International Journal of Gender, Science and Technology UGC Care Group I Journal
..ISSN: 2040-0748 Vol-13 Issue-02 June 2024

Voice Enabled Home Automation Using Pi Pico And Bluetooth

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Abstract

Voice-Controlled Wireless Home Automation This project combines a mobile phone app with an integrated system that operates on the internet, Bluetooth, and wi-fi. Its purpose is to let the handicapped and elderly handle all of their home utilities with their voice commands. Because of its layout, this device will be simple for the non-technical person to transport, set up, use, and maintain. Home automation refers to the process of linking various electrical devices used in a house.

Introduction

People nowadays like to get things done as fast, readily, and effectively as possible while putting in a minimum amount of work. Integrating a home automation device and transforming "ordinary" houses into "smart" ones is a simple way to fulfill this requirement. The term "smart home" has been around for a long time and is familiar to scientists. With the rapid advancement of electronic technology, the home automation industry is seeing rapid growth. There have been many proposals for "smart" systems that include various control techniques such as the internet and Bluetooth. A Pi Pico is a popular choice among homeowners who are interested in voice-activated appliance and security system management. More and more, automation is permeating not just the commercial and industrial realms, but also our daily lives. However, issues with cost and ease of use and installation still prevent broader acceptance. The overarching goal of this research is to design a system that is open source, inexpensive, and flexible enough to manage an increasing number of devices. Home automation systems that rely on voice recognition might make life easier for those with disabilities and the elderly. Those who are unable to leave their homes due to age or disability will benefit greatly from home automation systems.

Our solution makes use of the Pi Pico, an inexpensive yet powerful computer. The layout of the many Pi Pico computer devices has changed throughout the years. Integrated Bluetooth and Wi-Fi are features of the most

current Pi variant, the Pico 3. In this project, we will build a variety of Pi Pico-based home security peripherals. A thermostat will be supplied for the purpose of monitoring the temperature. Google APIs are used to identify the spoken requests. It takes the instructions in and then tells the system to utilize the chosen tools to do the job. The system monitors the current state of the appliances and may be enhanced by simple codes and devices to provide additional capabilities. Python is the main language for programming. In addition to automating your house, this system also provides security. Camera modules capture images, while motion sensors detect when a person is moving.

using a GSM module to transmit an offline message to the owner's phone after sending it online to the unauthorized individual's. The rapid development of new technology has led to the availability of monitoring and control services, as well as the internet, as means of communicating with many types of equipment. Banks, labs, hospitals, and other high-tech automated systems may all benefit from this technology, which reduces the likelihood of unauthorized entry. Security and convenience were the primary motivations for developing this method, which also happens to be a time and labor saver.

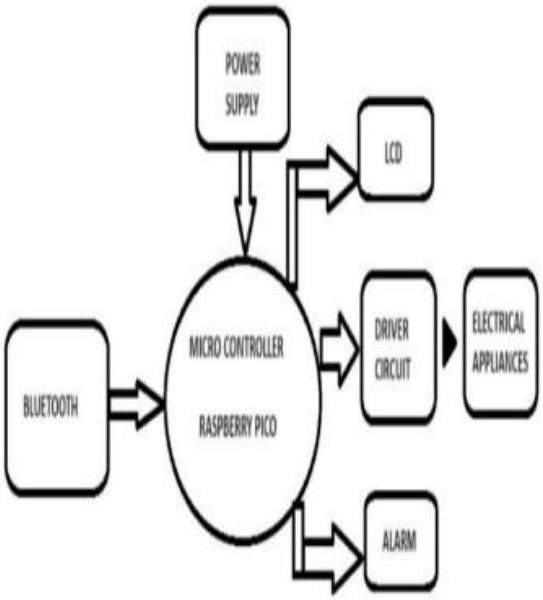
Related Work

It tries to classify the works on smart home network systems into three major types: support for decisions, service supply, and practical implementation, and it gives a brief summary of the literature on the topic. The main contributions of the writers are used to determine the categorization. The first thing that has been worked on is making making choices for home networks more efficient. For instance, the goal of the intelligent household control [1] project was to create systems for controlling homes that provide intelligent services to consumers via active networked sensor networks. The second project is the automation of homes with Pi Pico [2], which aims to automate home appliances by connecting them to any Wi-Fi-enabled mobile device. As a way to control the lights and the security system, the Arduino-based smart home system [3] project proposed a system. The sensing-based smart house project [4] enables greater home automation features including smart water tanks, alarm-based smart locks, and insect detection.

Simplify house management with voice commands using a sophisticated mix of

software and hardware, called a voice-activated house automation system that is based on a microcontroller. The system is built upon the microcontroller platform, which consists of the central processing unit and may be anything from Arduino or Pi Pico to ESP32/ESP8266. This microcontroller is responsible for interpreting spoken orders and coordinating the functioning of several home appliances. To accurately interpret spoken instructions and translate them into instructions that the micro controller can execute, the HM-10 and EasyVR speech recognition modules are combined. Actuators or relays allow the system to communicate with physical things, which is crucial to its efficiency. The fixtures and appliances' physical world and the microcontroller's digital world are connected via these components. The microprocessor may activate relays or actuators in response to instructions to regulate the house's temperature, lighting, and other electrical devices. You may enhance the system's responsiveness and usefulness by adding supplementary sensors. Initiating automated processes is triggered by specified criteria, and these sensors gather data about the surroundings. For instance, the system may be designed to respond to motion by adjusting the room temperature settings or turning on the lights based on what it detects. Similarly, light sensors enhance electricity efficiency and comfort by regulating lighting settings in response to surrounding light levels.

Block Diagram



Proposed System

You can see the schematic of a Pi Pico-based house automation and security system that uses voice recognition in the top figure. There are software and hardware aspects to the project. As for the hardware, it allows you to operate your household appliances just by speaking to them. The components shown in the schematic include a Raspberry Pi 3, a Bluetooth module, temperature and motion

sensors, a gas detector, an Ethernet connection, a Wi-Fi router, a relay circuit board, a 5v power source, and an Android Smartphone. The Pi Pico primarily offers Python as a programming language. Diagrammatic representation of the Pi Pico system for residence automation and security based on speech recognition is shown in Fig. (1). The project encompasses code as well as hardware. As a piece of hardware, it enables voice control of home appliances using voice input commands. The block diagram portrays the following components: Raspberry Pi, Bluetooth module, temperature, motion, gas, Ethernet, Wi-Fi, switch circuit board, 5-volt power source, and Android mobile phone. Among Pi Pico's supported programming languages, Python stands out. An automation system for homes that uses a central microcontroller device, such as Arduino or Pi Pico, to control and automate many home appliances and other objects is being advocated. A user's smart home might respond to their voice instructions alone if the system has built-in speech recognition. A variety of devices and systems might be controlled with these instructions, including security cameras, lighting, thermostats, media systems, and more. An appropriate interface, such as Wi-Fi, Bluetooth, or the Zigbee would allow the microcontroller to receive voice instructions, process them using preprogrammed logic, and then send signals to the corresponding devices to carry out the required activities. There may be sensors installed in the system to measure things like temperature, light levels, and occupancy in order to program the system to operate automatically based on these factors and others. Taking everything into account, the proposed solution offers a realistic and efficient way for homeowners to access and manage various sections of their houses using voice commands, enhancing user comfort, simplicity, and energy efficiency. Speaking to a robot is now a breeze using the free AMR (the Android Meets Robot) app. After establishing a connection with a nearby Wireless device, it transmits the command to the Raspberry Pi Pico, which then does the specified operation. Our security measures include motion detectors, temperature monitors, and gas leakage detectors. The dht-11 temperature sensor measures the relative humidity and temperature, and the data is displayed on an LCD screen. The Pi Pico automatically activates the buzzer in response to motion detection signals received from the PIR sensors. Leaks in the gas supply may be detected automatically, and the device will sound an alarm. If we hook up a water motor to a Raspberry Pi and set it up to

switch it on and off automatically, we can water our plants in the garden without lifting a finger. To automate your house with only your voice and a microcontroller, there are many critical steps to take. In the first place, a microcontroller—such as an Uno or Pi Pico—serves as the key processor. Lots of other objects may be linked to the microcontroller's input and output ports, including sensors, actuators, fans, lights, and appliances. In order for the microcontroller to comprehend spoken instructions, the system's software incorporates a speech recognition module. Python or C++ are common languages for creating such modules. So, it's necessary to pre-process the audio input. One common way to do this is by utilizing pre-trained machine learning models or libraries like Language Recognition. When a command is detected, the microcontroller takes it as an instruction and uses the output pins to activate the appropriate devices. Asking someone to "turn on the lights" will trigger the relay that is linked to the light's circuit, for example. Security and dependability may also be enhanced by using authentication techniques such as passwords or user-specific voice profiles. A home automation system that is both efficient and easy to use may be achieved via the application of this technique, which integrates hardware, software, and speech recognition technologies.

Several pieces of hardware are often required for a Raspberry Pi Pico-powered voice-activated home automation system. An essential first step is to get the Raspberry Pi Pico board. This board is the nerve center of the system. Typically, this board is equipped with Bluetooth and Wi-Fi capabilities for communication. Speakers and microphones are also necessary equipment for recording and responding to voice commands. It is feasible to set up automatic reactions depending on environmental factors by integrating sensors like temperature, humidity, and motion detectors. To remotely turn on and off appliances, you may use relay devices or controlled switches that are compatible with the Raspberry Pi Pico.

Results

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 Pi Pico 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 Pi Pico hardware and integrating it with open-source software platforms and voice Utilizing voice recognition technology, users can easily control their home systems and appliances with simple spoken commands. In addition to improving convenience, this method paves the way for more accessible and efficient management of household activities and routines. Automating your home via Pi Pico through voice control has endless possibilities for innovation and expansion, thanks to the ever-improving hardware and software technologies. With these advancements, homeowners can create intelligent and personalized living spaces that suit their preferences.

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