested solution provides a practical and effective means for homeowners to use voice commands to control and manage different areas of their homes, improving user comfort, convenience, and energy efficiency.

IV. SALIENT FEATURES OF RASPBERRY PI

Raspberry Pi is a credit card-sized computer with an ARM platform. Single "on chip" computing hardware is used. This uses a Raspberry Pi 3 model B. The Raspberry Pi 3 board is equipped with Bluetooth 4.1, WIFI, and 802.11 n wireless LAN. The memory card that was utilised for the board has Raspbian Stretch installed on it. Raspbian is the operating system for the Raspberry Pi 3 that is based on LINUX. The R-pi board has 40 general purpose input output pins (GPIO), which can be used for digital input and output. It also has a micro-USB power source, 4 USB ports, 1 HDMI port, and a 3.5mm audio jack. Additionally, this board features serial ports for attaching a display and a camera.

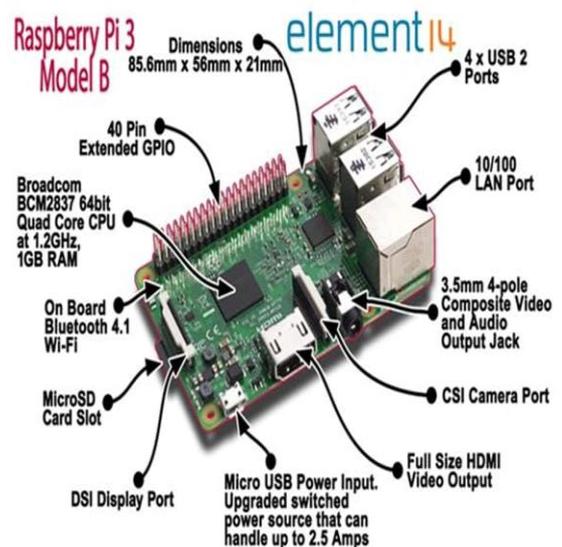


FIG 1: - Diagram of Raspberry pi 3B

V. BLOCK DIAGRAM

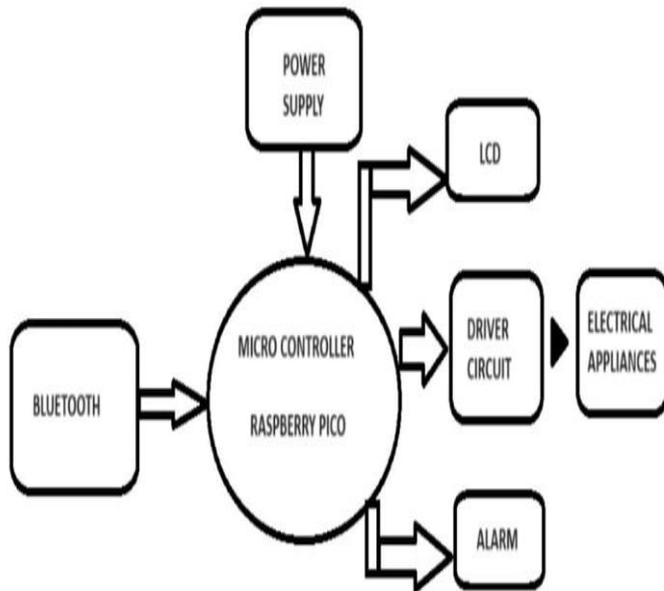


FIG 2: -Block Diagram

IV. METHODOLOGY

The AMR (Android Meets Robot) speech app allows users to provide voice commands. It connects to a nearby Bluetooth device, delivers the instruction to the Raspberry Pi, and the appropriate action is carried out. We use motion sensors, temperature sensors, and gas leakage sensors for security purposes. We use a temperature sensor (dht-11) to measure the temperature and humidity, and the results are shown on an LCD screen. The Raspberry Pi receives signals from the PIR sensors when they detect motion, and the Raspberry Pi then automatically turns on the buzzer. It will automatically detect any gas leaks and turn on the buzzer when a leak occurs. By connecting a water motor to the Raspberry Pi and programming it to turn on and off the motor automatically, we may water our plants sometimes in our home garden while using less human labor.

There are several important processes involved in voice control home automation with a microcontroller. First, the central processing unit is a microcontroller, like an Arduino or Raspberry Pi. The input and output pins of the microcontroller are connected to sensors, actuators, and appliances, fans, and

lights, among other things. The software of the system combines a voice recognition module, allowing the microcontroller to understand spoken commands. This module is usually built in a language like Python or C++. This calls for pre-processing the audio input, which is frequently accomplished by employing machine learning models that have already been trained or by using libraries like Speech Recognition.

Once a command is recognized, the microcontroller translates it into specific actions, triggering the corresponding devices through the output pins. For instance, saying "turn on the lights" activates the relay connected to the light's circuit. Additionally, to ensure reliability and security, authentication methods like user-specific voice profiles or passwords can be implemented. Overall, this methodology combines hardware interfacing, software development, and voice recognition technology to create an efficient and user-friendly home automation system.

V. FLOW CHART

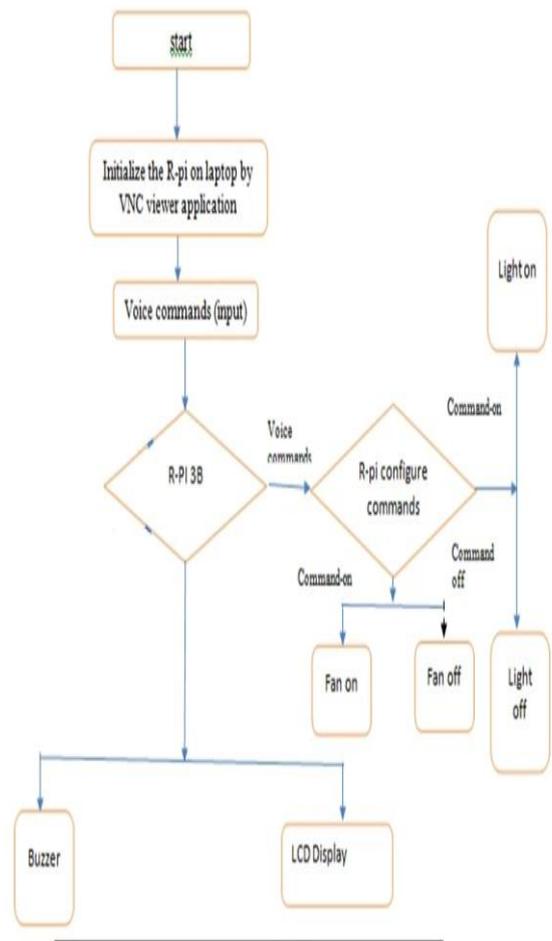


FIG 3: -FLOW CHAT

V. HARDWARE DETAILS

A voice-activated home automation system with a Raspberry Pi usually consists of multiple hardware parts. First things first: a Raspberry Pi board (such the Raspberry Pi 4) is required. This board acts as the system's central hub. For connectivity, this board often has Bluetooth and Wi-Fi capabilities. You'll also need accessories like speakers and microphones so that you can record and react to voice instructions. It is possible to combine sensors, such as humidity, temperature, and motion detectors, to enable automated responses based on ambient conditions. Relay modules or smart switches that can be interfaced with the Raspberry Pi to remotely toggle power are possible options for controlling appliances.

V. DESCRIPTION OF SOFTWARE

The software for home automation using Raspberry Pi through voice control typically involves several components and frameworks. One common approach is to use a combination of open-source software like Home Assistant or OpenHAB as the backbone of the automation system. These platforms provide a user-friendly interface for managing devices, creating automation routines, and integrating various third-party services. Using virtual assistants like Amazon Alexa or Google Assistant for voice control is a popular choice. This integration allows users to control their home devices using natural language commands spoken to their smart speakers or mobile devices.

To enable communication between the Raspberry Pi and these voice assistants, developers often use protocols such as MQTT (Message Queuing Telemetry Transport) or HTTP. These protocols facilitate the exchange of information between the Raspberry Pi and other devices or services in the home automation ecosystem.

Additionally, developers can leverage speech recognition libraries like CMU Sphinx or Google Cloud Speech-to-Text to convert spoken commands into text that the Raspberry Pi can understand and act upon. Natural language processing (NLP) algorithms may also be employed to improve the accuracy and flexibility of voice commands.

Overall, the software stack for home automation using Raspberry Pi through voice control is a combination of open-source platforms, communication protocols, and speech recognition technologies, all working together to create a seamless and intuitive user experience.

VI. RESULT

Voice control voice control for home appliances and home security when the owner is away.



Figure 6:

Screenshot of an Android phone with the Bluetooth module linked to the phone's Bluetooth. When the user says "ALL LIGHTS ON," or "ALL LIGHTS OFF," the scope of the project is expanded for the future by connecting a camera to a Raspberry Pi.

VII. CONCLUSION

The primary goal of the project was to create a system that would yield the most output with the least amount of complexity. Voice-activated household appliances aim to minimise human labour. It is very beneficial for the elderly and paralysed. Room temperature and humidity are shown on an LCD display via a temperature sensor. Buzzer will activate automatically in the event of any gas leak or unknown person entering the room. home automation using Raspberry Pi through voice control offers a convenient and futuristic way to manage and control various devices within a smart home environment. By leveraging the versatility of Raspberry Pi hardware and integrating it with open-source software platforms and voice recognition technologies, users can effortlessly interact with their home appliances and systems using natural language commands. This approach not only enhances convenience but also opens up possibilities for increased accessibility and efficiency in managing home tasks and routines. With continuous advancements in both hardware and software technologies, the potential for innovation and expansion in home automation using Raspberry Pi through voice control is promising, offering homeowners endless opportunities to create personalized and intelligent living spaces tailored to their needs and preferences.

VIII. REFERENCES

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