

VOICE CONTROLLED WIRELESS HOME AUTOMATION SYSTEM

Authors: Ezhil Venthan S & Gokulapriyan A, Computer Science and Engineering, Kingston Engineering College, Vellore.

Guide: Dr.U.V.Arivazhagu M.E.,M.B.A.,Ph.d., Professor and Head Of the Department, Computer Science and Engineering, Kingston Engineering College, Vellore.

ABSTRACT

Automation is an upcoming technology of 21st century. The important reason automation gaining its popularity is reducing human effort, interaction and to reduce human errors. With the improvement in latest technologies, smartphones have become an essential gadget to all. For 2016, the number of Smartphone users is forecast to reach 2.1 billion. Another upcoming technology is the natural language processing which uses human voice for commands. Combining all of these technologies, the project presents a wireless voice controlled home automation system. Such a system will be helpful for senior citizens and physically disabled persons who are in need of assistance to perform normal tasks [4]. This system will enable the user to acquire control over every appliance in their home. The automation system is implemented on existing homes with no modification to the infrastructure and little modification to the electrical wiring system [5]. The automation system recognizes the voice commands given by the user via the smartphone and transfers it to the microcontroller board which analyzes the command and acts accordingly.

General Terms

Voice recognition, Text-to-Speech

Keywords

Arduino Uno, Home Automation, Smartphone, Voice Control.

1. INTRODUCTION:

Imagine you just left home and get this anxious feeling that something is wrong. Did you leave the stove on? Is the door unlocked? You have no other option to pack up go back home to turn off the stove or lock the door or to find it all perfectly fine. Home automation system would have you back on these cases. From the convenience of your smart phone or tablet, one should have the ability to investigate and rectify the scenarios that are lock or unlock doors, switch on or off lights. To make the system easier to use, the system should be able to accept voice commands given by the user and act accordingly to the command. Natural language processing should be used so that the voice commands are properly interpreted and the system act consequently.

2. SYSTEM DESIGN

2.1. System Components

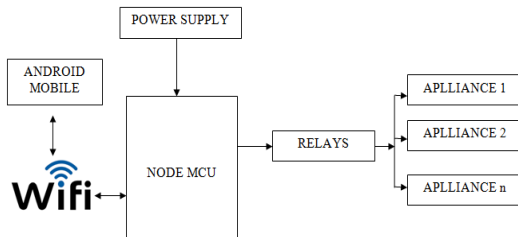


Figure 1: Architecture Diagram of the System

The Voice-operated Android and Arduino Home automation system uses an Android based Bluetooth or Wi-Fi enabled phone for its application and the Arduino Uno as the microcontroller. The key components of this system are:

- Android Smartphone
- Arduino UNO board
- ESP8266 12E Wi-Fi module
- Relays
- Light bulbs / LED's

2.1.1. Android Based Phone

The smart phone plays an important role in the system. The smart phone uses inbuilt microphone to get the command from the user. The android application uses speech-to-text programs to convert the command to text. After converting the text it is sent to the Arduino board for decision making or execution of commands [1].

2.1.2 Arduino

Arduino is an open source prototyping platform easy to use on software as well as hardware. The board can be programmed to switch on/off electronic appliances using ARDUINO (IDE).

2.1.3 Wi-Fi Module

This allows the Arduino board to connect to android application. It is based on ESP8266 12E capable of both TCP and UDP [2].

2.1.4 Relays

The Arduino has 14 pins which will flow the digital signal and the four analog pins mounted on it. Arduino operates the devices by using 5 volts but many appliances require 230 volts. The functioning of

relay is just to break the current and again established the connection through the heating coil which gets heated and attaches to the coils another part and the connection gets established [3].

2.2 GATEWAY

INTERNET - For the devices and the board to be connected, the board and the smart phone should be connected to the internet. This is the main requirement of the system.

3. IMPLEMENTATION

With the component, the microcontroller circuit is established. The electrical appliances should be connected to the relay and then to the switch board. Launch the android application “Home Automation Control in the android smart phone which is able to convert the voice command to text and will display it to the user before sending it to the microcontroller [1].

Before launching the application, the smartphone has to be connected to Bluetooth module or the Wi-Fi module which are connected to the Arduino/Wi-Fi Module [7]. The application reads the voice command from the user and converts it to a text value. This text is sent to the microcontroller for decoding. The microcontroller accepts the text interprets it and sends the power supply to the indented pin accordingly.



Figure 2: Application Home screen

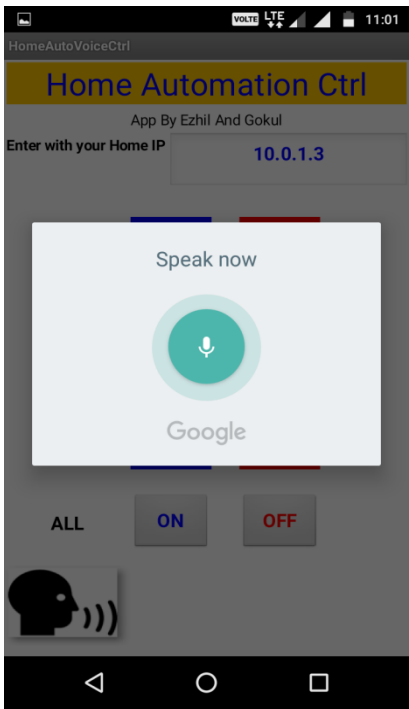


Figure 3: Accepting Voice Commands

4. TEST CASES

S.No.	Test Steps	Test Data	Expected Result	Actual Result	Status
1	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass
2	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass
3	Tap & Speak	Turn on the light	Turn on the light	Done on the lake	Fail
4	Tap & Speak	Turn on the light	Turn on the light	But I'm too late	Fail
5	Tap & Speak	Turn on the light	Turn on the light	Kinda late	Fail
6	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass
7	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass
8	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass
9	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass
10	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass
11	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass
12	Tap & Speak	Turn on the light	Turn on the light	Turn on the light	Pass

5. Figure 4: Table showing Test cases used for testing Voice to Text Conversion

FLOWCHART

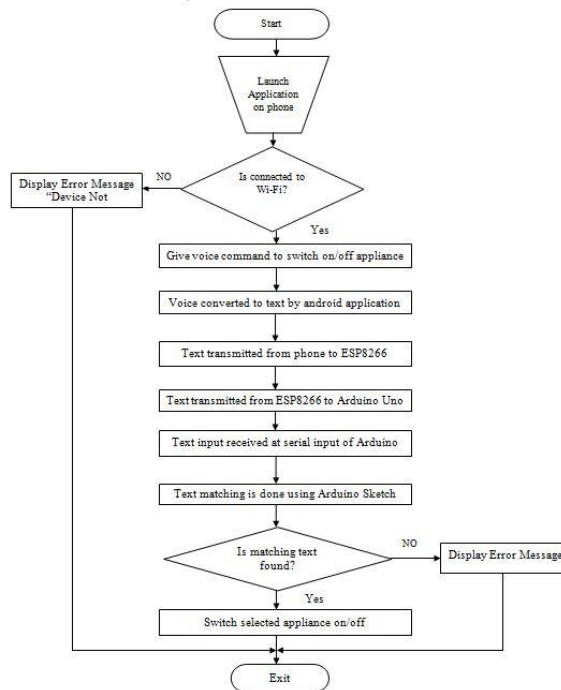


Figure 5: Flowchart of the System

6. CONCLUSION

The proposed system is a viable solution in the need for home automation system. It is able to bring every appliance into a single point of contact via a smartphone. The user doesn't have to manually check or control the appliance. It reduces the human effort and increase comfort in our homes. This system is further useful because of voice commands. The user doesn't have an extensive knowledge over the English language. Simple commands would suffice. The English language has penetrated so deep that people doesn't use their native words for electrical appliance. Another important aspect of the system is use of smartphones, which has become an essential gadget in 21st century application. The user does not need training to use the application. Another important advantage is the system is highly flexible and scalable. Any electrical appliances can be easily added to system and controlled. The system is designed so that it can help physically challenged and old aged people in controlling the appliances with ease and less effort.

7. RESULTS AND DISCUSSION

Hence Voice Controlled Home Automation System is possible with minimum number of components through Wi-Fi. The technology development and Integrated Chips development supports Home Automation and other supporting process in wide range. Some of the issues are discussed after the results are

- 1) Is that only a Single home appliance is controlled by the System?

No, as much of home appliances needed can be connected and controlled. The Relay or Logical Switch is extended as much required appliances to be connected. Single channel relay enables to connect single device and Two Channel relay for two devices such as fan and light and so on. The relay can be designed as per requirements, and Voice command to control the device is updated and program is flashed to the NODEMCU.

2) How is power supply is given to the NODEMCU?

Initially the power is given by connecting the NODEMCU to the laptop or system but it is not possible at all times. Hence a Rechargeable Lead Acid Battery with 1.4v is connected made as power supplier for the NODEMCU and connections are made in such a way that when power is on the NODEMCU uses the direct power supply, when power cut occurs it uses the battery power. The battery is capable of given power support up to 10hrs.

3) Is that possible to connect high power consuming appliances like AC can be controlled?

Yes, it is possible to connect and Control high power consuming appliance by choosing right relay with right power specification.

8. FUTURE WORKS

The system can be upgraded using RFID sensors in each room. Assign RFID sensors to electrical appliances. When the user enters the room, the RFID is registered in the application and the user can easily control the appliance. For security features, the system can be expanded to include home security feature like capturing the photo of a person moving around the house and storing it onto the cloud.

9. REFERNCES

- [1] Sen, S., Chakrabarty, S., Toshniwal, R. and Bhaumik, A., 2015. Design of an intelligent voice controlled home automation system. *International Journal of Computer Applications*, 121(15).
- [2] Folea, S., Bordenca, D., Hotea, C. and Valean, H., 2012, May. Smart home automation system using Wi-Fi low power devices. In *Automation Quality and Testing Robotics (AQTR)*, 2012 IEEE International Conference On (pp. 569-574). IEEE.
- [3] Deore, R.K., Sonawane, V.R. and Satpute, P.H., 2015, December. Internet of Thing Based Home Appliances Control. In *Computational Intelligence and Communication Networks (CICN)*, 2015 International Conference on (pp. 898-902). IEEE.
- [4] Wahab, M.H.A., 2016, September. IoT-based home automation system for people with disabilities. In *Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO)*, 2016 5th International Conference on (pp. 51-51). IEEE.,
- [5] Han, X. and Rashid, M.A., 2016, June. Gesture and voice control of Internet of Things. In *Industrial Electronics and Applications (ICIEA)*, 2016 IEEE 11th Conference on (pp. 1791-1795). IEEE..

- [6] Kodali, R.K., Soratkal, S. and Boppana, L., 2016, April. IOT based control of appliances. In Computing, Communication and Automation (ICCCA), 2016 International Conference on (pp. 1293-1297). IEEE.
- [7] Mowad, M.A.E.L., Fathy, A. and Hafez, A., 2014. Smart home automated control system using android application and microcontroller. International Journal of Scientific & Engineering Research, 5(5), pp.935-939.
- [8] Arduino Uno Projects: <http://arduino.cc/en/Main/arduinoBoardUno>
- [9] Obaid, T., Rashed, H., El Nour, A.A., Rehan, M., Saleh, M.M. and Tarique, M., 2014. ZigBee based voice controlled wireless smart home system. International Journal of Wireless & Mobile Networks, 6(1), p.47.