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Hands Free Home Control : A Bluetooth IOT Solution

Kiran Chegondi¹, Kamal Naidu Pasupuleti²

U.G. Student, Department of Computer Engineering, Sathyabama Engineering College, Chennai, Tamil Nadu, India ¹

U.G. Student, Department of Computer Engineering, Sathyabama Engineering College, Chennai, Tamil Nadu, India ²

ABSTRACT: In the twenty-first century, automation is a hot issue, thus it's crucial to our daily life. Every automated machine's key selling point is its reduction of manual work, effort, time, and mistakes brought on by human error. Smart phones have become a need for every individual on the earth as a result of the development of modern technology. Apps that benefit us in numerous ways are being created for Android systems. Natural language processing is a new technology that will allow us to control objects with our voice. Our study describes a voice-activated home automation system employing smartphones that combines all of these. Users of such a system will be able to voice-control any gadget in their home. Android smartphone, which is in nearly everyone's hand these days, and a control circuit are all that the user requires. When the first computers first appeared, it was still science fantasy to think that technology would advance to the point where voice instructions could be given to a machine. But, thanks to significant advancements in the industry, speech interface with gadgets is now about to become a reality.

KEYWORDS: VoiceRecognition, HomeAutomation, Arduino, Bluetooth, 12v4channelRelay, ConnectingWires

I. INTRODUCTION

Home automation is becoming more and more popular since it increases efficiency by lowering human effort and mistake. Home automation systems allow us to operate a variety of devices, including lights, fans, TVs, air conditioners, etc. A household automation system can also combine other features like security, alarms, and emergency systems. There are many different kinds of home automation systems, including ones that can be operated by Bluetooth, the internet, remote control (IR remote), etc. Each variety has its own benefits and drawbacks. In this project, we created a speech-

activated home automation system that allows users to operate various appliances using their voice. Arduino UNO, Bluetooth, as well as a smartphone are employed to build the vocal prompted home automation project. We are demonstrating a speech-activated home automation system that allows users to operate appliances using only their voice.

In order to complete this project .we require

- ArduinoUNO
- HC-05Bluetoothmodule
- 12v4channelrelayboard
- ArduinoIDEsoftware

II. RELATED WORK

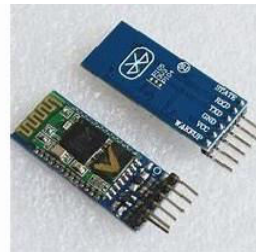
A common idea in the electronics industry is home automation, which is motivated by the need for more comfort and security. Automation can take the role of conventional switches, which may prove dangerous because of the possibility of sparking and fire mishaps. An innovative connected home system has been created in order to take full use of Wi-Fi technology's benefits. By the use of Wi-Fi, this technology enables control of home appliances from a personal computer. Wi-Fi technology transmits data wirelessly using radio frequency at initial rates of 1-2 Mbps as well as a reach of 40–300 feet. The mechanism that controls this automation system is the Arduino UNO board instrumentIt accepts data transmitted by Wi-Fi and use relays to regulate the switching of electrical devices that are linked. Overall, this cutting-edge home automation system offers a simple solution for the quick and secure management of home equipment.

a) Bluetooth based home automation

- In Bluetooth-based home automation systems, relays are used to link household appliances to an Arduino BT board at input and output ports.
- The Arduino BT board's software is written in the high-level interactive C programming language for microcontrollers.

The Bluetooth connection is established. Only authorized individuals are permitted access to the equipment thanks to the password protection that is offered.

- For wireless communication, a Bluetooth connection is made between the Arduino BT board and phone.
- The Python script used in this system is portable and may be installed on any Symbian OS environment.
- A single circuit is created and put into use to receive input from the phone that shows the device's state.

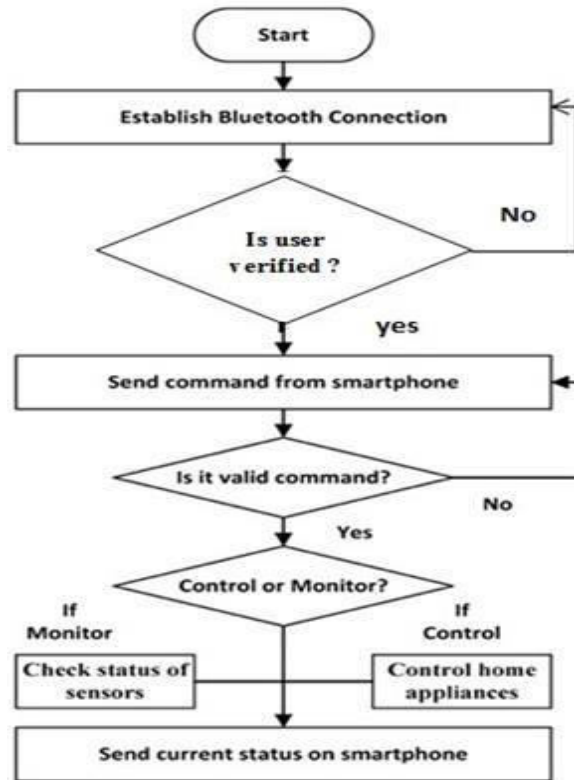


III. METHODOLOGY

Here, we'll demonstrate voice commands for four distinct home appliances. The Arduino, Bluetooth, Relay, LCD display, mobile, and Mobile Application are the main elements of this project. Our smartphone must first have the app installed, which is simple to find in the play shop. Our voice command is received by this app, which then wirelessly transmits it through the Bluetooth module. This command is decoded by the Arduino from Bluetooth module. The household appliances are then controlled by an Arduino order that is sent to the Relays. Eight distinct voice commands can turn these four household appliances on and off. The state of the household appliances, whether on or off, will be shown on the LCD module. To start, we must decide amongst 8 distinct Voice Command categories to operate 4 devices. To operate a gadget, certain specific voice commands are utilized. For instance, the commands "turn on light" and "turn off light" serve to turn on and off certain lights, respectively. The Arduino code makes advantage of these voice instructions..

Flow chart diagram

Bluetooth module receives a voice command sent through the app and transmits it on to the Arduino. Arduino is now comparing this command to the prespecified instructions (which are defined in Arduino code). If the command matches, Arduino sends a request to the relay module to turn it on. On the 162 LCD Display Module, the device state (on or off) is visible..



For instance, when we use the app to give the voice command "turn on light." The Bluetooth module then transmits this command to the Arduino. The Input-1 (IN1) pin of said relay module is then sent Low (0) input voltage by the Arduino. Relay is now in On mode. As a result, the device (light) that is attached to relay-1 of said relay module will likewise come on. On the 16*2 LCD Display Module, the status print "D1 (Device 1) is ON" is displayed concurrently.

When we use the app to deliver the voice command "switch off light." Once more, the Bluetooth module provides this command to the Arduino. This time, the Input-1(IN1) pin of said relay module receives a High (5v) input signal from the Arduino. The relay is now in Off mode. As a result, the device (light) that is attached to relay-1 of said relay module will likewise shut off. On the 162 LCD Display Module, the status print "D1 (Device 1) is OFF" is displayed concurrently.

IV. ARCHITECTURE

The Arduino IC or architecture is being discussed here (ATmega328p). The ATmega328/P is an upgraded RISC (reduced instruction set computer) based low-power CMOS 8-bit microcontroller. The AVR employs Harvard architecture, which has distinct memory and buses for program and data in order to optimize speed and parallelism. The ATmega328 CPU's fundamental operation is below:



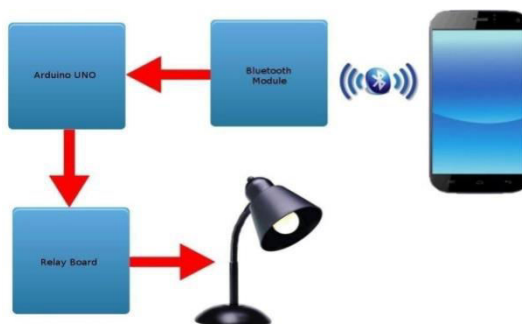
1(a)

1(b)

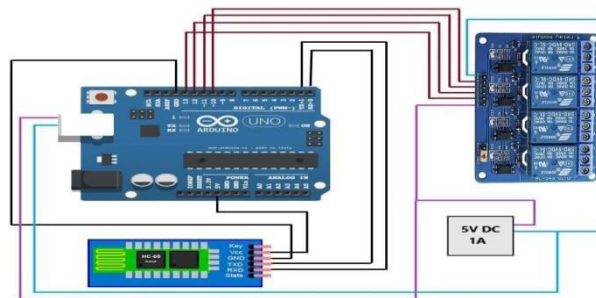


- (a) Data is transmitted in serial through the port (from the Arduino IDE on the PC). The instructions are transmitted to the instruction register after the data has been decoded, and it decodes them using the same clock pulse.
- (b) The subsequent set of instructions is stored into the instruction register with the arrival of the subsequent clock pulse.
- (c) There are three 16-bit registers in addition to the 8-bit general purpose registers.
- (d) Even when the power is out, EEPROM retains data forever. In an EEPROM, programming takes time.
- (e) The Interrupt Unit determines if an interrupt is present before executing an instruction in the ISR (Interrupt Service Routine). A popular interface bus for sending the data between microcontrollers and tiny peripherals like cameras, displays, SD cards, etc. is called serial peripheral interface, or SPI. It employs different clock and data lines as well as a choose line to pick the target device for communication.
- (f) Watchdog timer helps identify and fix MCU issues.
- (g) Once the value of positive pin is greater than that of the negative pin, the output is determined by the analogue comparator.
- (h) Status and control monitor other CPU blocks periodically to regulate the flow of orders being executed.
- (i) Arithmetic and logical unit (ALU): All 32 of the general purpose working registers are directly connected to the high-performance AYR ALU. Arithmetic operations between general purpose
- (j) registers are completed in a single clock cycle. The three basic kinds of ALU operations are arithmetic, logical, and bit-function.
- (k) I/O pins: You may link Arduino sensors, actuators, and other ICs using the digital inputs as well as outputs (digital I/O) on the board. If you learn how to utilise them, you can use the Arduino to perform some really helpful tasks, such as modules.

Bluetooth module: Here on transmitter side, a GUI app on the mobile phone delivers ON/OFF signals to the receiver at which loads are attached, where a Bluetooth module is linked to the Arduino board. By this technique, the loads may be remotely ON/OFF-ed by tapping the designated area of the GUI.



Voice module: Uses inbuilt voice recognition on Android mobile devices to send voice instructions to your robot. connects to Bluetooth Serial Modules & transmits the voice that was identified as a string. For instance, the Smartphone will produce a string if you say Hi. Your Bluetooth module responds with a *Hello#. followed by the start and stop bits * and # Used with any microcontroller that has the ability to handle strings. Examples of platforms include Arduino, ARM, PICAXE, MSP430, 8051-based CPUs, and several additional controllers and processors.

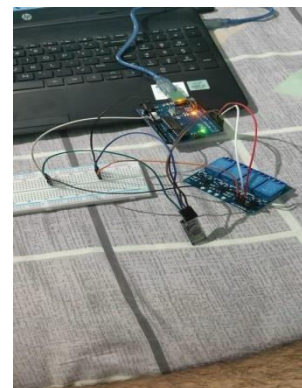


V. EXPERIMENTAL RESULTS

Switch on :



2(a)

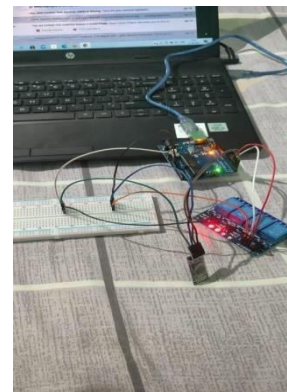


2(b)

Switch off :



2(c)



2(d)



VI. CONCLUSION

With the help of an Arduino board and Bluetooth module (HC-05), we successfully developed a voice-controlled home automation system in this project. This project may be used to extend the number of relays to control "4" input controls. Our adopted module is more trustworthy and adaptable to regulate various loads. and The wireless control's coverage area is 10 metres. So, this idea might be helpful for a voice-controlled, real-time home automation. As a result, voice-activated home appliance control utilising Arduino technology outperforms remote control control of domestic appliances employing Bluetooth module HC-05. Many automation applications, including those in the automobile, military, healthcare, transportation, and industrial automation, can be added to this project. Also, the adoption of GSM modules can expand the coverage area.

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