A
Project Report on

SMARTLY CONTROLLED DEVICES

Submitted to the partial fulfillment of the requirement for the award of the degree of

BACHELOR OF TECHNOLOGY
IN
COMPUTER SCIENCE & ENGINEERING

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NCR Campus, Modinagar

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BONAFIDE CERTIFICATE

This is to certify that project Report entitled "**SMARTLY CONTROLLED DEVICES**", which is submitted by **Anurag Kumar Singh** (RA1511003030394) in the partial fulfillment of the requirement for the award of degree B.Tech in (Department of Computer Science Engineering) of SRM Institute of Science and Technology, NCR Campus, Modinagar, Ghaziabad is a record of the candidate own work carried out by them under my own supervision. The matter embodied in this thesis is original and has not been submitted for the award of any other degree.

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HOD (CSE)
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We are also indebted to all the teaching and non-teaching staff members of our college for helping us directly or indirectly by all means throughout the course of our study and project work.

Finally, we take this opportunity to thank our parents, family members and friends for their moral support and help and extended thanks to our well wishers.

ANURAG KUMAR SINGH (RA1511003030394)

DECLARATION

I Anurag Kumar Singh (RA1511003030394) hereby declare that the work which is being presented in the project report "**Smartly Controlled Devices**" is the record of authentic work carried out by us during the period from Jan '18 to May '18 and submitted by us in partial fulfillment for the award of the degree "Bachelor of Technology in Computer Science and Engineering" to SRM IST, NCR Campus, Ghaziabad (U.P.). This work has not been submitted to any other University or Institute for the award of any Degree/Diploma.

ANURAG KUMAR SINGH (RA1511003030394)

ABSTRACT

Technology is a never-ending process. To be able to design a product using the current technology that will be beneficial to the lives of others is a huge contribution to the community. In the past few years there are so many inventions in the field of consumer electronics such as cellular, air conditions, home security devices and home theaters. All these appliances can be easily controlled by a single controller, using personal area network in a home environment. Busy environment and personal limitation the market is going towards the home automation and networking and Bluetooth is an ideal solution for this purpose. In buildings, temperature and other electronic devices can be easily controlled by home automation but high degree of computer work is involved. This report demonstrates a simple home automation system which consists of remote mobile, host controller, and several home appliances. The client module can communicate with host controller through a wireless device such as Bluetooth.

Automation is also involved in building management system in which lights**,** temperature, security devices and other appliances are controlled through a high degree of computer involvement. In this report, all the devices which are used in building management system are control by a single controller using a wireless network. Client module and host controller are used to communicate with each other through a wireless device such as Bluetooth enabled the mobile phone. In this report, an android based smart phone is used. Home automation is not a new thing but the advanced automation system in nowadays require a big and expensive infrastructure. In this report, we have proposed a low cost, flexible secure automation system that can easily control TV, tube lights and fans from android based mobile phone using Bluetooth. Here HC-05 Bluetooth module and Arduino Uno board is used for switching. This board has 32 digital input and outputs ports.

Home automation is on horizon. It is an emerging technology and also a need of today. From the last decade a number of standards have been defined for home appliances. The main objectives of home automation are controlling, management and co-ordination of home appliances in a comfortable, effective and secure way.

On the other hand, Artificial Intelligence is evolving as a technology for developing automatic systems that can perceive the environment, learn from environment, and can make decision using case based reasoning. Using Vision capability, knowledge based, learn ability, decision making and reasoning the AI provides a better solution for almost all automatic systems.

This report presents the design and implementation of a low cost but yet flexible and secure cell phone based home automation system. The design is based on a stand-alone Arduino BT board and the home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core.

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CHAPTER 1

INTRODUCTION

Home Automation refers to IT/computers to control home appliances. It integrates electrical devices in a house with each other. For example: It can include centralized control of lighting, appliances etc. to provide improved convenience, comfort, energy, efficiency and safety.

Artificial Intelligence is also a big topic of today's era. Many companies developing this for decreasing human labor. One of the key feature that distinguish us, humans, from everything else in the world is intelligence. This ability to understand, apply knowledge and improve skills has played significant role in our evolution and establishing human civilization. But many people (including Elon Musk) believe that the advancement in technology can create super intelligence that can threaten human existence.

In today's IT world, home automation is being popular due to easiness, flexible means of monitoring and controlling the appliances and other things according to user's comfort and needs.
This project named **'Smartly Controlled Devices** 'is idea of home automation using android. The popularity of automation has been increasing greatly in recent years due to considerable affordability and simplicity through smartphone and table connectivity. A home automation system integrates electrical devices in a house with each other. Due to advancement of wireless technology, several connections are introduced such as GSM, WIFI and BLUETOOTH. Each of the connections are having their own unique specifications and applications.

This project forwards the design of home automation and security system using Arduino UNO, a credit sized computer. Arduino Microcontrollers are becoming famous these days due to their ease of use and vast application areas such as Automation, Robotics, IoT, Embedded systems, Weather and Agriculture applications (for smart irrigation systems) and many more. It's cheap and easy to program which is why these are best for newbies especially who want to learn and pursue their career in microcontroller and embedded design fields. Their easy interfacing with sensors and actuators is one of the attracting features.

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CHAPTER 2

Literature Success

As per our survey, there exist many systems that can control home appliances using android based phones/tablets. Each system has its unique features. Currently certain companies are officially registered and are working to provide better home automation system features. Following models describes the work being performed by others.

N. Sriskanthan explained the model for home automation using bluetooth via PC. But unfortunately the system lacks to support mobile technology. Muhammad Izhar Ramli designed a prototype electrical device control system using Web. They also set the server with auto restart if the server condition is
Currently down. Hasan has developed a telephone and PIC remote controlled device for controlling the devices pin check algorithm has been introduced where it was with cable network but not wireless communication. Amul Jadhav developed an application in a universal XML format which can be easily ported to any other mobile devices rather than targeting a single platform. Each of these system has their own unique features and on comparison to one another lacks some advancement.

Our designed system has application layer prototype. The application is able to synthesize the speech data with the help of Google Voice Reorganization. The synthesized data are analyzed and further processing is carried out. Data is send to the database, detailing about every event. AI program than analyses the data in the database and find patterns and then adjust itself according to the user comfort. In layman words, our design system provides features of controlling the home appliances using voice commands and then analyses by the AI program.

CHAPTER 3

Project Objectives

Android controlled Smart Home Automation using Artificial Intelligence should be able to control the home appliances wirelessly with effectively and efficiently. Controlling Home Appliances via Application (Switch and Voice Mode) to develop an application that includes the features of switches and voice mode application. Switch Mode or Voice Mode can be used to control the switches of home appliances.

Secure Connection Channels between Application and Arduino Uno

Some of the advantages of the Home Automation using Arduino, Bluetooth and AI are:

- It will help to reduce the human effort and will help to reduce the cost on home utilities.
- The overall cost of the project is also reduced in the long run.
- It helps to provide home security.
- It is also energy saving and provides ease of life.
- The application is to be highly extensible, with possibility of adding features in the future as needed.

Scopes:

The project aims at designing a prototype for controlling the home appliances that can be controlled wirelessly via an application that provides the features of speech recognition, AI and switch mode. An application is run on android device. The system can be used in wide range of areas.
The system integrated with different features can be applied in the following fields.
• The system can be used in home, small offices to the big malls
The system can be used from home to offices to control the electrical appliances.
• For remote access of appliances in internet or Bluetooth.
The home/office appliances can be controlled via smartphone or can be accessed via Bluetooth.
• For the development of technology friendly environment
The system incorporates the use of technology and making smart home automation. By the use of day to day gadgets we can utilize them for different prospective.

Technology Exposures That Project Provides:

1. Bluetooth technology.
2. Interfacing Adapter to Arduino Uno.
3. Interfacing relays with ac and dc power sources.
4. Using Relay as a Switch.
5. Embedded programming in Arduino.
6. MIT app Inventor
7. Database connectivity

Chapter 4: Implementation

Components

This home automation system consists of two main hardware components: the cell phone and the Arduino BT board. The cell phone hosts the Python script which enables the user to access the home appliances and also the control commands for the appliances. This Python script communicates with the Arduino BT board and sets up an ad-hoc communication protocol between the two devices, which allows controlling the behavior of the Arduino BT board.
An off-the-shelf ready-made Arduino BT is an 8-bit microcontroller board based on the ATmega168 Bluetooth module is used. It supports wireless serial communication over Bluetooth. This board has 23 digital input and output ports, 16kB of flash Memory, 10-bit analog to digital converter, pulse width modulator and extra hardware resources which makes it suitable for the required task.

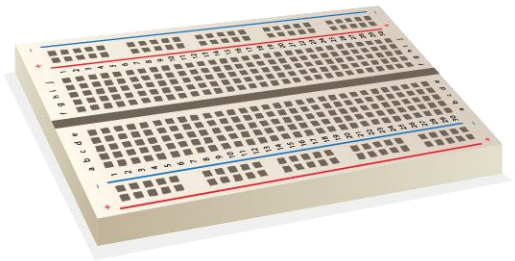
Arduino Uno board

The Bluetooth antenna in our module picks up the packets sent from the cell phone. Subsequently, these packets containing the appliance status commands are pipelined through ATmega168 microcontroller and the designed analogue circuitry according to the definition of each output.

Bluetooth module HC-05

- After joining all the components, the power is turned on and the connection LED on the Bluetooth module starts blinking.
- Start the “Bluetooth Controller” app in the smartphone and connect it to the Bluetooth module. If the pairing is successful, the LED becomes stable.
- Set different keys for different loads and their corresponding value that must be transmitted when that key is pressed in the app.
- As soon as a key is pressed in the smartphone, the Bluetooth module receives the corresponding data and transmits it to Arduino.
- Arduino then compares the received data with the data written in the sketch and accordingly turns on the respective load.

4 channel 5V Relay



Bread Board

Jumper wires

Arduino IDE is used for programming the Arduino board . The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2.[56]

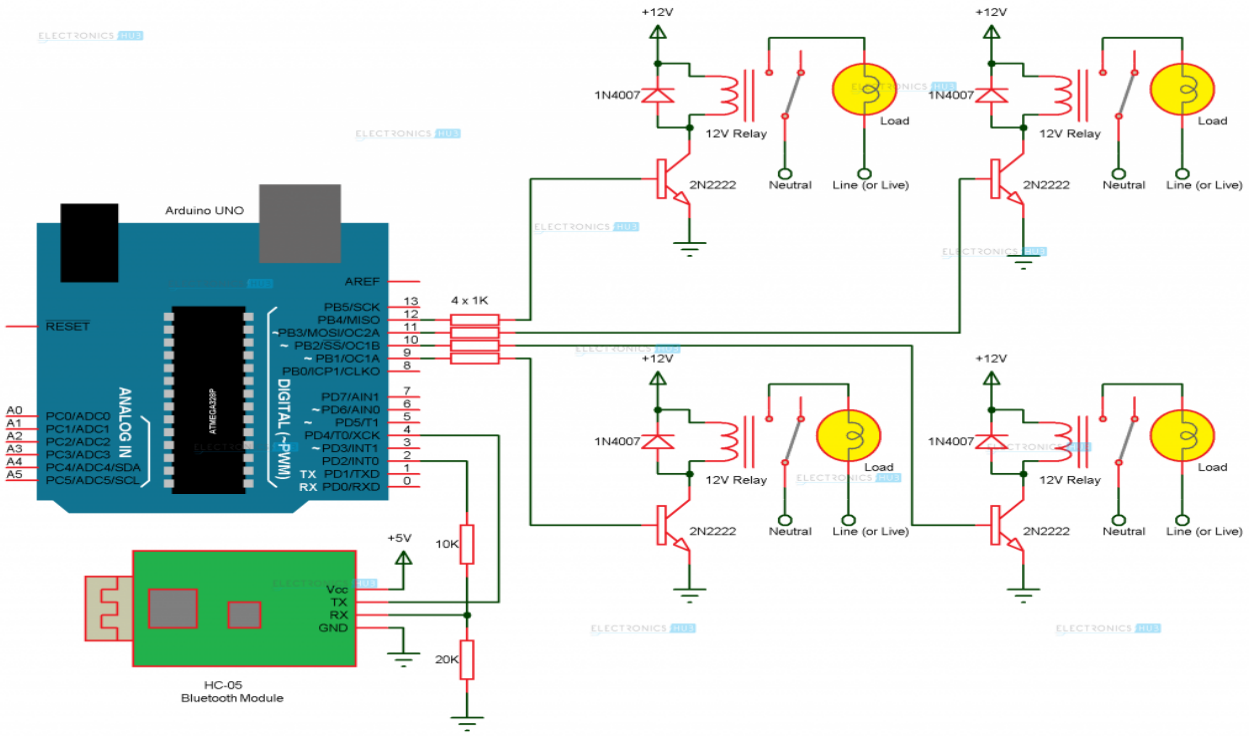
The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution

Working

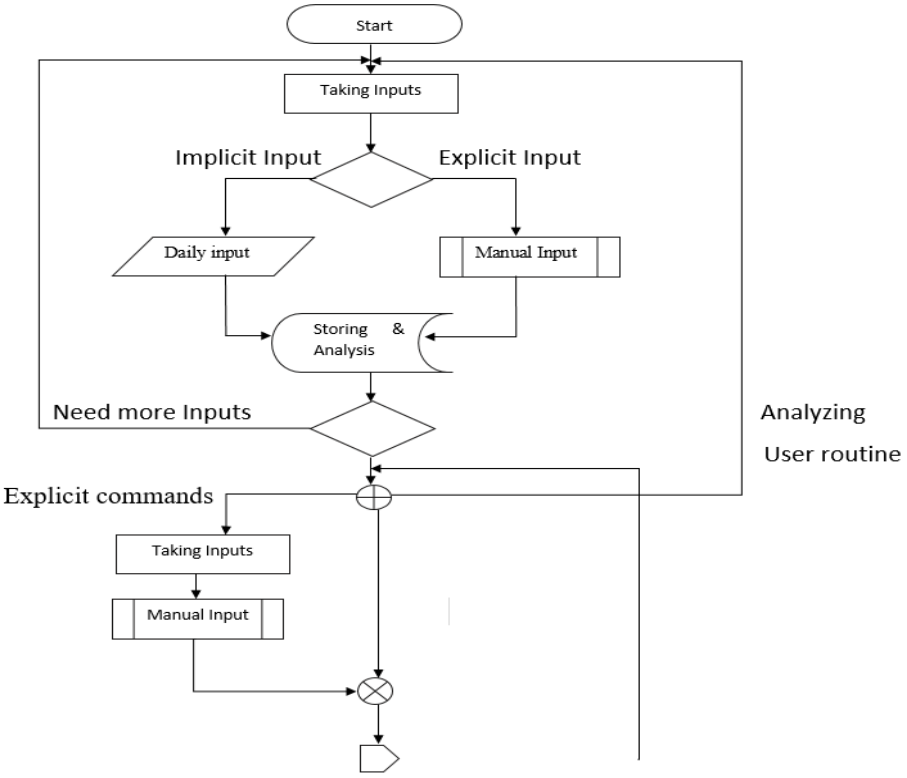
- Connect the RX of the Bluetooth to the TX of the Arduino and the TX of the Bluetooth to the RX of the Arduino.
- Connect the power pin of the Bluetooth to the 5V output pin of the Arduino and the ground of the Bluetooth to one of the ground pins of the Arduino.
- Connect the V_{cc} of the relay to the 5V output pin of the Arduino and the ground pin of the relay to one of the ground pins of the Arduino.
- Connect the input pins of the relay to the Arduino according to the code.

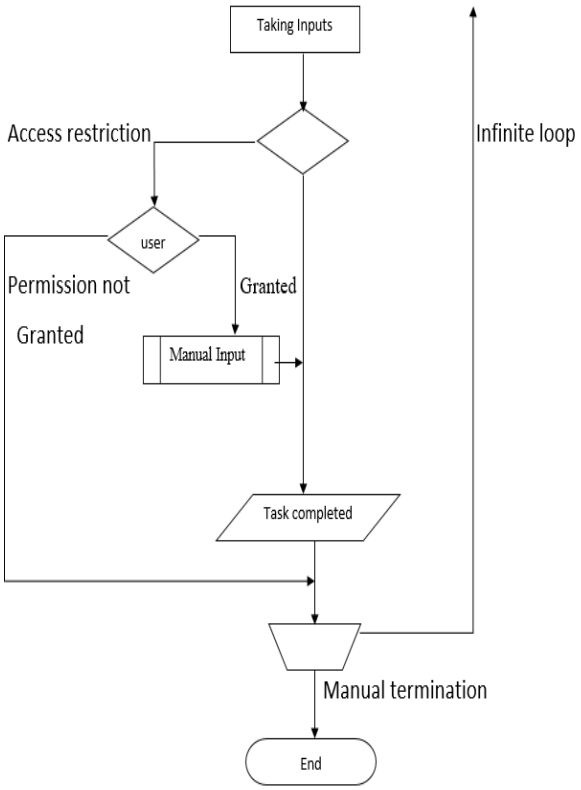
- After joining all the components, the power is turned on and the connection LED on the Bluetooth module starts blinking.
- Start the “Multi_des_pro” app in the smartphone and connect it to the Bluetooth module.
- The app already have keys programmed according to the Arduino program.
- As soon as a key is pressed in the smartphone, the Bluetooth module receives the corresponding data and transmits it to Arduino and data is send to the database.
- Arduino then compares the received data with the data written in the sketch and accordingly turns on the respective load.
-

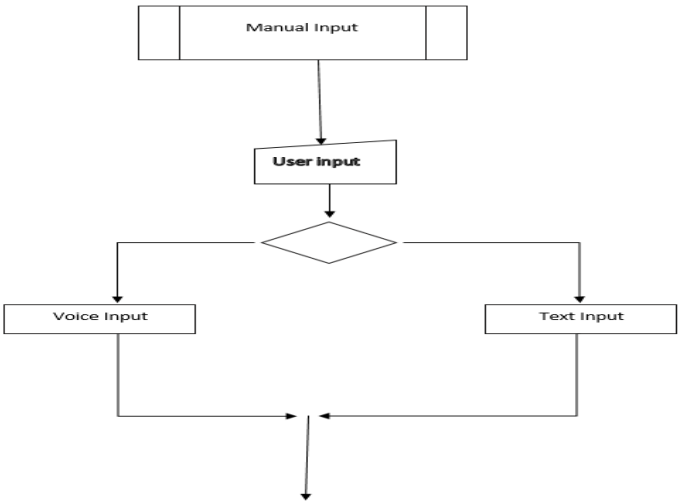
Circuit Diagram



FlowChart


Start
Taking Inputs
Implicit Input
Explicit Input
Daily input
Manual Input
Storing & Analysis
Need more Inputs
Analyzing User routine
Explicit commands
Taking Inputs
Manual Input


Taking Inputs
Access restriction
Infinite loop
user
Permission not Granted
Granted
Manual Input
Task completed
Manual termination
End


Manual Input
User input
Voice Input
Text Input

Programming Code:

Arduino Code:

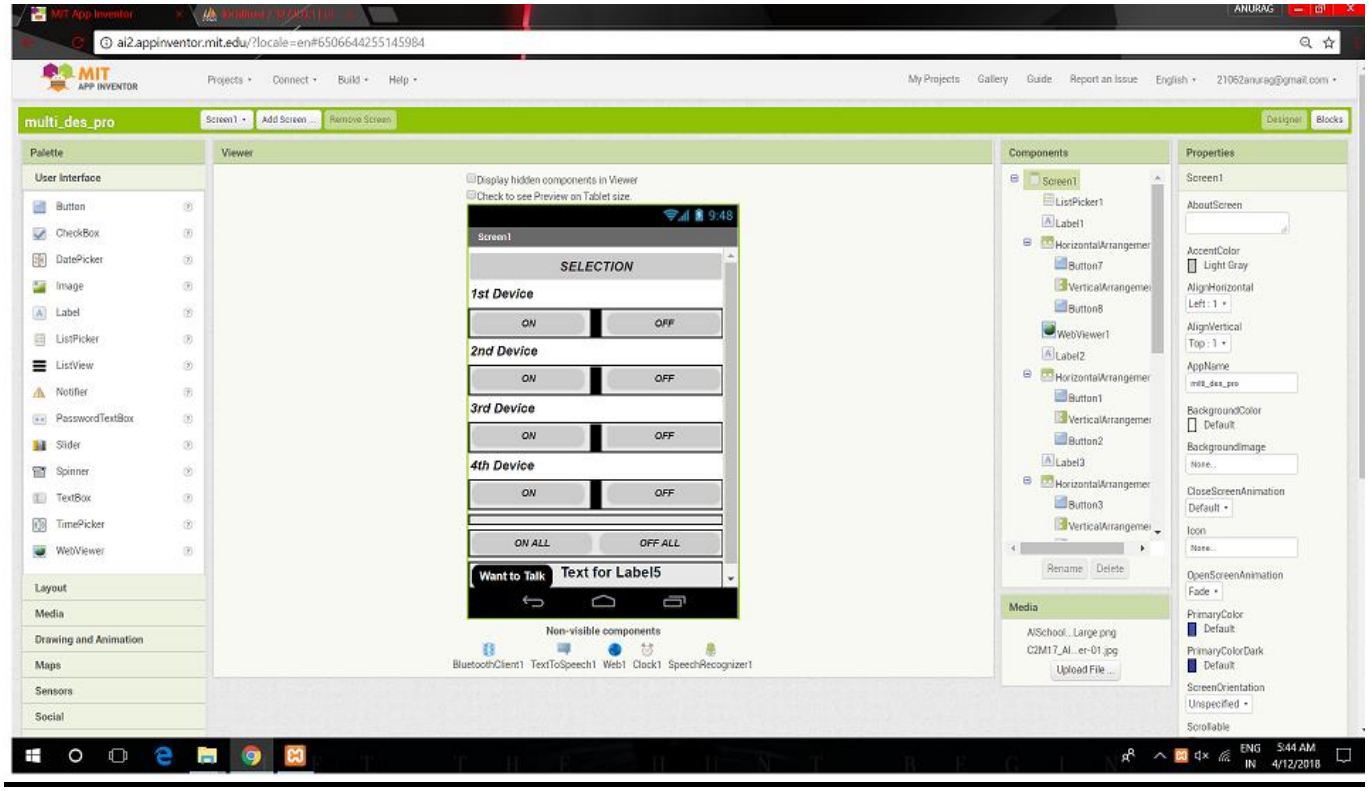
sketch_mar25a

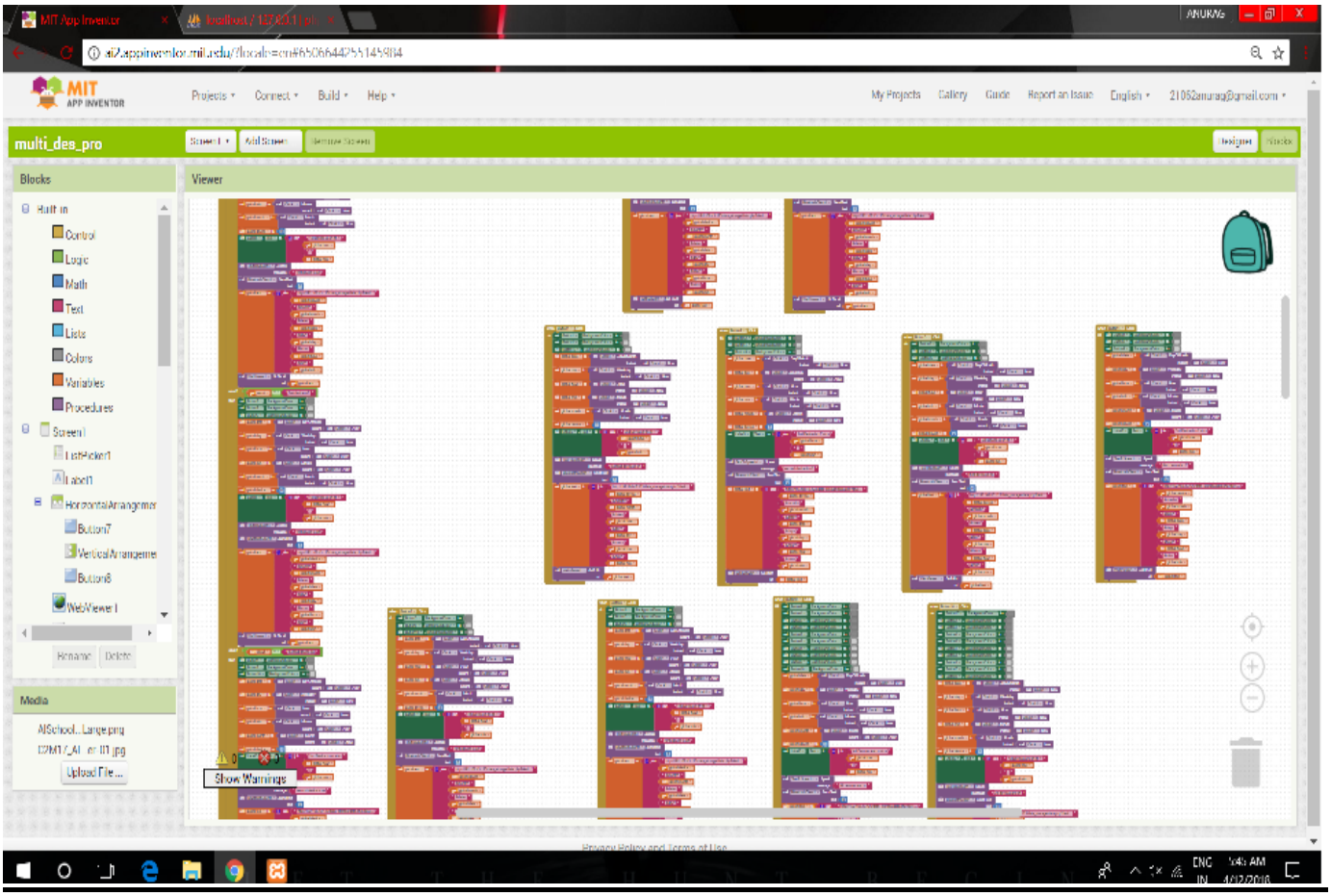
```
#include <SoftwareSerial.h>

const int rxPin = 4;
const int txPin = 2;

SoftwareSerial mySerial(rxPin, txPin);

const int Loads[] = {8, 10, 11, 12};

int state = 0;
int flag = 0;

void setup()
{
    for (int i=0;i<4;i++)
     {
       pinMode(Loads[i], OUTPUT);
     }
    mySerial.begin(9600);
    for (int i=0;i<4;i++)
     {
       digitalWrite(Loads[i], HIGH);
     }

}

void loop()
{

     if(mySerial.available() > 0)
     {
       state = mySerial.read();
       flag=0;
     }
```

sketch_mar25a

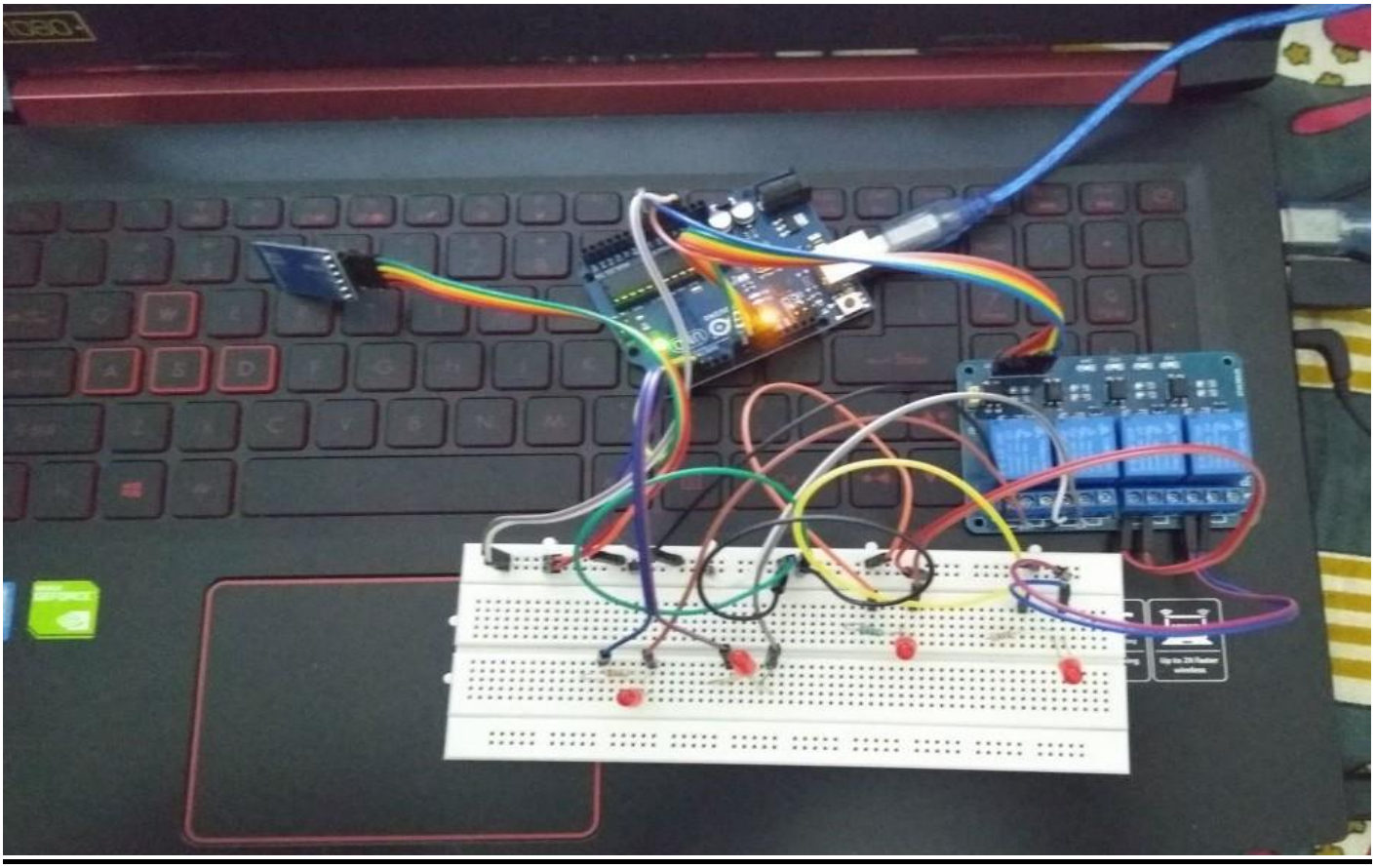
```
  switch(state)
  {
    case '0':digitalWrite(Loads[0], LOW);
             flag=1;
             break;
    case '1':digitalWrite(Loads[0], HIGH);
             flag=1;
             break;
    case '2':digitalWrite(Loads[1], LOW);
             flag=1;
             break;
    case '3':digitalWrite(Loads[1], HIGH);
             flag=1;
             break;
    case '4':digitalWrite(Loads[2], LOW);
             flag=1;
             break;
    case '5':digitalWrite(Loads[2], HIGH);
             flag=1;
             break;
    case '6':digitalWrite(Loads[3], LOW);
             flag=1;
             break;
    case '7':digitalWrite(Loads[3], HIGH);
             flag=1;
             break;
    case '8':digitalWrite(Loads[0], LOW);
             digitalWrite(Loads[1], LOW);
             digitalWrite(Loads[2], LOW);
             digitalWrite(Loads[3], LOW);
             flag=1;
             break;
    case '9':digitalWrite(Loads[0], HIGH);
             digitalWrite(Loads[1], HIGH);
```

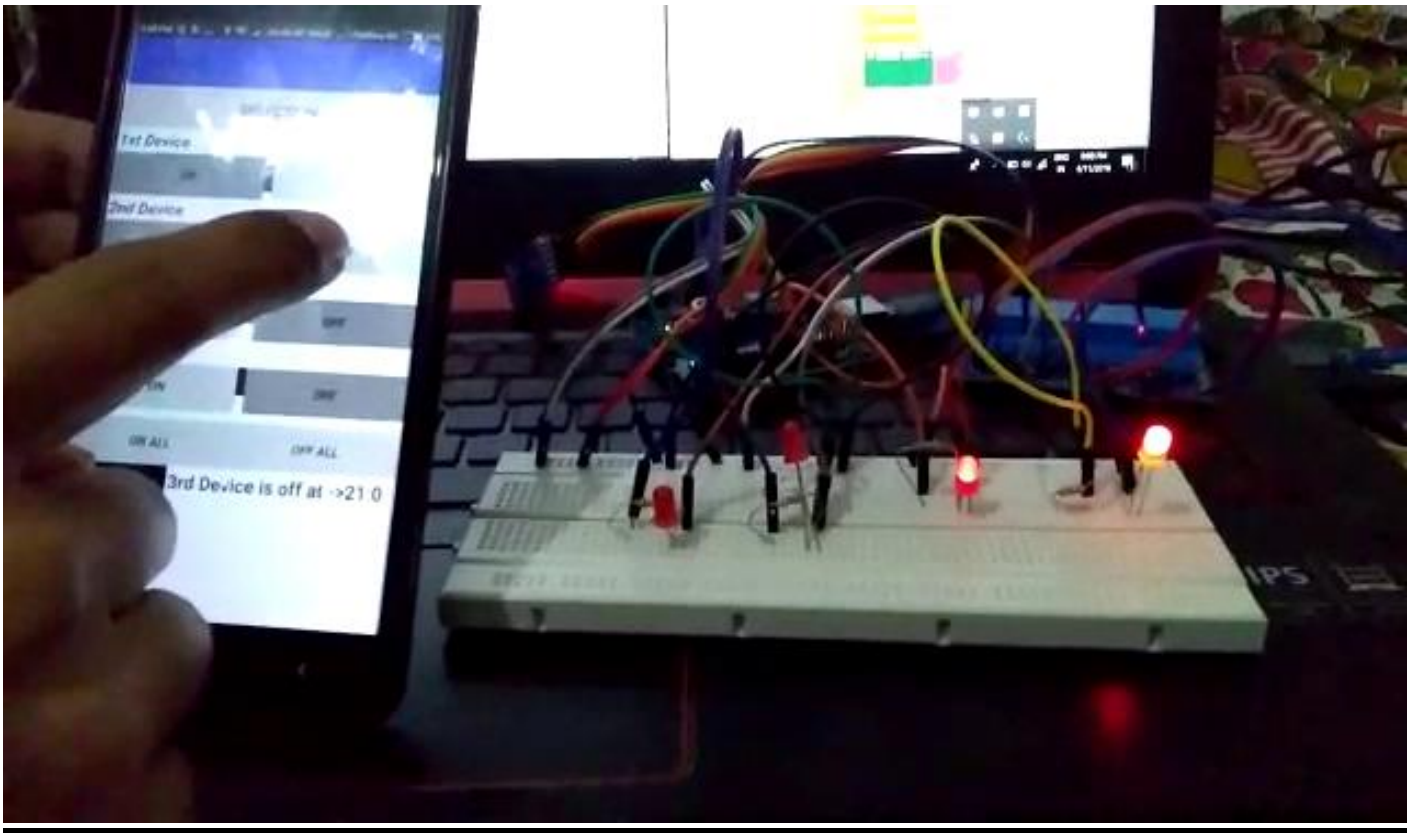
‘Multi_des_pro’Code



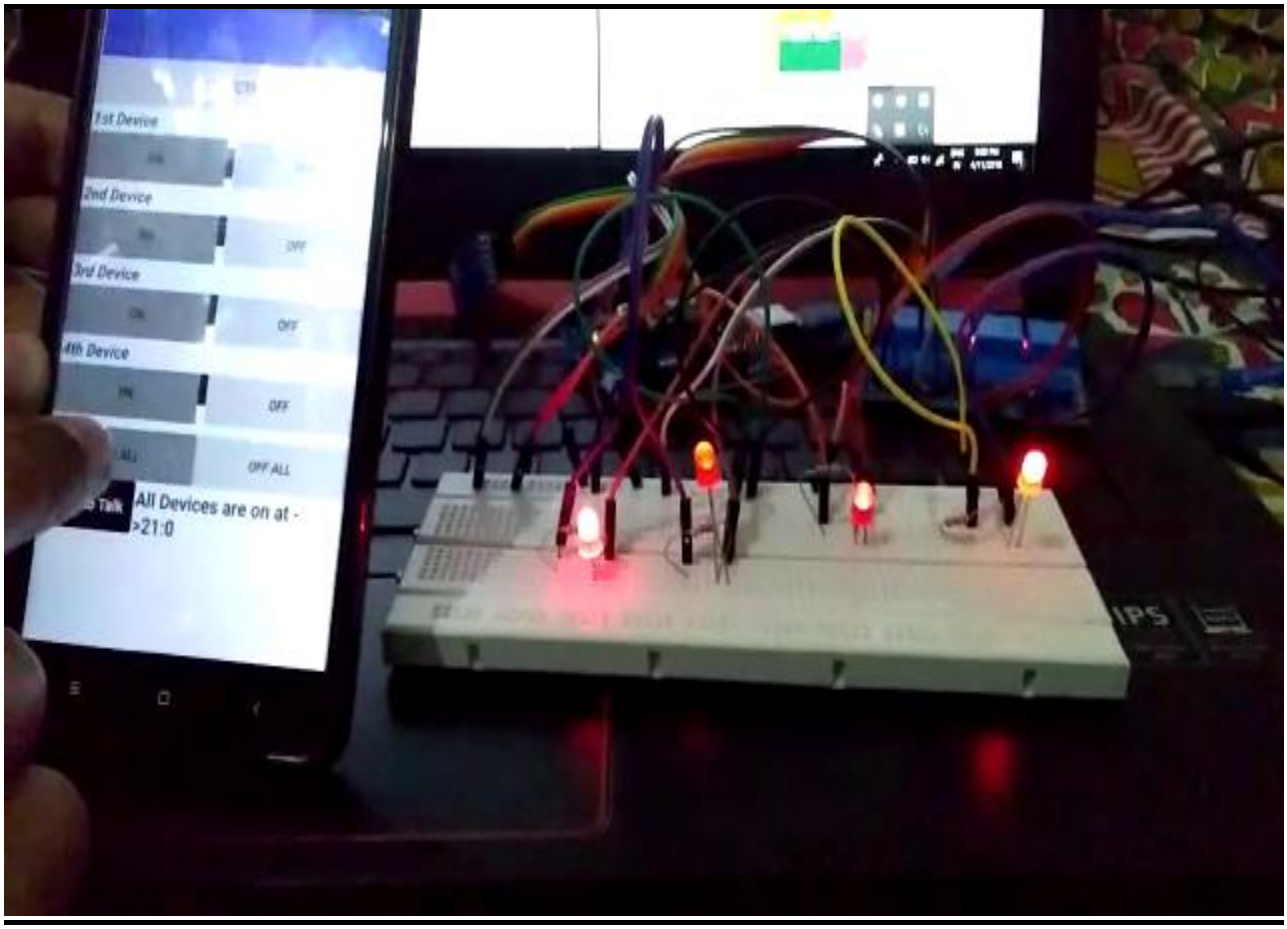


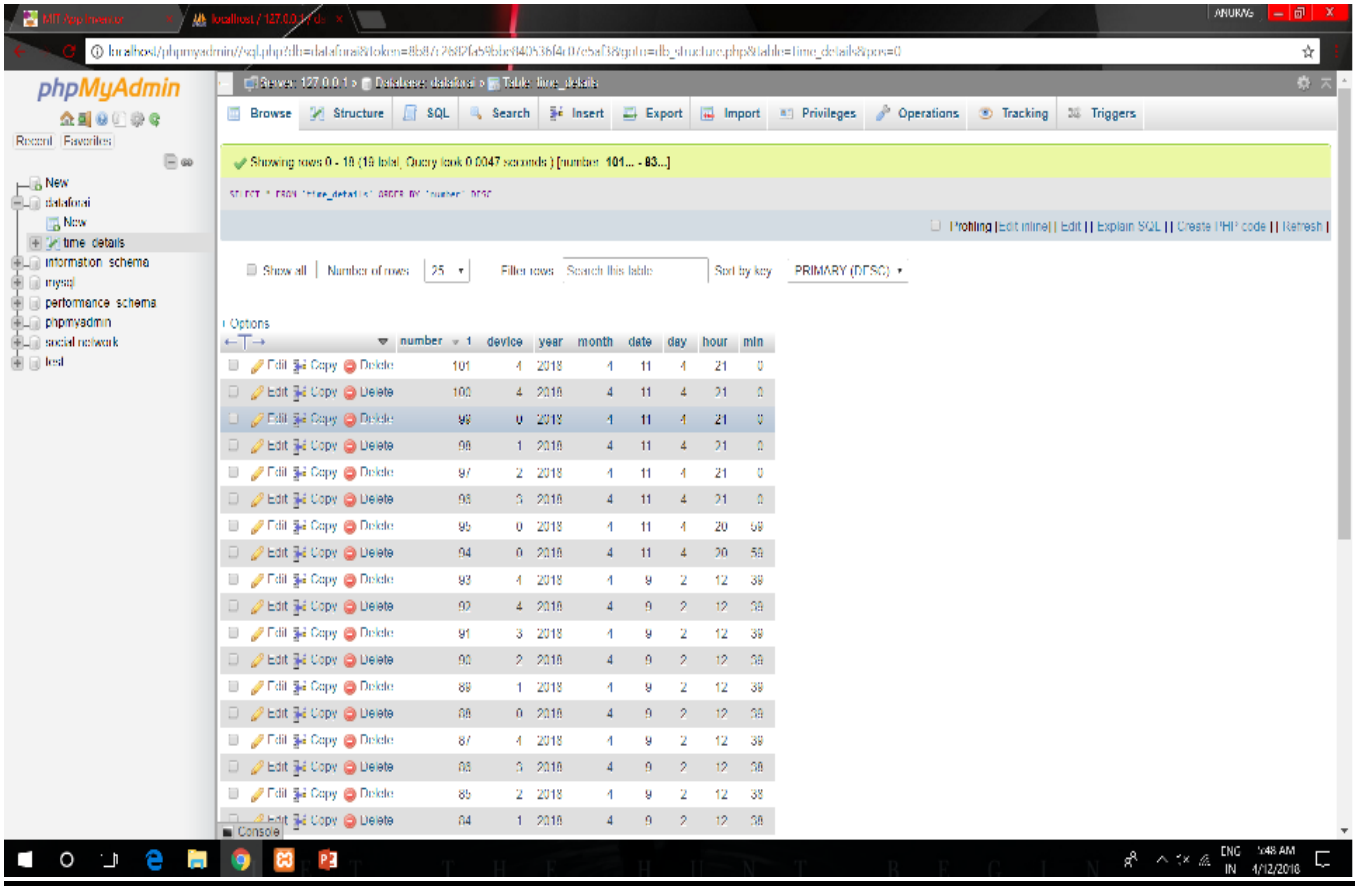
Screenshots:






1st Device
ON
2nd Device
ON
3rd Device
ON
4th Device
ON
ON ALL
OFF ALL
Want to Talk
All Devices are off at -
>21:0


1st Device
2nd Device
OFF
3rd Device
OFF
4th Device
OFF
OFF ALL
All Devices are on at -
>21:0


phpMyAdmin
Browse
Structure
SQL
Search
Insert
Export
Import
Privileges
Operations
Tracking
Triggers
Showing rows 0 - 18 (19 total, Query took 0.0047 seconds.) [number: 101... - 83...]
Profiling | Edit inline | Edit | Explain SQL | Create PHP code | Refresh
Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: PRIMARY (DESC)
Options
number | device | year | month | date | day | hour | min
Edit Copy Delete 101 1 2018 1 11 4 21 0
Edit Copy Delete 100 4 2018 1 11 4 21 0
Edit Copy Delete 99 0 2018 1 11 4 21 0
Edit Copy Delete 98 1 2018 1 11 4 21 0
Edit Copy Delete 97 2 2018 1 11 4 21 0
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Edit Copy Delete 95 0 2018 1 11 4 20 59
Edit Copy Delete 94 0 2018 1 11 4 20 58
Edit Copy Delete 93 1 2018 1 9 2 12 39
Edit Copy Delete 92 4 2018 1 9 2 12 38
Edit Copy Delete 91 3 2018 1 9 2 12 39
Edit Copy Delete 90 2 2018 1 9 2 12 38
Edit Copy Delete 89 1 2018 1 9 2 12 39
Edit Copy Delete 88 0 2018 1 9 2 12 38
Edit Copy Delete 87 1 2018 1 9 2 12 39
Edit Copy Delete 86 3 2018 1 9 2 12 38
Edit Copy Delete 85 2 2018 1 9 2 12 38
Console

Chapter 5

Conclusion

The Home Automation system provides a centralized control over the home appliances with the addition of low cost devices and an intelligent system. The introduction of a Personal Assistant, in this case Jasper, has eliminated the need of an additional device like a smartphone or a Bluetooth device. The hands-free control over the appliances provides help and assistance to the disabled and elderly. With the growth in the field of Home Automation, the main aim of the project is to bring about an Intelligent System to make day to-day household decisions. Using Natural Language Processing, the user's request is executed and acknowledged by the Intelligent System. The AI developed does not only control the appliances but is also used to retrieve information from the Web depending on the query.

The prime objective of our project is to use the Smartphone to control the home appliances effectively. The switch mode and voice mode are used to control the home appliances. This project is based on the Arduino Uno, Android platform these platforms are Free Open Source Software. So the overall implementation cost is low and can be easily configured.
User can easily interact with the android phone/tablet. The user can send commands via the switch mode or speech mode. The data are being analyzed by the application and are sent over through Bluetooth signal. The Arduino Uno analyses the data sent by Bluetooth and activates the Input Output Pins. The Pins are connected to the relays switch which activated the required home appliances.

In this way, automation process is carried out. This is a simple prototype. Using this as a reference further it can be expanded to many other programs.

References:

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- www.arduino.cc/en/Guide/HomePage
- https://en.wikipedia.org/wiki/Home_automation

Code reference-

- https://www.arduino.cc/en/Main/Software