

Review on Construction of Voice Controlled Home Automation Control System using Bluetooth for Elder and Physically Disable People of Addis Ababa, Ethiopia

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Abstract: The most common challenges for disabled and elderly people worldwide are ON Television, lamps, the Internet, Refrigerators, Fans, and other home appliances. To solve this problem the researcher constructs a Voice-controlled home automation control system. In this research, a voice-controlled home automation system has been presented for elderly and disabled people. The proposed system has the main components of a Voice recognition system. The main object of this system is to control home appliances using voice commands. Based on the received signal from the disabled person at the Bluetooth receiver related to the appliances, desired switching operations are performed. The desired system is a low-power and low-cost system. Home automation appliances are one of the primary growing industries that may change the way people live. Typical Bluetooth (wireless) home automation system allows one person to control household appliances from a centralized control unit which is wireless. These appliances always have to be specially designed to be compatible with each other and with the control unit for most commercially available home automation systems. The designed system can be incorporated as a single portable unit and allows one to wirelessly control lights, air conditioners, fans, security cameras, television sets, electronic doors, computer systems, amplifiers, etc., and turn ON or OFF any appliance that is plugged into a wall outlet, get the status of different sensors and take decision accordingly. The system is movable and designed in a way that is easy to install, configure, run, and maintain. The problem lies with the situation of the elderly or disabled people, who cannot usually help themselves to move around and might need external assistance. People who live alone additionally need a supporting hand at home. Therefore a voice-managed domestic automation appliance system is designed, so that the users can carry out certain jobs with just the use of their voices, additionally, the system is designed to have a hand-held device (remote) so that the elderly or disabled person can easily speak their commands, and otherwise they would have to walk over to the microphone to speak.

Keywords: Home automation; voice control; smart home; bluetooth module

1. Introduction

This study is advanced to govern domestic home equipment using a voice-controlled Android application. A Bluetooth device is interfaced with the control unit for detecting signals transmitted by the Android application. This record is conveyed to manipulate the unit which switches on loads ON/OFF as desired. An Arduino IDE was used in this project as a controlling device. Remote operation is achieved by any smartphone or Tablet with

Android OS, upon software voice operation. The conveying step uses Android software for the voice signals which are conveyed to virtual bits [1]. At the receiver end, these signals are used for controlling the home appliances on and off. At the receiving end, the appliances are driven by a Relay that is interfaced to the microcontroller. Serial communication data sent from the Android application is received by a Bluetooth receiver linked to the Arduino IDE. The program on the Arduino IDE refers to the serial signal to generate respective output based on the input signal to operate the Relay.

The research has integration technology of Android mobile and embedded systems [2]. Android mobile user has to install software on his mobile handset to manage the devices. Then he/she can give a signal using the voice on that software. For this, everyone has to turn on Bluetooth on mobile, so the primary wireless managing technique used in this research is Bluetooth technology. The Bluetooth device is linked with the circuit that has a decoder. It sends out a code for corresponding commands sent by humans. Then the respective tool linked with the circuit will be turned ON or OFF depending on the signal given. For example: Turn on Television, Turn off Television. Turn on Fan etc. Such that by giving signals from mobile everyone can control domestic home appliances. This facility and control not only provide better control locally and remotely but also support special needs, particularly services that support the elderly and disabled people [3]. Generally, the researcher designed the system for four home Automation appliances a fan, TV Lamp, and amplifier.

2. Design Procedure and Basic Design Blocks

The Researcher designed a voice-controlled domestic Home Automation appliance system, where different appliances are controlled by sending a Voice signal (Figure 1) [4]. The voice-controlled Home Automation research is implemented using Bluetooth and a smartphone. For the successful completion of this research, some procedures will be followed to carry out different jobs. Different literature reviews would be revised relating to this research and data will be collected about the Voice Activated Home Automation system. Arduino Software was selected to develop the software programming.

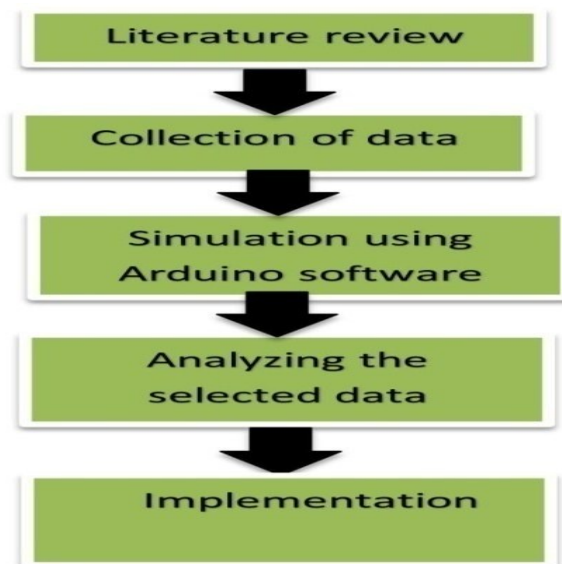


Figure 1. Design Procedure.

Basic Design Blocks

This system is divided into three parts basic design blocks namely [5]:

- (1) Transmission block,
- (2) Controlling block and
- (3) Receiving block.

The whole scenario of design will be presented as follows, with the help of Figure 2. Figure 2 represents the transmission block. This figure represents the flow of the whole system, and explain how the system will work.

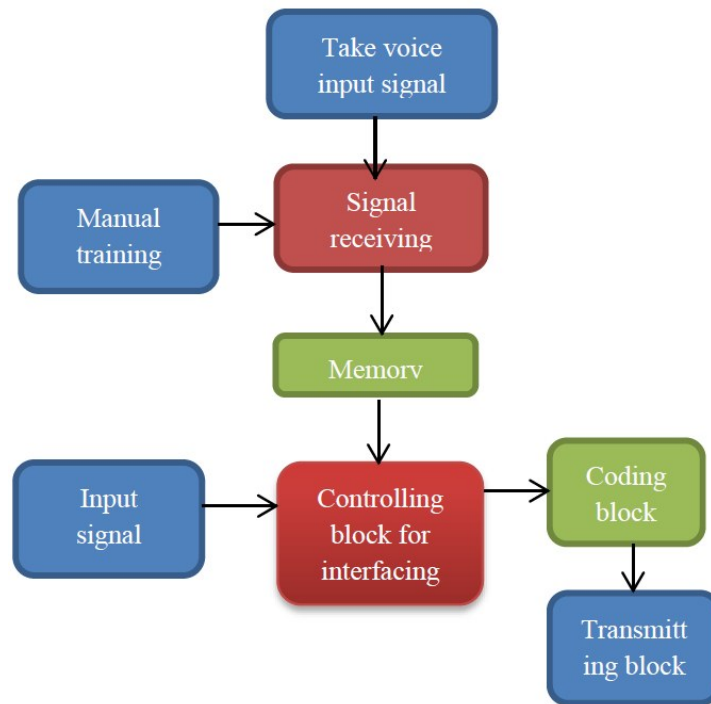


Figure 2. Transmission block [5].

3. Implementation of the System

Voice-controlled home Automation system is a smart home system. This burgeoning enterprise has spawned a choice selection of products from several respected manufacturers. Home automation-controlled systems usually work on wireless technology, but very few systems are voice-controlled. The proposed system is an innovation to this technology where the voice-controlled home Automation system is introduced to be more compatible and convenient by bringing a hand-held device to the consumers. Voice-managed domestic Automation machine makes use of a transducer, keyboard, Integrated circuit for speech recognition, RF module, and AVR microcontroller primarily. Additional equipment such as the LCD is commonly added to expand the home automation system’s capabilities and make it more users friendly.

Control your Arduino with voice instructions for the use of an Android smartphone; before the user makes a voice-activated home automation system, he/she must first learn the basic principles of the experiment. This manual will permit you to command the Arduino usage of your Android telephone and an HC-05 Bluetooth module. The microcontroller device with the Bluetooth module and relay circuit desires to be connected to the transfer board. Then the writer needs to launch the Android-based application— “Auto Home” on our Smartphone. Through the software, we can instruct the microcontroller to switch ON/OFF an appliance. After getting the instruction through the Bluetooth module, the microcontroller offers the sign to the relay board.

The software first searches for the Bluetooth device. If it is obtainable then it launches the voice recognizer it reads the voice and converts the audio signal right into a string. It produces a fee for every piece of equipment so one can receive the microcontroller device. The microcontroller makes use of the port in serial mode. After studying the statistics it decodes the entry cost and sends a sign to the parallel port through which the relay circuit might be activated. In this task, the researcher used a Bluetooth module. The writer can also attach a GSM module to do the work, using which the application can be used anywhere where a mobile network is available.

When the string “turn on light” is detected by the application, it will send the string as “*turn on light#”. So, the real message acquired through the Bluetooth Module is in the format of “*Message#”. The reason for padding the ‘*’ and ‘#’ at the beginning and end of the string is to identify the starting and ending of the message. We are able to delete the ‘#’ from the string but leave out the ‘*’ in order to identify the starting of the string. The received message is compared with some predefined strings and if the message matches with any of them, then a corresponding action like turning on or turning off the load happens. We have used the following

commands: “turn ON Amplifier”, “turn OFF Amplifier”, “turn ON Lamp”, “turn OFF Lamp”, “turn ON TV”, “turn OFF TV”, “turn ON Fan”, “turn off Fan”, “turn ON all” and “turn OFF all”.

4. System Design

The circuit diagram of the research is given below which will help to prepare the hardware project easily. Arduino Mega is connected to a Bluetooth device by four I/O points. AMR software is used to recognize voice which is installed on the Android phone. Relay is also used as a switch to the system. A voltage regulator is also connected to complete the circuit to regulate the amount of voltage drop. The overall systems for four home automation appliances are designed according to the circuit diagram given in Figure 3.

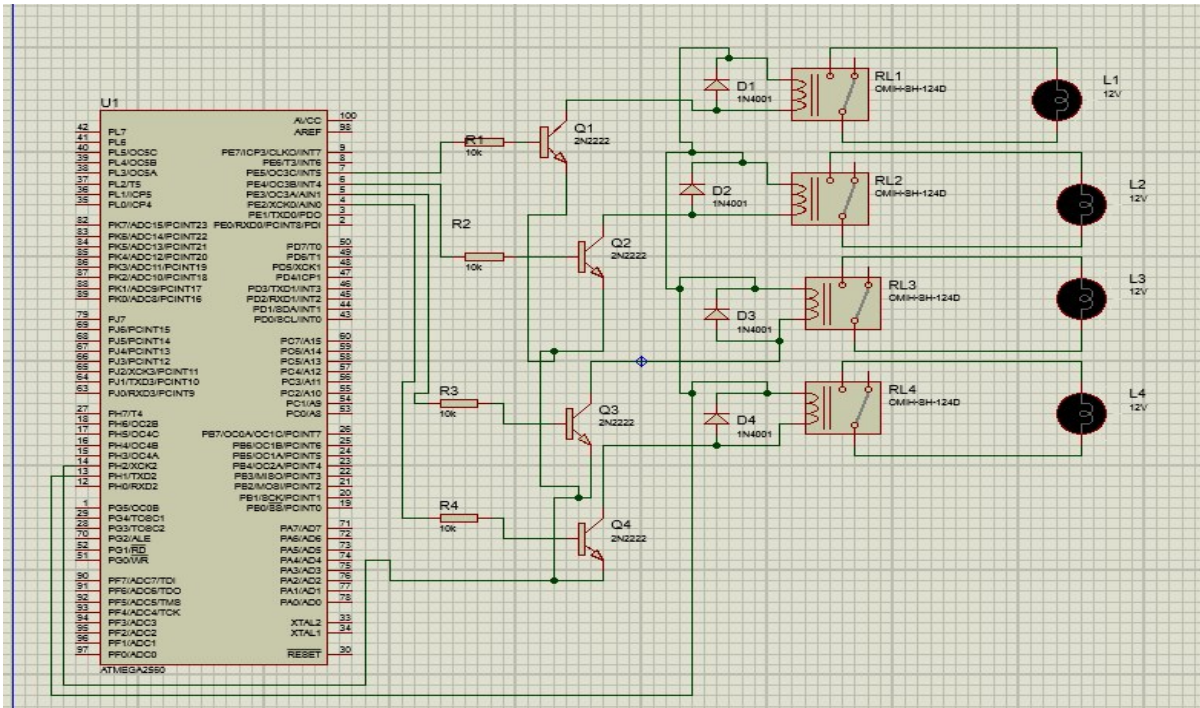


Figure 3. Overall circuits.

5. Result Discussion

Controlling of four devices of home automation household appliances are successfully achieved, Fan, TV, Air conditioner, and light bulb/lamp. Only the fan can be voice-controlled for three levels of speed, full, medium, and off-state speed. The other, bulb/ Lamp, TV, and amplifier can be voice-operated upon two levels of ON and OFF.

In voice-controlled domestic home automation appliances, several factors have to be considered for the successful process of producing voice command control. Once the focus group was completed; the participants’ reactions to the design were studied. The results from this study were used to further improve the design of voice-controlled home automation.

6. Conclusion

The motive of the system is to apply cellular phones' built-in Bluetooth facility for home automation. The complete application software has been designed using Android, using a C Language program. The domestic automation device furnishes a very good paradigm for any Automation System primarily based on Android Mobile Phones and Bluetooth. The purpose of this study is to control some of the major household devices by voice for disabled people. It isn't always most effectively geared toward imparting a healthful and cushy lifestyle to the users, however additionally at aiding the unwell or handicapped and those residing alone, so that they can easily handle all their obligations at a convenience. Making the design easier to handle and sleeker, with a technique to control more appliances at a time is the future requirement. The design of the voice-controlled

home automation system is both portable and ready to be installed in every main household circuit. The researcher introduced portability in the entire system, using voice controlling and the application end.

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Informed Consent Statement

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Data Availability Statement

Not applicable.

Conflicts of Interest

The authors declare no conflict of interest.

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