



Home Automation System Using Voice Tag

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Abstract— The concept of home automation has transformed traditional households into intelligent living spaces, where appliances and systems are interconnected and controllable remotely. While conventional control interfaces such as smartphone apps and physical switches have been widely adopted, voice recognition technology emerges as a promising alternative that enhances accessibility and user experience. Voice-controlled home automation systems enable users to interact with their devices effortlessly, leveraging the power of natural language processing to execute commands. The project Voice controlled home automation project helps to control the electrical loads based on Bluetooth input signal. The Bluetooth device receives this input signal from android device. This system is especially beneficial in case of handicapped or aged people who find it difficult to walk and operate the electrical switches to turn on or off the loads. This system solves this issue as now the user just has to give voice commands to turn on or off the loads. This system solves the issue by interfacing a unit with home appliances that switches these loads based on the input received from android device. The Android app also provides an effective GUI for providing this functionality.

Keywords: Smartphone, Bluetooth, GUI, Home Automation, Voice Tag.

I. INTRODUCTION

The concept of home automation has transformed traditional households into intelligent living spaces, where appliances and systems are interconnected and controllable remotely. While conventional control interfaces such as smartphone apps and physical switches have been widely adopted, voice recognition technology emerges as a promising alternative that enhances accessibility and user experience. Voice-controlled home automation systems enable users to interact with their devices effortlessly, leveraging the power of natural language processing to execute commands.

In this context, the integration of voice tags represents a novel approach to optimize the control process further. Voice tags are personalized identifiers assigned to specific commands, allowing users to trigger actions simply by uttering predefined phrases. Unlike generic voice commands, voice tags add a layer of customization and context awareness,

facilitating more precise control over individual devices and functionalities.

This paper presents a comprehensive study on the design, implementation, and evaluation of a Home Automation System Using Voice Tag. The system aims to empower users with a more intuitive and personalized control experience, leveraging the latest advancements in voice recognition and artificial intelligence. Through a combination of hardware components and software algorithms, users can assign voice tags to their preferred commands, creating a tailored environment that aligns with their preferences and habits.

The remainder of this paper is organized as follows: Section 2 provides an overview of related work in the field of voice-controlled home automation systems. Section 3 delves into the design and architecture of the proposed system, outlining its key components and functionalities. Section 4 presents the implementation details and technical considerations, followed by Section 5, which discusses the evaluation methodology and results. Finally, Section 6 concludes the paper with a summary of findings and directions for future research.

Voice controlled wireless smart home system has been presented for elderly and disabled people.

The proposed system has two main components, they are

(a) voice recognition system, and (b) wireless system. This system to control home appliances uses a voice controlled android application. By the increasing use of PC (personal computers), internet, mobile phone and wireless technology, it makes it easy for a user to remotely access and control the appliances.

A lot of research has been done and many solutions have been proposed to remotely access the home appliances. Some of them used internet, wireless technology to communicate and control home appliances, others used Bluetooth and GSM technology for controlling the home appliances.

The main aim of our system is to build a perfect companion for someone to be at home. Generally, home automation research targeted many needs like applications that provide the luxury and smart requirements while some threw



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light on the special needs for elderly and disabled etc. our system is a computer based system that can accept voice to direct commands and process them. The system provides us switching any device ON/OFF.

People with disabilities often face unique challenges in accessing and controlling their living environments. Fortunately, technology has revolutionised the way we live and interact with our surroundings. From smartphones to automated smart homes, advancements in technology have made our lives more convenient and efficient. Home automation has emerged as a powerful tool for empowering individuals with disabilities and promoting inclusivity.

II. LITERATURE SURVEY

A. S. Alphonse et al.,[1] presented on the adoption of biometric and RFID security gadgets as innovative solutions for enhancing door lock systems. The traditional reliance on physical keys has proven vulnerable to security breaches, prompting the need for more robust measures. Biometric features such as Fingerprint, Voice and Bluetooth offer unparalleled security by leveraging unique biological characteristics for authentication. Additionally, integrating RFID technology enables convenient access control through assigned cards or tags, eliminating the need for physical keys or complex passwords. The combination of these cutting-edge solutions establishes a comprehensive security infrastructure, significantly reducing risks associated with conventional lock systems.

A. Chaitanya et al.,[2] With the advancements in technology, the Internet of Things has been widely used in recent times to automate various real-life tasks. In this paper, the authors develop a secure home automation system using NFC (Near Field Communication) tags and a custom-built mobile application. The designed system is an attempt at developing a cost-effective home automation system that can be monitored in real time. Various environmental parameters are also monitored and analyzed using the necessary sensors. An automated voice control functionality is implemented. The voice control is multi-lingual and can be customised as per the user's convenience. The authors also propose a machine-learning based framework to analyse the power consumption in a home. This would help the user with insights and help in reducing electricity costs.

A. Gutal et al.,[3] Many organizations rely on the traditional biometric systems for logging their attendance or providing authorized access, which are not of much use today because of

the contagious nature of disease. Through the proposed system in this paper, an attempt has been made to eliminate human contact as far as possible and facilitate centralized monitoring of all the visits made into the residential society. The presented system leverages the best of both worlds - IOT and Deep Learning, thereby incorporating an IOT device, voice assistant, a web server and a mobile application for the end users. Furthermore, the system provides an admin with the ability to maintain records automatically for future references and send the critical alerts as and when required. The user can then simply monitor all the visits made to it from a remote location.

T. B. Khalid et al.,[4] Home Automation is such sector which is being developed to ensure safety and comfort for the people. wanted to integrate the same technology for the elderly and disabled and in doing so we sought to make an energy efficient, affordable and a reliable system. The voice and touch assisted home automation system uses an Arduino Mega 2560 as the processor. The system builds upon the utilization of an existing smartphone technology where a smartphone application is used, which allows the users to control up to 44 devices in addition of multiple smoke detectors and PIR motion sensors, using Bluetooth technology. Unlike other systems, for the ease of use, the entire system can be launched and controlled via NFC tags. The cost has been kept under USD 30, for the entire construction, thus enabling its use for the masses, with potential to modernize each and every old home.

A. Islam et al.,[5] presented design and implement a cost-effective and yet flexible and powerful application based smart home automation system using the Internet of Things. System is designed to detect burglary, increase in the concentration of harmful gasses, smoke and fire flames, detection of suspicious activities and informing the user through text message or push notification. Our system is designed in such a way that it can configure itself dynamically based on the change in needs of the user. Our system eliminates most of the drawbacks in the previous system such as high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security, lack of integration of multiple protocols using new methods or improving the existing methods to achieve better results. The entire home environment can be monitored by various sensors deployed all over the home and controlled by the user-friendly android application.

M. Sowmiya et al.,[6] presented perceive and detect gas leakage, gas cylinder drop level, food count and library book

history of the student by using gas sensor, weight sensor and RFID (Radio Frequency Identification) approach and to provide complete information and usefulness needed. This proposed system defines the design of RASPBERRY PI based on a security system for use in industries or hostel. Industries have been a key part in the swelling of the nation's economy. The swelling in industries has also lead to the swelling of tragedies in the past decades, out of which majority caused by omission or human errors. The initiate method is discussed a menace board system to detect perilous gas leaks, Gas cylinder drop level, hostel food count and library book count from the set value using raspberry pi, gas sensor, weight sensor and RFID reader. A congruous measure is taken by the raspberry pi system turns on and makes a message send to the security van through GSM modem.

design a voice-controlled home automation system. For example, the system could be designed to control a variety of devices, such as lights, thermostats, and appliances. The system could also be designed to be more complex, such as by using artificial intelligence to understand natural language commands.

III. PROPOSED METHODOLOGY

The system consists of the following blocks:

- **Microphone:** The microphone picks up sound waves and converts them into electrical signals.
- **Voice Recognition Module:** The voice recognition module receives the electrical signals from the microphone and converts them into digital data. The digital data represents the spoken words.
- **Controller:** The controller receives the digital data from the voice recognition module and interprets it. The controller then sends signals to the driver circuit.
- **Driver Circuit:** The driver circuit receives signals from the controller and amplifies them. The amplified signals are used to turn on or off the devices in the home.
- **Power Supply:** The power supply provides power to all of the other blocks in the system.

In a home automation system that uses voice tags, the voice recognition module would be designed to recognize specific voice commands. For example, the voice recognition module might be designed to recognize the command "turn on the light." When the voice recognition module recognizes a voice command, it would send a signal to the controller. The controller would then interpret the signal and send a signal to the driver circuit. The driver circuit would amplify the signal and send it to the light fixture. The light fixture would then turn on.

This is a basic example of how a voice-controlled home automation system works. There are many other ways to

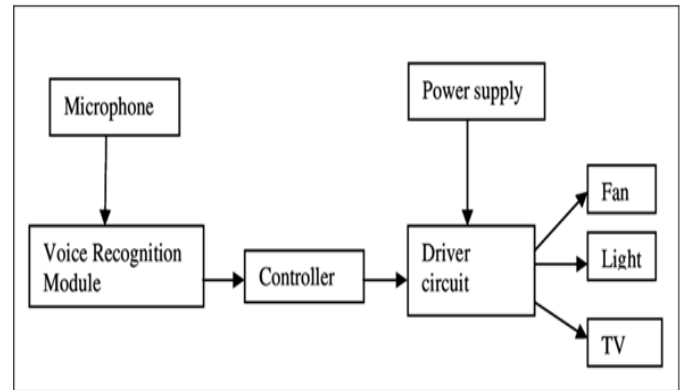


Figure 1: Block diagram

The features of the developed prototype are:

- The prototype establishes a wireless remote switching system of home appliances.
- The command to switch on and off an appliance can be given from radio buttons on the application from one's smartphone.
- There is also a provision developed to use voice commands on smartphone to remotely switch home appliances
- Any device capable of Wi-Fi connectivity can be used to control the prototype.
- Simple design easy to integrate into a variety of appliances and extend on further range.
- Displays the status of each appliances on the application in smartphone
- Cost effective.

IV. RESULTS AND DISCUSSION

Figure 2 presents is the circuit diagram of the project -

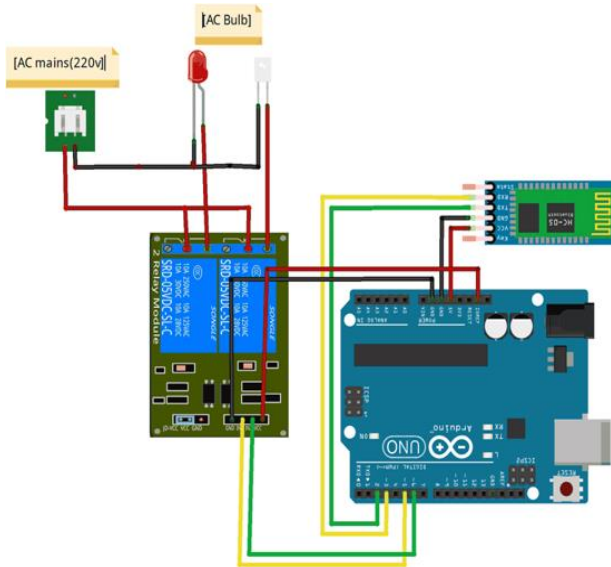


Figure 2: Circuit Diagram of the Project

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.

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Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

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The program reads the Bluetooth module data through serial communication and compares it with defined conditions. If any of the conditions is true, then that task will perform. If any of the condition is not satisfied, it will do nothing. Firstly, we must include all necessary Libraries for the successful execution of the code. Libraries include SoftwareSerial only. Also, we have defined the necessary variables and objects for further programming.

We use the Software Serial library to define the Rx & Tx serial communication pins to the Arduino. Other than that, we can directly use Arduino pin (0,1) for Rx and Tx, but it will create a hustle of removing the connection whenever we upload a fresh code.

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Figure 3: Arudino UNO

The IDE is common to all available boards of Arduino.

- **ATmega328 Microcontroller**- It is a single chip Microcontroller of the ATmel family. The processor code inside it is of 8-bit. It combines **Memory (SRAM, EEPROM, and Flash), Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator.**
- **ICSP pin** - The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board.

- **Power LED Indicator-** The ON status of LED shows the power is activated. When the power is OFF, the LED will not light up.
- **Digital I/O pins-** The digital pins have the value HIGH or LOW. The pins numbered from D0 to D13 are digital pins.
- **TX and RX LED's-** The successful flow of data is represented by the lighting of these LED's.
- **AREF-** The Analog Reference (AREF) pin is used to feed a reference voltage to the Arduino UNO board from the external power supply.
- **Reset button-** It is used to add a Reset button to the connection.
- **USB-** It allows the board to connect to the computer. It is essential for the programming of the Arduino UNO board.
- **Crystal Oscillator-** The Crystal oscillator has a frequency of 16MHz, which makes the Arduino UNO a powerful board.
- **Voltage Regulator-** The voltage regulator converts the input voltage to 5V.
- **GND-** Ground pins. The ground pin acts as a pin with zero voltage.
- **Vin-** It is the input voltage.
- **Analog Pins-** The pins numbered from A0 to A5 are analog pins. The function of Analog pins is to read the analog sensor used in the connection. It can also act as GPIO (General Purpose Input Output) pins.
- The technical specifications of the Arduino UNO are listed below:
- There are 20 Input/Output pins present on the Arduino UNO board. These 20 pins include 6 PWM pins, 6 analog pins, and 8 digital I/O pins.
- The PWM pins are Pulse Width Modulation capable pins.
- The crystal oscillator present in Arduino UNO comes with a frequency of 16MHz.

- It also has a Arduino integrated WiFi module. Such Arduino UNO board is based on the Integrated WiFi ESP8266 Module and ATmega328P microcontroller.
- The input voltage of the UNO board varies from 7V to 20V.

V. CONCLUSION

This project successfully implemented voice controlled home automation system controlling relays using arduino with Bluetooth module HC-05. This project can be used for controlling 'n' number of input controls i.e by extending number of relays. Our implemented module is more reliable and flexible in order to control any loads and the coverage area for wireless control is 10 meters. Hence this project can be useful for a real time voice controlled home automation. Thus arduino based voice controlled home appliances proves to be a better remote controlled operation on home appliances using Bluetooth module HC-05. This project can be extended for many automation applications such as industrial automation, automotive, military, healthcare, transportation and so on. Further the coverage area can also be increased by the use of GSM modules.

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