



Smart Home Automation Based on Voice Command Using Smart Phone

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Abstract: *In the recent years, the voice controlled home automation systems have seen a rapid change due to introduction of various wireless technologies. This system is the most suited to seniors and the disabled persons especially those who live alone and since recognize voice so it is secure. The words manipulated home automation system is designed to control all lights and electrical home appliances in a home or office using voice instructions. All that the end user needs is an Android Operating System (OS) Smartphone, which exists in almost everybody's hand nowadays, and a control signal. The control circuit involves an Arduino Uno microcontroller, which steps the user commands and controls the switching of devices. The connection between the microcontroller and the Smartphone is made via Bluetooth, a widespread wireless technologies used for writing data & integer data. So in this paperwork our aim is to design a voice reputation wireless based home software system.*

Keyword: *Arduino Uno; Bluetooth Module; Home automation; HC-04, Smartphone; Voice Control; Voice home automation.*

1. INTRODUCTION

The foremost aim of technology has been to increase efficiency and minimize work. With the advent of 'Internet of Things' in the last decade, we have been pushing for ubiquitous computing in all spheres of life. That thus features extreme importance to simplify human interfacing with technology. Automation is one such area that aims that achieves ease whilst increasing efficiency. Voice controlled House Automation Program aims to further the reason for automation in order to achieve the purpose of simplicity.

The primitive man realized that a highly effective way to communicate with one another [1] is through words. With minimum effort, ideas could be narrated with relative ease. If the first computers came around, reaching the level of sophistication in order to narrate directions using voice to a machine was only noticed in science fiction. On the other hand with tremendous breakthroughs in the field, we are at the precipice of truly using voice to interface with devices. Applying this effective yet historical form of communication we would humanize technology mainly. Voice controlled home Automation System deploys the use of voice to control devices.

The advantages of using voice as an interfacing medium are multifold. Firstly we would get rid of or significantly decreased the need of training for operating this technology. Secondly, the easiest

things of these services would entail a larger adoption of existing technology [2] [3] and would assist individuals with varied disabilities, sick and tired person, and old man access the same technology. We have deployed an Android OS Application as user entrance end mostly due to reduce at which the program provides us with means to use complex technology and as a result of widespread re-homing in the mobile industry. Android OS is the most common OS for over 80% of the mobile phones users [3]. Voice controlled House Automation System leverages the potency of Arduino to provide an all-natural Voice controlled House Automation System. Using Natural Language Handling and the available hardware generally in most smart phones, it converts voice to be used for controlling electrical devices.

2. SYSTEM OVERVIEW

The voice controlled home automation system contains both a base station and a remote station. Each station will be packaged separately. Base station and remote station has some different activities

3. OPERATION BASE MODULE

This operation station will operate with a +5V power supply. This voltage is maintained all over the Operation in the DC power supply. Here is something about our project that how it is working. A

Bluetooth device is connected to the base station. When a voice comment is send to the microcontroller then the comment receive by Bluetooth device. Voice comment is very case sensitive it must be matched with the set program. Finally check the comment by the written program and gives a final output.

4. SYSTEM DESIGN

4.1 System Components

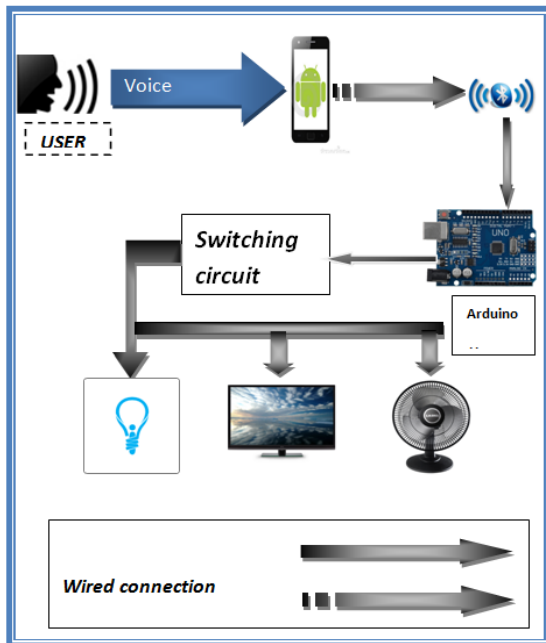


Figure 1 Block Diagram of the System

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

- ❖ Arduino Uno
- ❖ Bluetooth module
- ❖ Bread board
- ❖ Android based phone

4.1.1 Android Based Phone

Android is a mobile working machine (OS) primarily based at the Linux kernel and currently evolved by using Google. With a person interface based totally on direct manipulation, the OS makes use of contact inputs that loosely correspond to actual-global moves, like swiping, tapping, pinching, and opposite pinching to govern on-display items, and a virtual keyboard. We have used the Android platform because of its massive market globally and it's clean to use consumer interface programs on the Android phones [4] enlarge the functionality of devices and are written generally in the Java programming language the use of the Android software program improvement package (BT Voice App). The voice recognizer [5] [6]

that's an in constructed characteristic of Android tele-phones is used to build an application which the person can perform to automate the appliances [7] in his residence. The user interface of the utility is proven below:

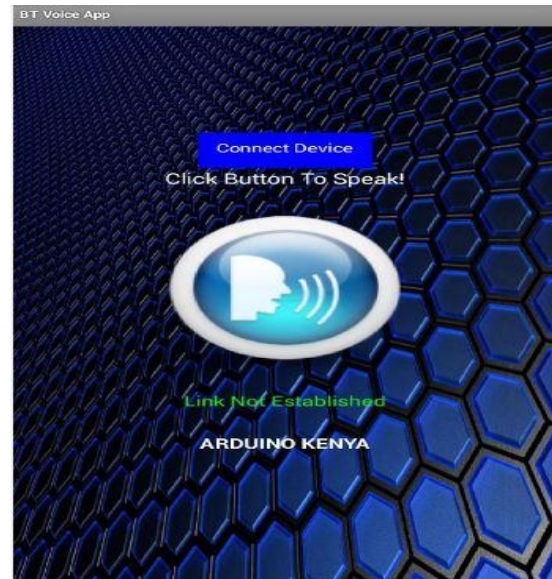


Figure 2 Interface for the Voice Control Application

The microphone voice command is given to switch the corresponding device on/off. The voice recognizer listens and converts what's said to the nearest matching phrases or text. The Bluetooth adapter gift inside the cell phone is configured to send this article to the Bluetooth module on the Arduino Uno board that might in flip manage the electric appliances.

4.1.2 Bluetooth Module

Bluetooth is a wireless technology [8] general for exchanging data over short distances (the usage of brief-wavelength UHF radio waves inside the ISM band from 2.4 to 2.485 GHz) from constant and cell devices and building non-public area networks (PANs). The Bluetooth module [4] being used permits us to transmit and acquire signals. It gets the textual content [9] from the Android Smartphone and transmits it to the serial port of the Arduino Uno.

The Bluetooth module being used right here is the HC-04 module. it's far an clean to use Bluetooth SPP (Serial Port Protocol) module, designed for obvious wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (more desirable facts charge) 3Mbps Modulation with whole 2.4GHz radio transceiver and baseband. It makes use of CSR Blue core 04- outside single chip Bluetooth machine with CMOS generation and with AFH (Adaptive Frequency Hopping feature). It has a slave default Baud charge of 9600. It

automobile connects to the final tool on energy as default. Pairing pin code is “1234” as default.

pin number is given a high or low output signal to switch the appliance on and off respectively [12].

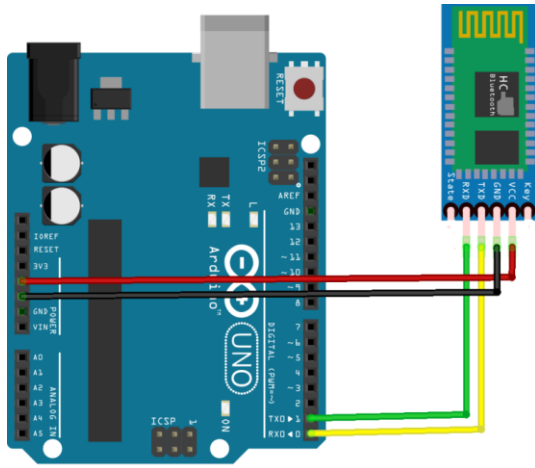


Figure 3 HC-04 Bluetooth Module

4.1.3 Arduino Uno

The Arduino Uno [10] [3] is a microcontroller board primarily based on the ATmega328p [10]. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a electricity jack, an ICSP header, and a reset button.

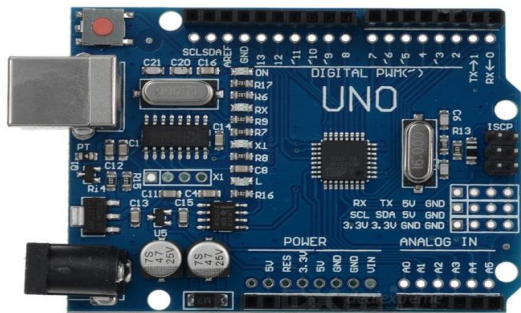


Figure 4: Arduino Uno

It contains everything needed to support the microcontroller. We either want to attach to a computer the use of a USB cable or power it with an AC-to-DC adapter. The Arduino circuit acts as an interface among the software element and the hardware a part of the project. The Bluetooth module transmits the text to the Arduino Uno serial port. The text is matched in opposition to the numerous combinations [11] of predefined texts to replace the appliances on/off. The appliance name and a command for on/off are saved as predefined command as an instance, to interchange on a TV the person desires to mention “tv on” and to replace it off he needs to say “TV off”. The appliances are connected via the relay boards to pin numbers 2, 3 and 4 of the Arduino Uno. When the matching text is detected the corresponding

TABLE I TECHNICAL SPECS

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

5. REMOTE STATION

The remote station [13] will operate with equal +5 V electricity supply. The station microcontroller receives the digital sign commands from the base station using the wireless protocol and plays the request feature. On the basis of command signals obtained it's going to update the reputation of relay switches board.

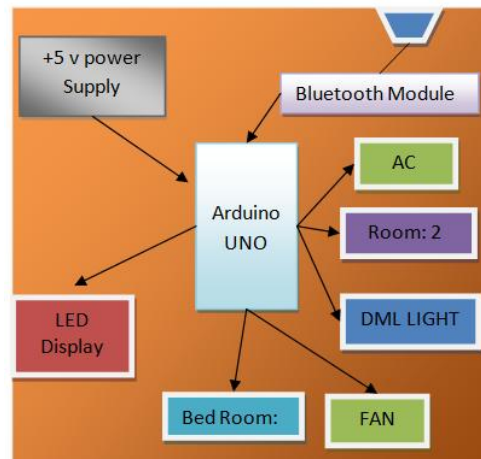


Figure 5 Functional Block Diagram of Remote station Unit.

6. SPEECH RECOGNITION UNIT

The speech reputation gadget [8] is a totally assembled and easy to use programmable speech popularity circuit. Programmable within the sense that we can train the words that we want the circuit to recognize. This circuit board permits us to test with many sides of speech popularity technology. It has 8 bit data out which can be interfaced with any microcontroller for in addition development.

7. IMPLEMENTATION

Using the above cited additives [2] we implement our machine on a breadboard. The microcontroller device with the Bluetooth module and relay circuit needs to be connected with the transfer board. Then we need to release the android based software-“auto-mobile domestic” on our phone. Through the application we are able to instruct the microcontroller to exchange on/off equipment. Upon getting the guidance via the Bluetooth module the microcontroller gives the signal to the relay board.

The software first searches for the Bluetooth device. If it is to be had then it launches the voice recognizer. It reads the voice and converts the audio sign right into a string. It produces a fee for every appliance in order to accept to the microcontroller tool. The microcontroller makes use of the port in serial mode. After studying the facts it decodes the enter price and sends a sign to the parallel port thru which the relay circuit can be activated. on this paintings we use Bluetooth module. We also can connect a Bluetooth module to do the work, the usage of which the utility can be used anywhere in which a cell network is available. Some images to illustrate the working of the system have been given below.

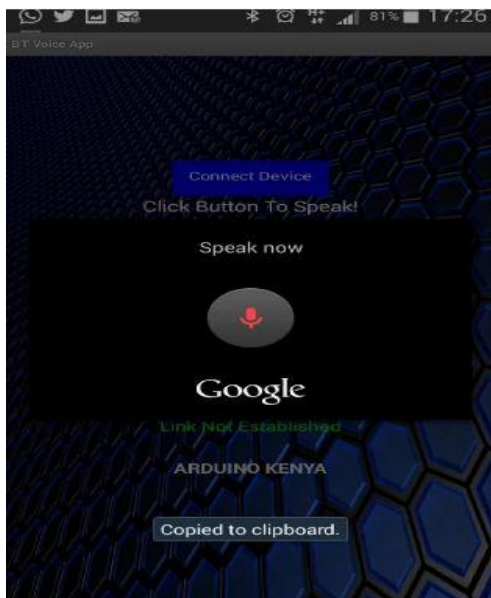
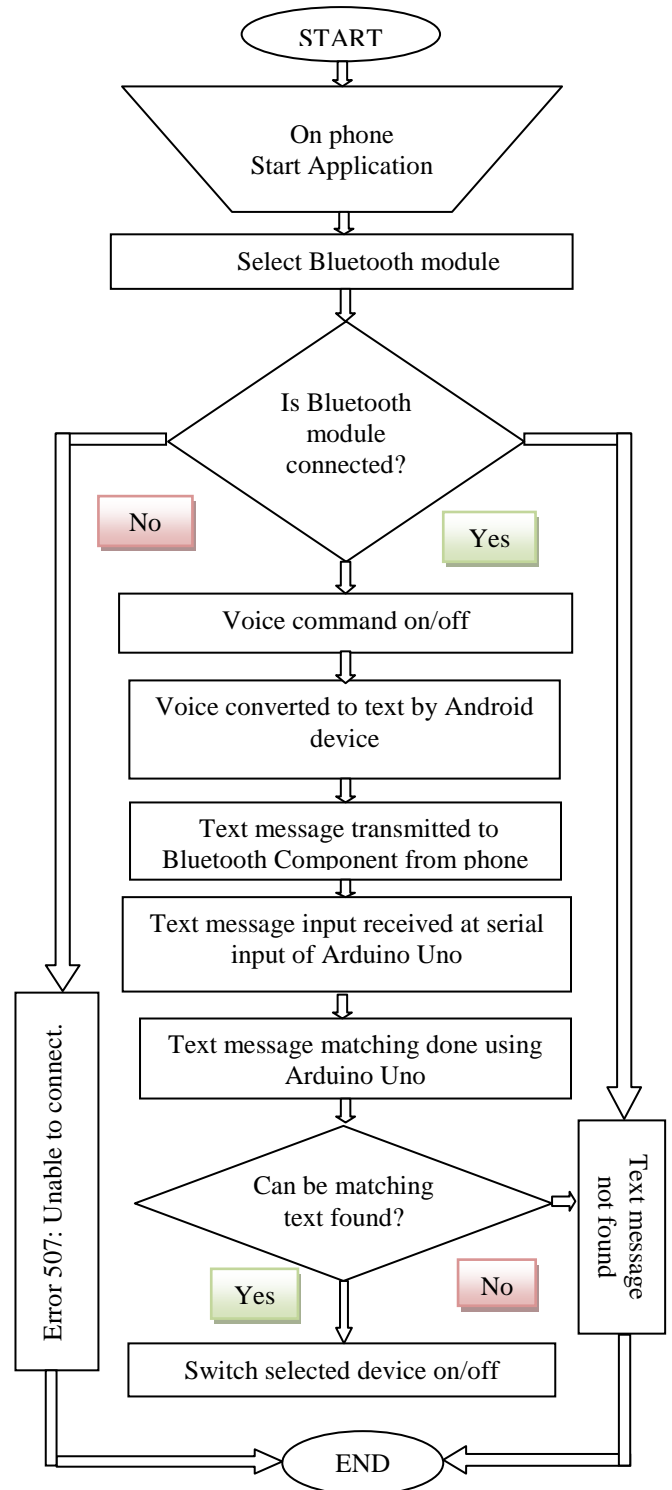


Figure 6 Turning ON Light 1

8. FLOWCHART



9. PROJECT FEASIBILITY

Our project is very user friendly. It is very easy to use. The function of the system is easy to understand. Anyone can maintain the system. It is very useful for winter season and more useful who is physically injured. The cost of the system is under bearable for the user. It is easy to use for anyone. So every user can

choose the system for their Voice controlled House Automation System without any hesitation.

10. POWER SUPPLY UNIT

In the power section a simple 9-12V battery is connected with the transmitting end as well as receiving quite. since the microcontroller which is the crucial processing unit works on regulated +5V power deliver so this can be done by connecting a +5 volt regulator on the output of battery.

When you supply the voltage you should be careful about the voltage. The over voltage can damage the machine. So we have to be careful about the voltage. As display inside the determine below show the power supply of the system. Here we also use the +five volt electricity supply inside the figure as show beneath battery operated +five volt strength supply machine evaluation.

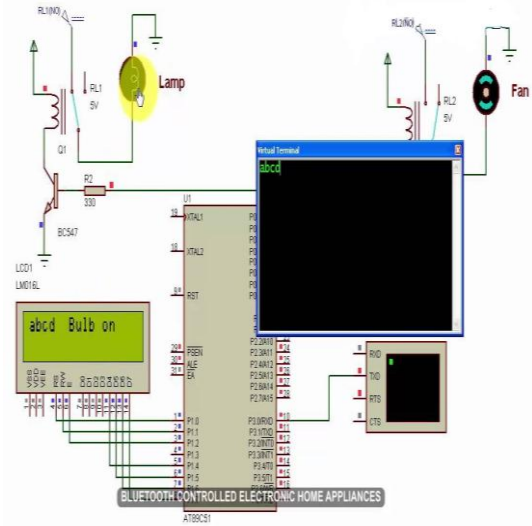


Figure 10 Project with Proteus circuit design

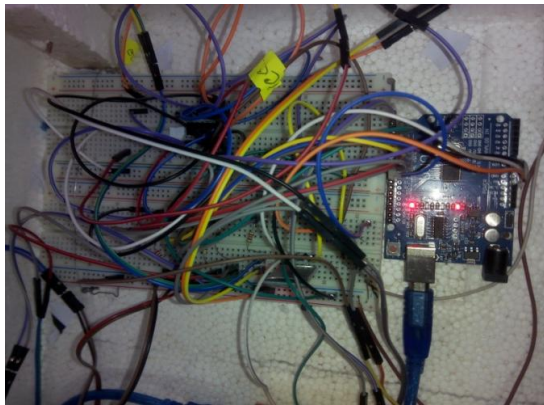


Figure 8: Various Connections

13. VOICE COMMAND

TABLE 1 SHOWN BELOW VOICE COMMAND

Voice Command							
Room-1				Room-2			
String		Integer		String		Integer	
On	Off	On	Off	On	Off	On	Off
Light on	Light off	2	3	Light 2 on	Light 2 off	12	13
FAN on	FAN off	8	9	AC on	AC off	10	11
TV on	TV off	4	5	Blinking light on	Blinking light off	14	15
DM L light on	DM L light off	6	7				

11. DISPLAYING OUR PROJECT



Figure 9 Displaying our project.

12. PROTEUS CIRCUIT DESIGN

14. Result Station

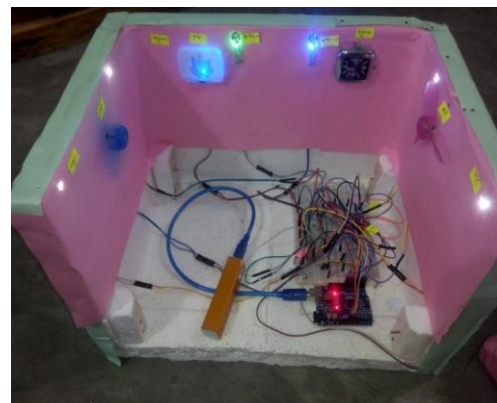


Figure 11 Result successfully

The project Voice controlled House Automation System has been successfully designed and tested.

14.1. Input and Output Voice Command

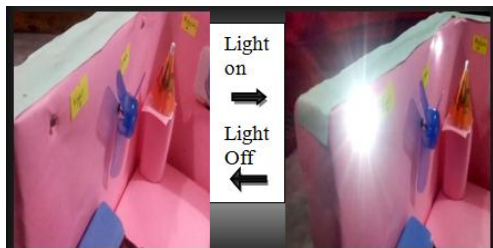


Figure 12.1 Room-1 light on/off



Figure 12.2 Room-1 Fan on/off

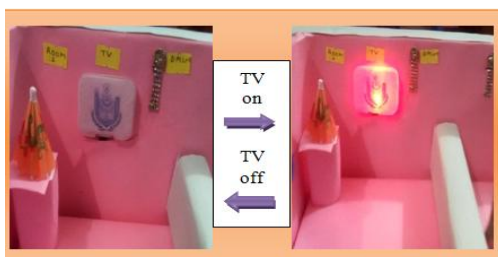


Figure 12.3 Room-1 TV on/off

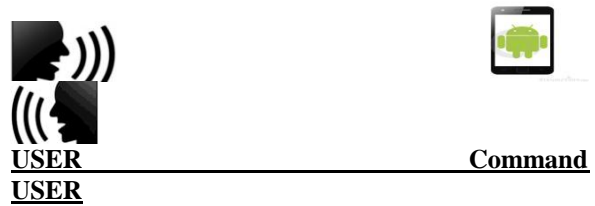


Figure 12.4 Room-1-2 DML light on/off



Figure 12.5 Room-2 AC on/off



Figure 12.6 Room-2 light 2 on/off



Command

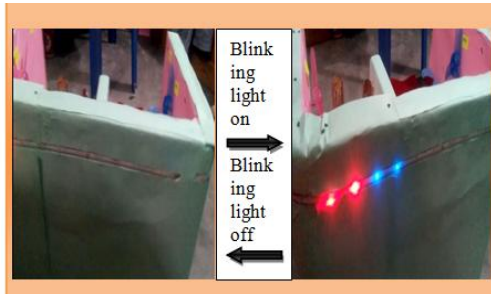


Figure 12.7 Outlook Blinking light on/off



Command



Figure 12.8 All on/off

15. CONCLUSION

Voice recognition Home Automation System is a very useful project for the adults and physically disabled persons, who are not able to do various activities efficiently when they are at home and need one's assistant to perform those tasks. It is easy to use. The functionality of the system is easy to understand. It is very useful for winter season and more useful who are physically injured. The cost of the system is not very high.

The proposed project undertakes a viable solution the need of automation at the very basic level, that is, in our homes. The project will enable us to bring every appliance at every corner of our home under

our control from a single point without having to get up and manually switch on or off the appliance. The use of a Bluetooth module assists the use of this system from various locations in our house.

So every user can choose the system for their home automation system without any hesitation.

REFERENCES

- [1] Mohamed Abd El-LatifMowad, Ahmed Fathy, Ahmed Hafez "Smart Home Automated Control System Using Android Application and Microcontroller" International Journal of Scientific & Engineering Research, Volume 5, Issue 5, May-2014 ISSN 2229- 5518
- [2] YouTube:https://www.youtube.com/watch?v=4zhrnBKGX_I
- [3] ArduinoUnoProjects:<http://arduino.cc/en/Main/arduinoBoardUno>
- [4] Datasheet Bluetooth to Serial Port Module HC05:<http://www.electronic60norte.com/mwfls/pdf/newBluetooth.pdf>
- [5] Blog link: <http://www.instructables.com/id/Voice-Activated-Arduino-Bluetooth-Android/>
- [6] Blog link: <https://create.arduino.cc/projecthub/abhijit-pattnaik/voice-controlled-home-automation-f1345f>
- [7] Blog link: <http://meta-guide.com/videography/100-best-arduino-voice-control-videos>
- [8] Blog link :<http://nevonprojects.com/tv-remote-controlled-home-automation-pic/>
- [9] Blog link: <http://rzttronics.com/control-rgb-led-using-bluetooth-and-arduino/>
- [10] Bloglink:<http://www.electronicshub.org/microcontroller-based-mini-projects-ideas/>
- [11] Prof. Jitendra R. Rana, Prof. S.N.Pawar, ZigBee Based Home Automation, <http://ssrn.com/abstract=1587245>
- [12] Mahmood, S M, Abdulsattar, M, Firas, A Y; Home Automation Management with WLAN (802.11g) and RF Remote Control, Raf. J. of Comp. & Math's, 6(1), 2009.
- [13] Aru O E ,Ihekweaba G, Opara F K, Design Exploration of a Microcontroller Based RF Remote Control 13amps Wall Socket, IOSR-JCE, 11(1), 56-60, 2013.

Authors Biography



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