Home Automation System

A PROJECT REVIEW

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in partial fulfilment for the award

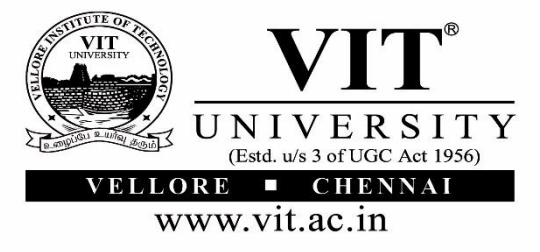
of the

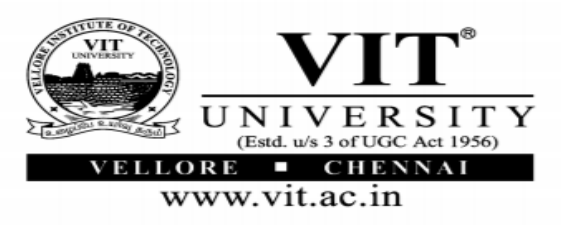
B. Tech

degree in

Computer Science and Engineering

School of Computer Science and Engineering





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DECLARATION

I hereby declare that this project entitled "**Home Automation System**" submitted by us to the School of Computer Science and Engineering, VIT University, Vellore-14 in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering** is a record of bonafide work carried out by me under the supervision of **Sathiya Kumar C, Associate Professor**. I further declare that the work reported in this project has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma of this institute or of any other institute or university.

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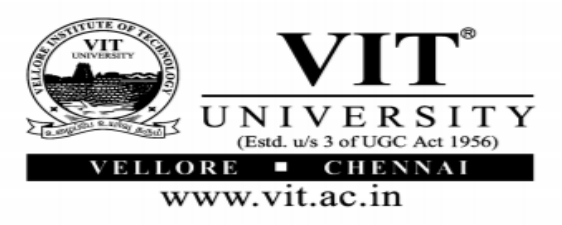

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CERTIFICATE

The project report entitled "**Title of the project**" is prepared and submitted by **Saksham (Register No: 15BCE0279), Kanav Sethi (Register No: 15BCE0311), Shivang Raj (Register No: 15BCE0691) and Gurrehmat Singh Oberoi (Register No: 15BCE0927).** It has been found satisfactory in terms of scope, quality and presentation as partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering** in VIT University, India.

Sathiya Kumar C

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1.0 Introduction

This document specifies the requirements for the production and design of the voice and gesture controlled home automation system. The product will provide a simple and easy to use interface to users to control many of the electronic items of the home using Bluetooth. The product is an attempt to make a modern-day home automation device.

1.1 Goals and objectives

Nowadays, people have smartphones with them all the time. So, it makes sense to use these to control home appliances. Presented here is a home automation system using a simple Android app, which you can use to control electrical appliances with voice commands. Commands are sent via Bluetooth to Arduino Uno. Also, we will be using accelerometer to control electrical appliances with hand gestures. So, one need not get up to switch on or switch off the device.

1.2 Theoretical Background

This project presents the development of home appliances based on voice command and using gesture commands. We should be able to develop using our knowledge design, implement and configure a device that meets user requirements. In regard with the project, a gesture sensor is used to turn on and off the devices based on the movement of the hands. Google application has been used as voice recognition and it processes the voice input from the smart phone. The voice input has been captured by the android and has been sent to the Arduino Uno. Bluetooth module in Arduino Uno receives the signal and processes the input signal to control the light and fan. This is very beneficial as a person doesn't has to get up and walk all the way to the switch board to turn off or on the device. The proposed system intends to control electrical appliances with relatively user-friendly interface and ease of installation. A large number of research

papers have been published on home automation using various technologies

1.3 Motivation

Home automation industry is growing rapidly. This is fuelled by the need to provide supporting systems for the elderly and the disabled, especially those who live alone. Coupled with this, the world population is confirmed to be getting older. Home automation systems must comply with the household standards and convenience of usage.

Automation is, unsurprisingly, one of the two main characteristics of home automation. Automation refers to the ability to program and schedule events for the devices on the network. The programming may include time-related commands, such as having your lights turn on or off at specific times each day. It can also include non-scheduled events, such as turning on all the lights in your home when your security system alarm is triggered. Once you start to understand the possibilities of home automation scheduling, you can come up with any number of useful and creative solutions to make your life better. The other main characteristic of cutting-edge home automation is remote monitoring and access. While a limited amount of one-way remote monitoring has been possible for some time, it's only since the rise in smartphones and tablets that we've had the ability to truly connect to our home networks while we're away. With the right home automation system, you can use any Internet-connected device to view and control the system itself and any attached devices.

Home automation gives you access to control devices in your home from a mobile device anywhere in the world. The term may be used for isolated programmable devices, but home automation more accurately describes homes in which nearly everything -- lights, appliances, electrical outlets, heating and cooling systems -- are hooked up to a remotely controllable network. The truth is that home automation systems have the power to simplify everything within your home and life. For example, homeowners often struggle with technologies that don’t work together. They hate the numerous remote controls cluttering coffee tables, and the wires tangled

throughout rooms, but they don't know they have any other options. Today's home automation technologies eliminate the confusion.

1.4 Software context

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In regard with the project, a gesture sensor is used to turn on and off the devices based on the movement of the hands. Google application has been used as voice recognition and it processes the voice input from the smart phone. The voice input has been captured by the android and has been sent to the Arduino Uno. Bluetooth module in Arduino Uno receives the signal and processes the input signal to control the light and fan. This is very beneficial as a person doesn't has to get up and walk all the way to the switch board to turn off or on the device. The proposed system intends to control electrical appliances with relatively user-friendly interface and ease of installation.

1.5 Major constraints

The major constraints of this project are budget and ease in access and use for user.

2.0 Literature Review

A lot of research is being carried out to improve the Smart Home system. A lot of new ideas have been proposed to change the existing condition of smart home automation and one of the important ways to improve the smart home system is to change from wired transmission to the wireless communication. This is because the major weakness of the wired connection is the limitation of network ranges and upgrading difficulty. On those consequences, researchers have come to the idea of

doing it wirelessly. Wireless technologies are today very popular around the world and are much appreciated by end consumer. The wireless lifestyle allows users to avoid the growing 'cable chaos' going on under their desks. Now with the embedded Bluetooth technology, digital devices can form a network in which the appliances and devices can communicate with each other. Today, home automation is one of the major applications of Bluetooth technology. In wireless, the Smart Home network range can be expanded with the implementation of wireless sensor network (WSN) through multi-hopping technique also called ad-hoc network. In multi-hopping technique, the signal from the source to destination is sent through minimum number of wireless hops.

3.0 Overview of Proposed System

3.1 User profiles

Users of the system will be the members of the house in which this system is installed. The applications will be accessible to members of home via their smart phones.

3.2 Assumption and dependencies

- User has basic knowledge of operating android devices.

- User should have sufficient knowledge of English since the system interface will be in English.
- Bluetooth is available to all the users who use this system.
- The user is assumed to give system correct information about his/her details (if asked).

4.0 Proposed System Analysis and Design

We will be automating whole house as a model. In the room we will be able to switch on or switch off the fans and lights, all at once or one at a time, with the

help of either voice commands or with the help of hand gestures. We can also regulate the fan speed and the brightness of the lights through voice commands. We will be giving voice commands to an android mobile application and that command will be delivered to the components with the help of a Bluetooth module. For gesture control we will be using accelerometer that will basically measure the angle of rotation and accordingly switch on or switch off the components (fans, lights) as per the code fed to the Arduino. For example, if we rotate the accelerometer to the left, then the lights go off. If we rotate the accelerometer towards the right then lights go on. Using voice commands, if we say "Lights on" to the phone speaker operating on the android operating system the lights will be on and if we say "Lights off" then the lights will be off. We can also give commands to a specific light by saying "Light One off" or "Light One On". Same applies for the fans.

4.1 Design Approach

Fig 1: Block Diagram

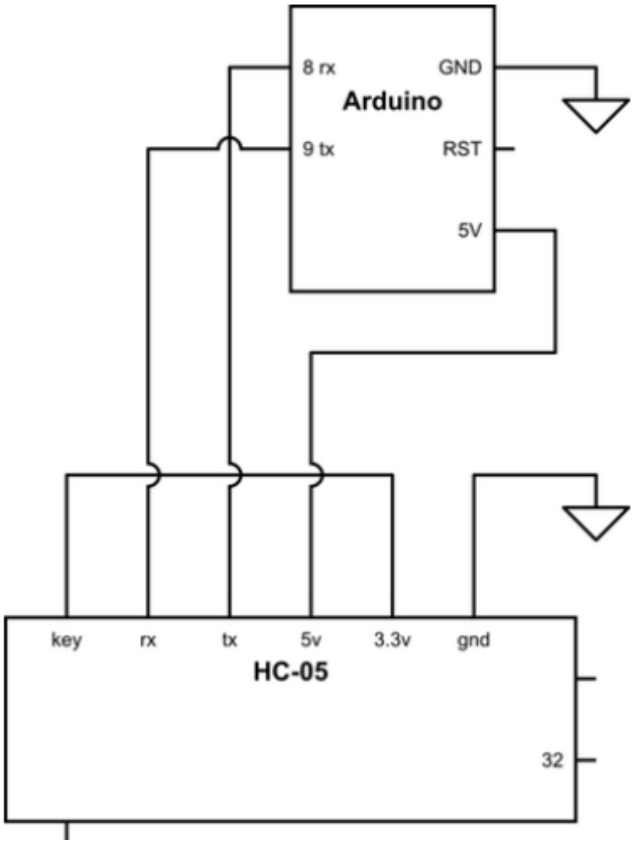


Fig 2: Bluetooth Circuit

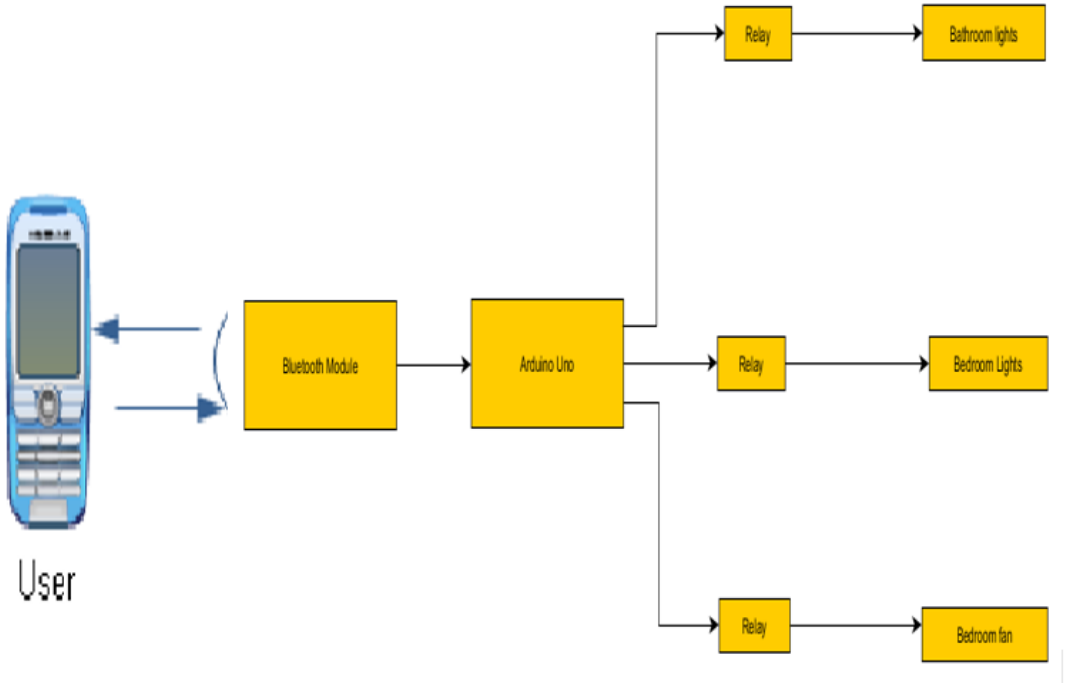


Fig 3: System working

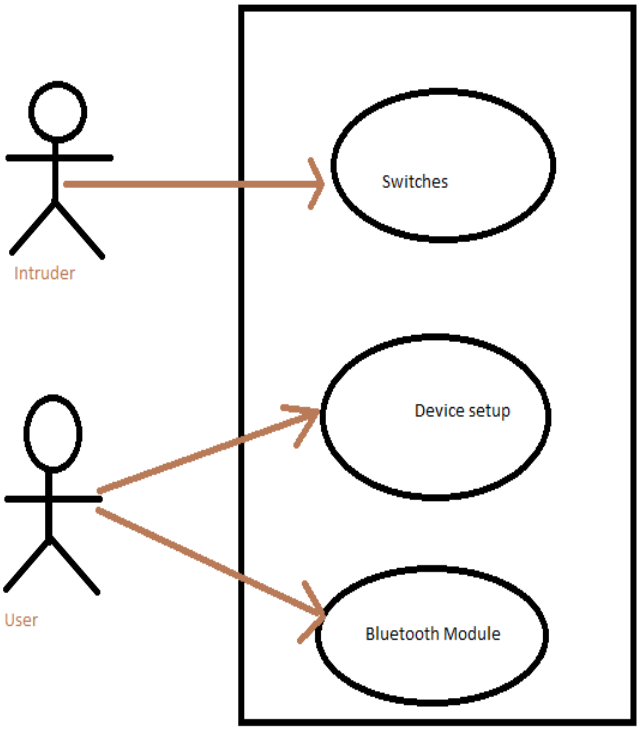


Fig 4: Module Diagram

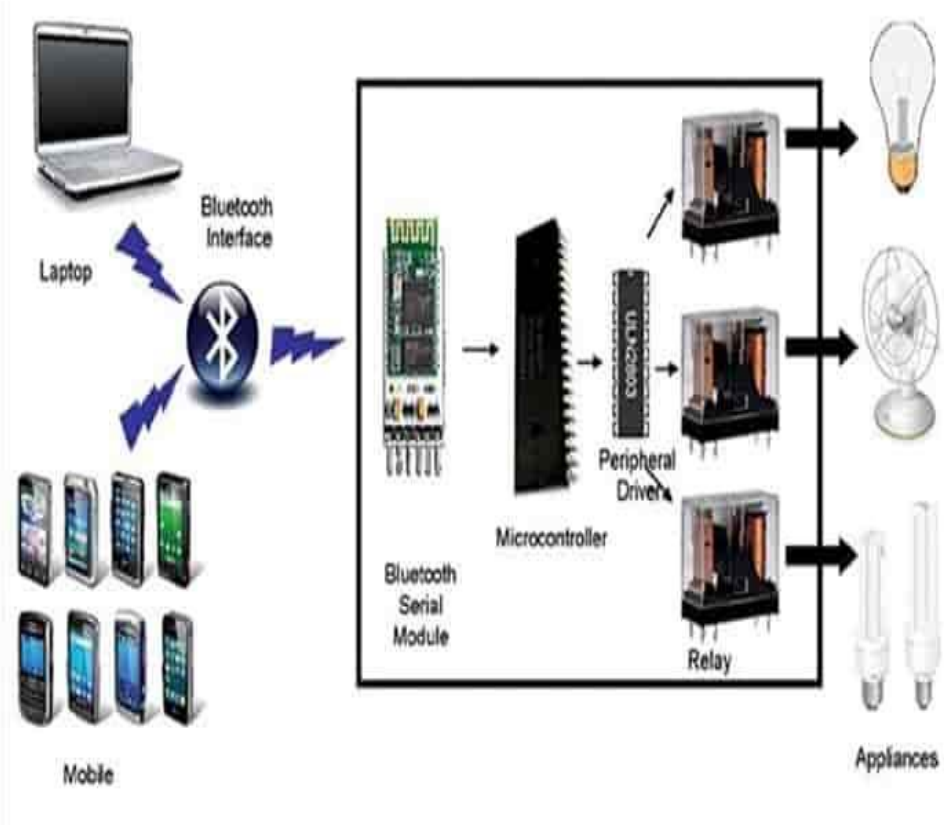


Fig 5: Architecture

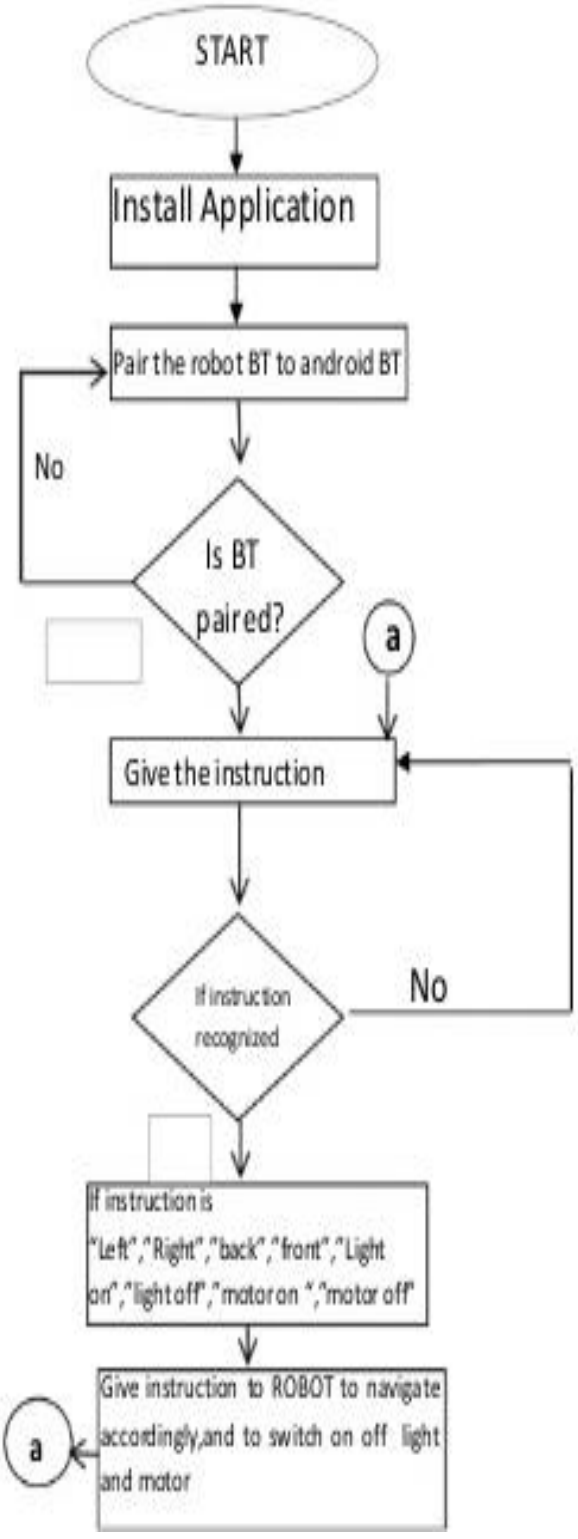


Fig 6: Flowchart

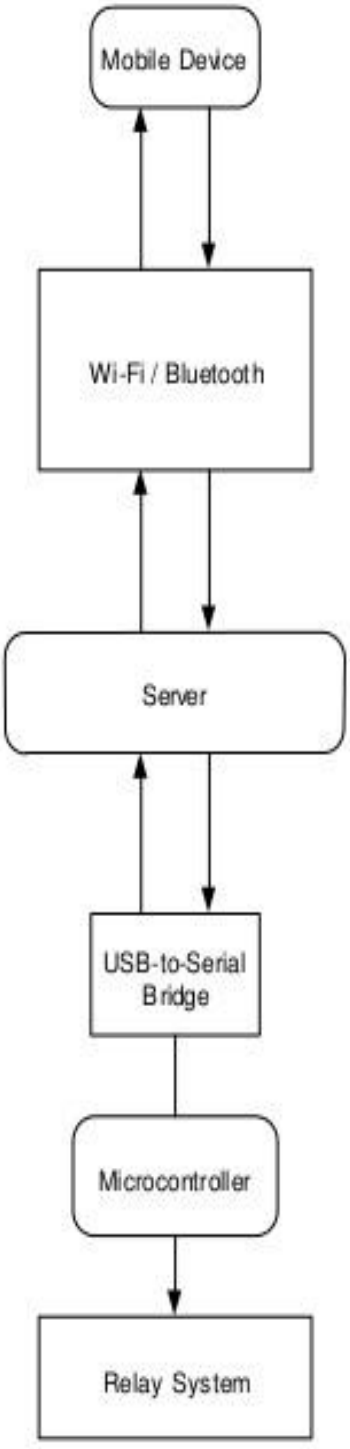


Fig 7: Data flow diagram

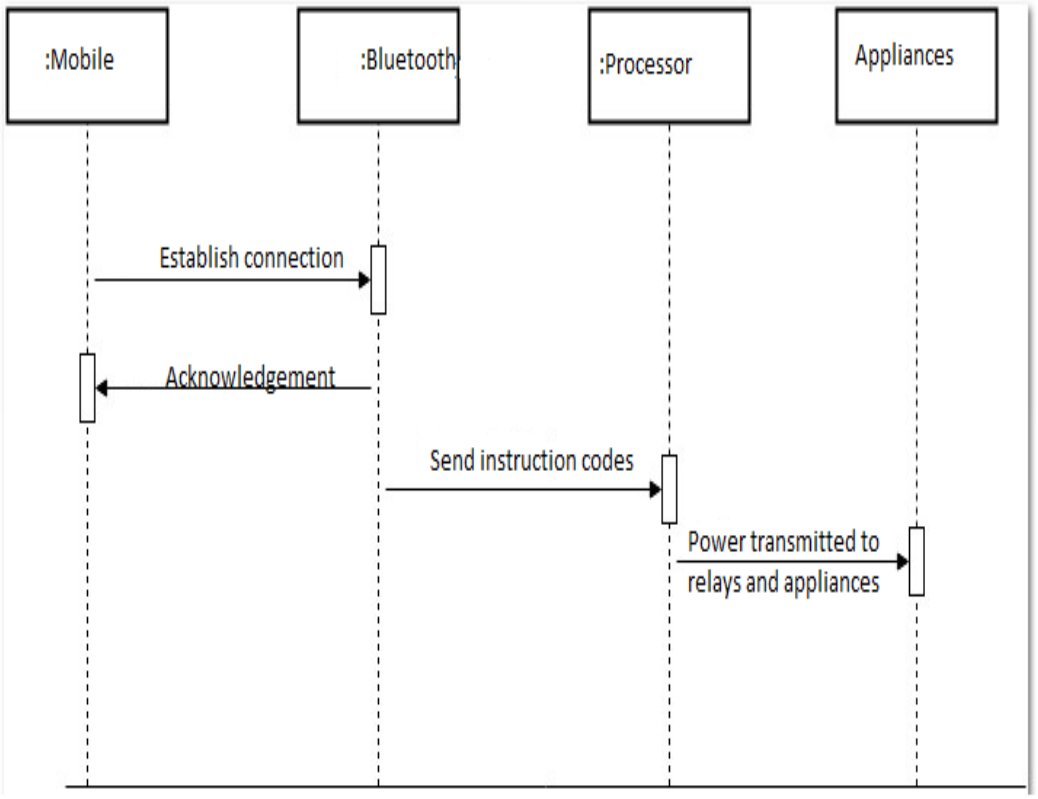


Fig 8: Time sequence diagram

4.2 Software Requirements

The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board The ATmega328 on the Arduino Uno comes pre-burned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP or similar. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The

ATmega16U2/8U2 is loaded with a DFU bootloader, which can be activated by:

• On Rev1 boards: connecting the solder jumper on the back of the board and then resetting the 8U2.

• On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU bootloader).

4.3 Hardware Requirements

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Four screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mils (0.16"), not an even multiple of the 100-mil spacing of the other pins.

4.4 Non-Functional Requirements

4.4.1 Usability

- The interface is simple and easy to use.
- System is user friendly and self-explanatory.

4.4.2 Reliability

- The system cannot be relied upon completely but we have to try to attain maximum reliability.
- Reliability will also be higher since we try to attain maximum accuracy.

4.4.3 Security

- The system must be secured from unauthorized access.

4.4.4 Performance

- Speed: The system should be made as fast as possible to reduce response time.
- Capacity: We should try to make it accessible to maximum users at a time.

4.4.5 Supportability

- Security: The system has to be secure from attacks.

- Robust: The system should be tough and not prone to breakdowns and in case of breakdown should be stabilized soon.

5.0 Results and Discussions

5.1 Result's screenshot

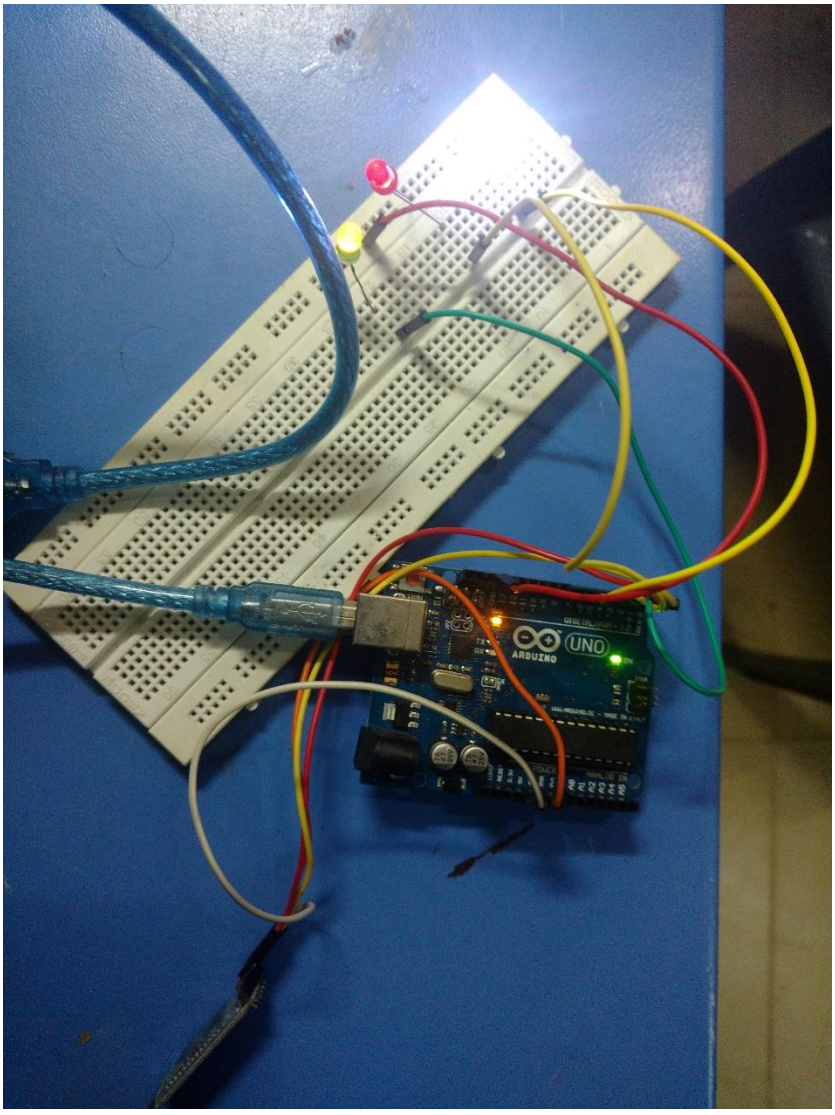
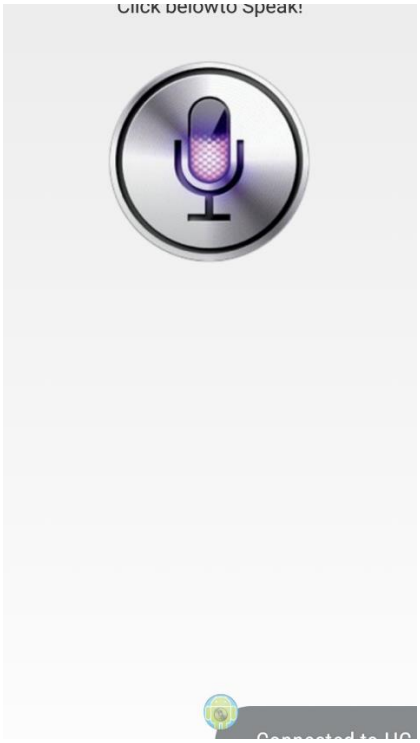
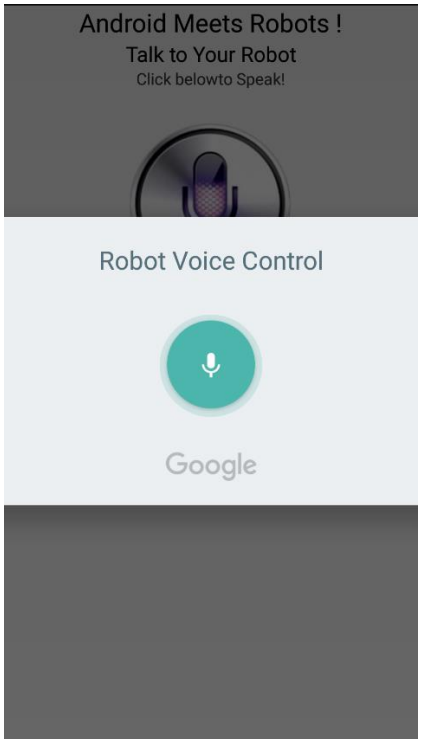


Fig 9: Working project


Click belowto Speak!


Android Meets Robots !
Talk to Your Robot
Click belowto Speak!
Robot Voice Control
Google


Android Meets Robots !
Talk to Your Robot
Click belowto Speak!
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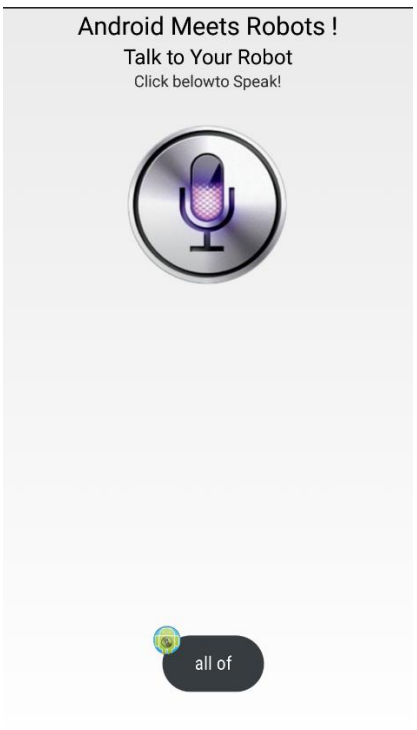
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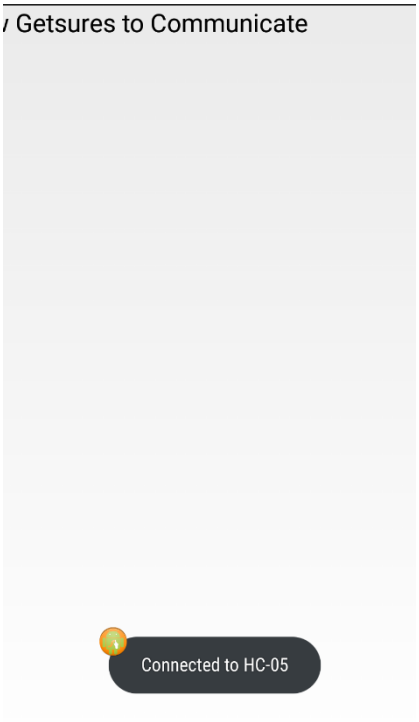
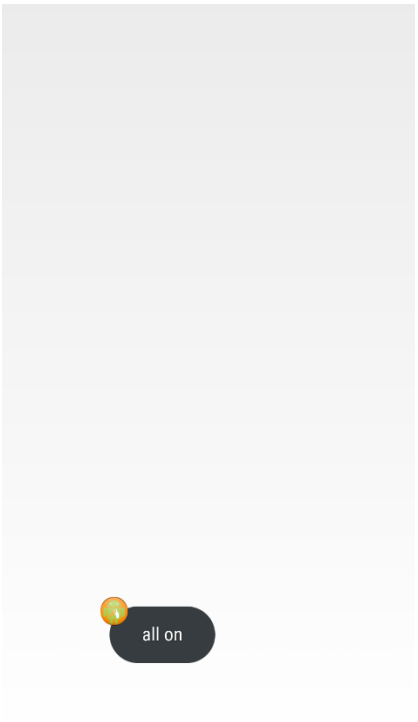

Getsures to Communicate
Connected to HC-05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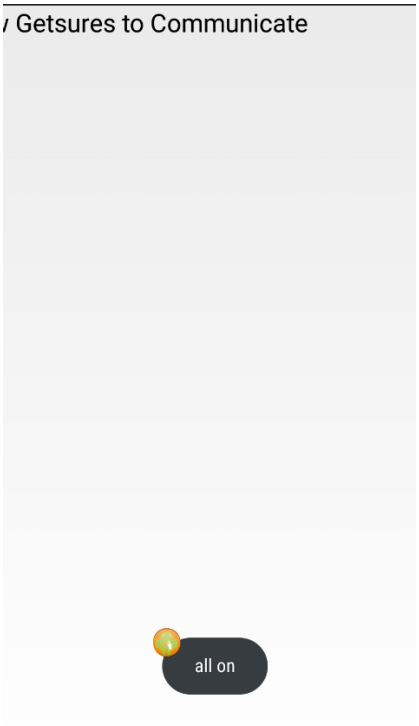
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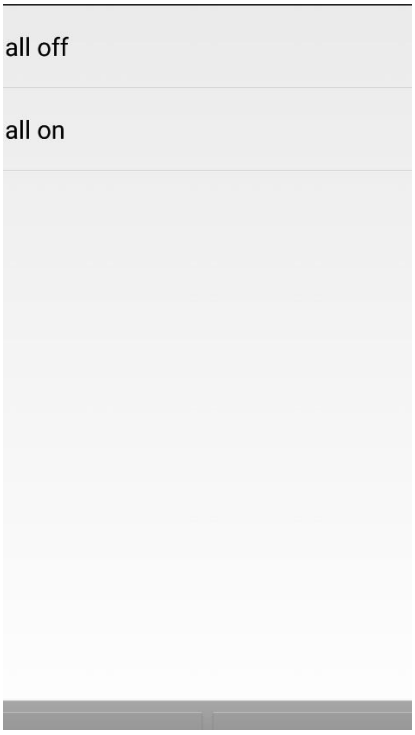
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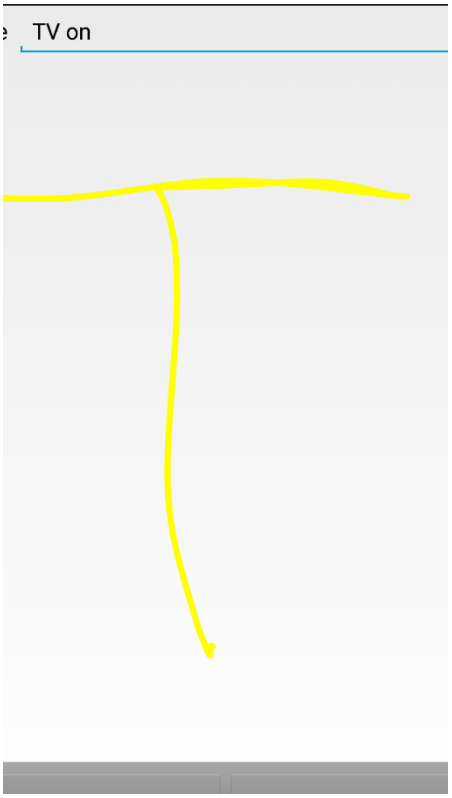

Fig 10: All functional screenshot

Bluetooth module in Arduino Uno received the signal and processed the input signal to control the light and fan. The proposed system intended to control electrical appliances with relatively user-friendly interface and ease of installation. We have demonstrated up to 20 meters of range to control the home appliances via Bluetooth. A gesture sensor is used to turn on and off the devices.

5.2 Constraints and Trade-offs

Constraints

• BLUETOOTH RANGE 100M

• LENGTH OF ACCELEROMETER WIRE

• VOICE RECOGNITION WILL BE DONE IN ENGLISH

• ONLY WORKS ON ANDROID OPERATING SYSTEM

Trade –offs

• We will be doing the project on small scale thus reducing the expenditure.

6.0 Conclusion and Scope for future work

By our efforts, we have seamlessly incorporated Bluetooth into the smart home which can be used by a simple Android Application to control almost all of the amenities in the Smart Home.

Home Automation is undeniably a resource which can make a home environment automated. People can control their electrical devices via these Home Automation devices. We think this product have high potential for marketing in the future. At the moment the components are a bit too high to be able to produce these devices for an interesting price. But the new stream of home automation systems has developed into a vast one and the current market is flooded with a flurry of home automation systems and device manufacturers. Factors such as the significantly growing electronics and technology market, presence of a large number of manufacturers expanding their product portfolios, and the increasing importance of home monitoring systems are driving the growth of the home automation system market. The global home automation system market was valued at USD 39.93 Billion in 2016 and is expected to grow significantly at 11.3% in the next five areas.

7.0 References

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