



# DEVELOPMENT OF VOICE RECOGNITION BASED HOME AUTOMATION SYSTEM USING BLUETOOTH

<sup>1</sup>S.R.Patil, <sup>2</sup>S.A.Patil, <sup>3</sup>R.V.Babar, <sup>4</sup>G.B.Jirage, <sup>5</sup>P.K.Gaikwad

<sup>1,4</sup> Research Scholar, <sup>2,3</sup> Assistant Professor, <sup>5</sup> Associate Professor

<sup>1,4,5</sup> Department of Electronics, Shivaji University, Kolhapur, India

<sup>2</sup> Department of Electronics, Smt. Kasturba Walchand College, Sangli, India

<sup>3</sup> Sinhgad Institute of Technology, Lonavala, India

*E-mail ID: patilsanmati15@gmail.com*

**Abstract:** The concept of making any home "smart" is known as home automation. A smart home is a cluster consisting with networked equipment that which operates in better feasible manner by the user. This paper discusses development of voice recognition based home automation system using Bluetooth. In this system android application with a Bluetooth technology is implemented. The design comprised AT89C51 microcontroller, an android application with Bluetooth module (HC-05). The automation identifies speech commands from the user and sends them to our microcontroller, which recognizes the voice and switches the devices accordingly. The home automation system is intended to use voice commands to manage all lights and electrical equipment in a home.

**IndexTerms - Bluetooth, Voice control, Microcontroller, Home Automation, Voice recognition, Smartphone.**

## I. INTRODUCTION

IoT plays an essential function in the life and lifestyle of each person in the coming days. IoT makes the task of human easier and more convenient. All around us can be controlled by a click, and the control is under human hands. Just one click can carry out a large number of measures. Wireless access and control of every gadget in home such as light, fan, fridge, TV, Air Conditioning System, Washing Machine etc. is possible from smartphone, mobile or laptop. This reduces energy usage considerably and improves interior safety and gives a better environment in which to live. Home Automation is one of the biggest growing sectors which can revolutionize the way people live.

The voice controlled home automation system aids in the operation of electrical equipment through the use of voice commands. The system transmits data via Bluetooth module to control the operation of electrical loads. Home Automation System comprising with Voice Controlling is planned to carry on motivation of computerization as well as to achieve the objective of effortlessness. Bluetooth can receive input signals from any Bluetooth-enabled device, such as a smartphone. Smart home automation is very useful for persons who are disabled or elderly. The technology solves the problem of turning on/off electrical appliances because the user only needs to speak to manage the gadget or electrical loads. The system is developed in such a way that the user can operate all appliances at once or individually.

## II. LITERATURE REVIEW

Akbar et.al. explained the usage of a mobile app for electronic equipment control. The energy-savings and the cost of electricity utilized on each device are also helpful to accomplish optimization [1]. In this [2] article residential equipment based on IoT via an Android application can be monitored and controlled using the Raspberry pi card. The major goal of this program is to automate all equipment, including home appliances, using Raspberry Pi over the internet, as well as to provide system security using sensors such as PIR and LPG. The use of our renewable energy resources is largely carried out by this excellent technology. The author uses voice recognition and user interface control to achieve home automation [3]. Mukesh Kumar et.al., elaborated to develop a automation system for home exclusively for paraplegics [4]. IoT is intended to have thousands of sensors connected via wireless and other communication technologies to the Internet. The sensors create a vast quantity of data that needs analysis, interpretation and application [5]. Home Automation System uses the Internet of Things simply by using smartphones to manage and monitor electrical and electronic devices at home remotely. A flexible home automation system is given with the implementation of a low cost solution [6]. The author discusses the development of a home automation system with the use of an arduino uno microcontroller and a hardware module to convey instructions to gadgets [7].

Nisar et al. [8] used RFID (radio frequency identification) to produce as well as supervise monitor the interior movements of individuals in an home considering as smart home. RFID tags were utilized to monitor and collect the elderly person's movement activities. The information gathered was used to take proper decision about the elderly person's health. RFID, on the other hand, is unable to function in areas where its radio waves are not accessible. Nisar and Ibrahim [9] also introduced the Android application to a Smart Home Model that monitors the vital health. Yuksekkaya et al. [10] created a home appliance automation system based on GSM, the Internet, and speech recognition. The CPU processed informative data acquired from the RF (Radio Frequency) antenna, which then used to control the appliances. Sriskanthan and Karande [11] connected all of the household appliances and used Bluetooth to operate them. A mobile host controller from remote place and household equipment were part of network. The host controller interacted with the home equipment via Bluetooth can be controlled the home equipment using a Bluetooth module and a network RS232. Tyagi et al. used Arduino and Android OS to control home appliances using voice commands [12].

**III. METHODOLOGY**

This article was developed with the co-design technique combining hardware and software. A Bluetooth module (HC-05) has been used to interact with the Smart phone, as illustrated in Fig. 1. The four relays are interfaced to microcontroller for four home appliances such as fan, tube, lamp 1 and lamp 2. For Android application platform on smartphone mobile voice prompt acts as Input. Bluetooth module (HC-05) transmits the received command. The entire system was controlled by two devices, namely the microcontroller and a wireless network know as Bluetooth. The Fig. 2 depicts the circuit diagram of the home automation system.

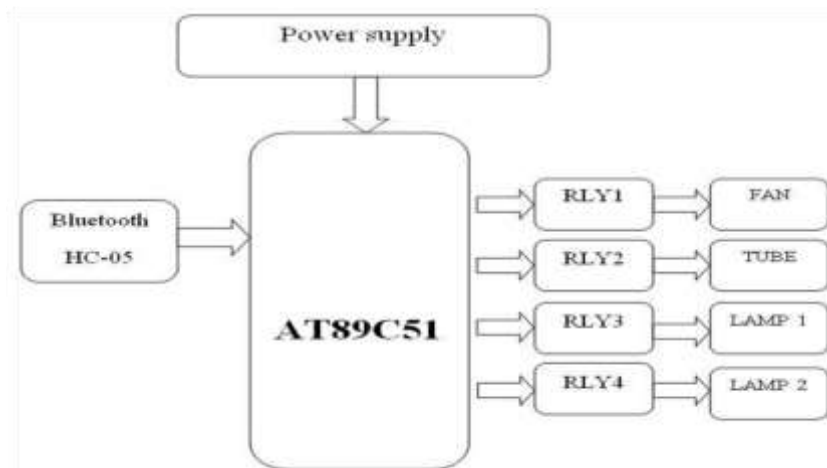


Figure 1: Block Diagram of the system

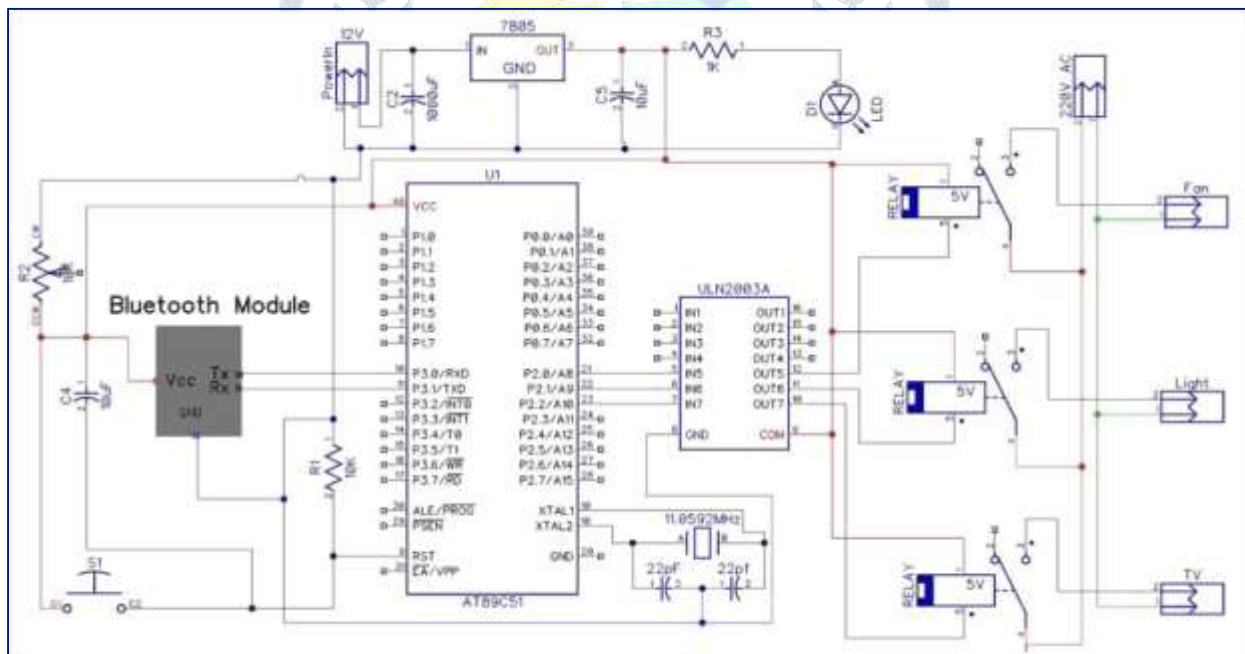


Figure 2: Circuit Diagram of the system

**IV. TESTING AND DISCUSSION**

The flowchart of the home automation system is shown in Fig. 3. Initially open the application on android phone. At the same time select the Bluetooth module which is to be connected. When the Bluetooth module is successfully connected then voice command is given to switch the device on/off. This voice is being converted to text by app in the smartphone and converted text is transmitted to microcontroller. When text received at serial port of microcontroller, it will check that is there matching between the text. If matching found then the respective command will be executed.

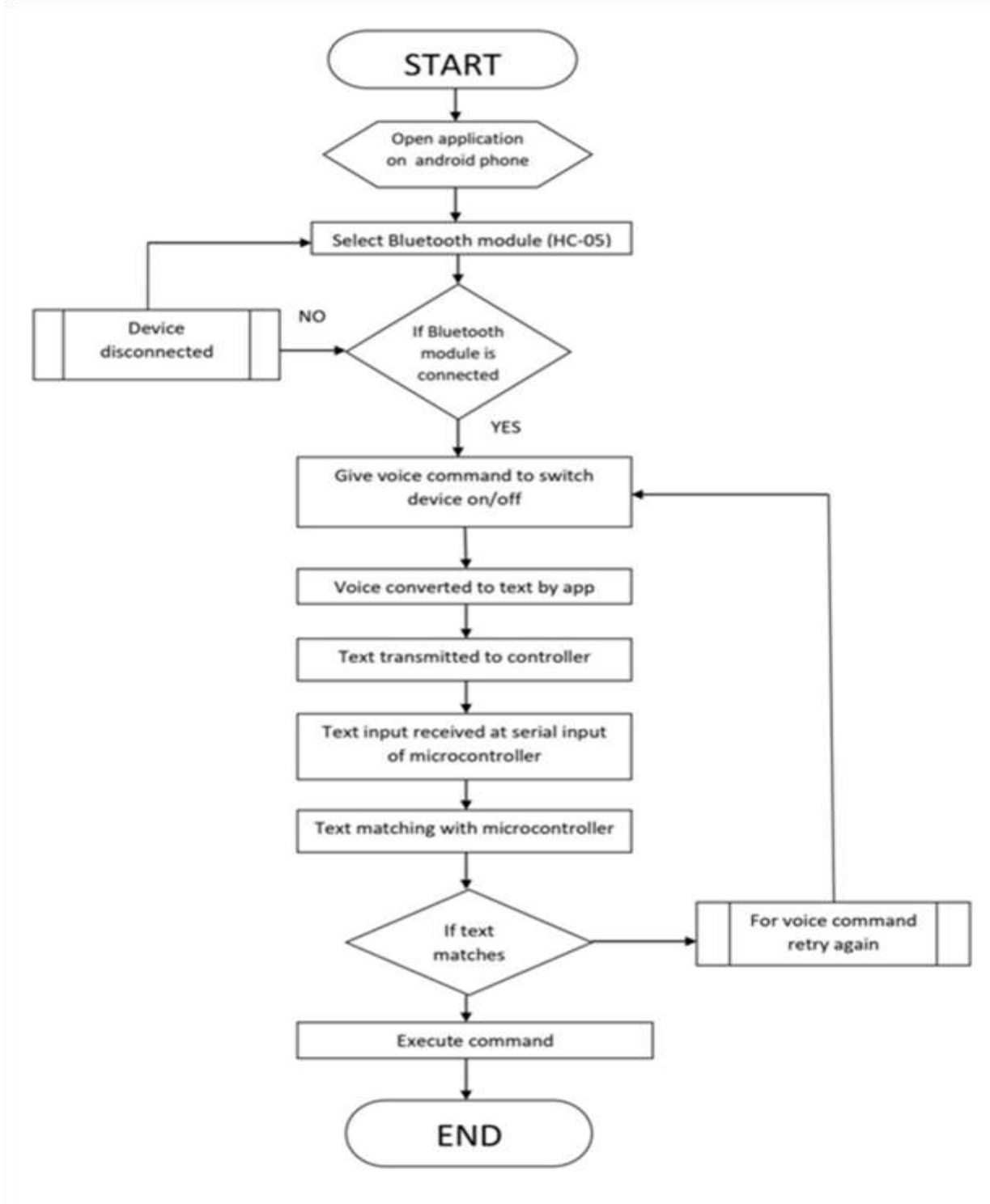


Figure 3: Flowchart of the home automation system

Fig. 4 depicts the designed prototype of the home automation system. The AT 89C51 is connected with necessary crystal and other required peripherals. The Bluetooth module (HC-05) was successfully interfaced with microcontroller. Four relays are connected to control four home gadgets those are fan, tube, lamp1 and lamp2. By turning ON power, blinking of the LED connected on the Bluetooth module takes place. For connect the Bluetooth module, we must first open the "Bluetooth Controller" app on our Smartphone. The LED becomes stable after these devices have successfully paired. In Fig. 4 tube is connected to second relay and voice command for each relay is given in terms of alphabets such as a, b, c and d for relay 1, relay 2, relay 3 and relay 4 respectively.

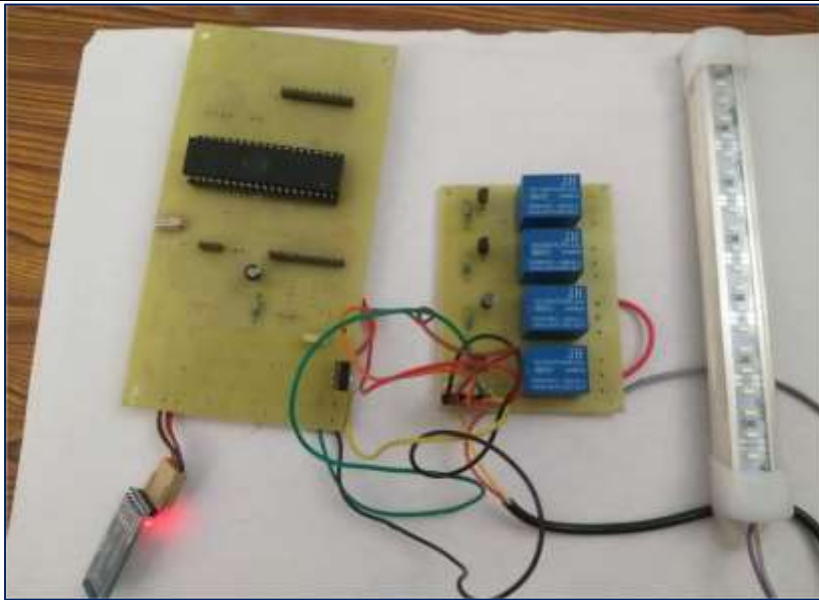


Figure 4: Designed Prototype of the home automation system

Figure 5(a) shows the vocal command configuration window. In the android app set different voice command for different load as shown. If we give voice command "a", then the text acknowledged by the Bluetooth module is "a" and it is transmitted towards the microcontroller. By microcontroller AT 89C51 logic comparison of the received data and the stored data is done and respective load is turned ON. When we say "b," the data received by the Bluetooth module is "b," as illustrated in Fig.5 (b). This data, "b," is sent to the microcontroller. Micro-controller then compares the received data with the data set in it and accordingly turns on the load. Here at relay 2 position the tube is connected. So when, voice signal "b" is received that means the tube connected at this pin gets ON as shown in Fig. 6.



Figure 5(a): Vocal command configuration Window

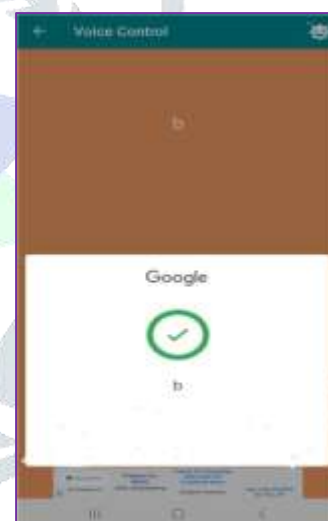


Figure 5(b):When voice command "b" given

## V. CONCLUSION

Microcontroller based voice controlled automation of smart home using android application platform and Bluetooth is done as well as results has been checked. In this present paper a Bluetooth technology and an Android application platform is used. The main advantage of this system is to make physically disabled people and more elder people more self dependent.

## VI. FUTURE WORK

Further characteristics such as biometrics can be incorporated in future so that unauthorized users do not have access to equipment and a schedule can also be established to preserve energy efficiently for each device linked. Smartphones can be used for smart home in the future. According to some analysts, this will happen in the next 15 years.

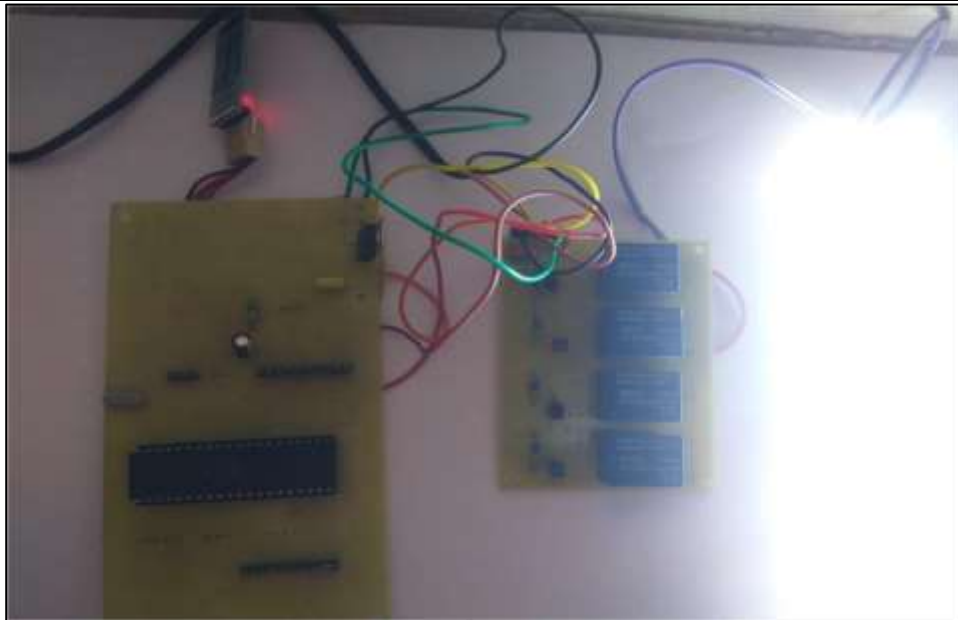


Figure 6: When give voice command “ b”

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