ADVANCE HOME AUTOMATION SYSTEM

V.I.K.I

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ABSTRACT

A smart home is a residence in which technology has been applied to expect and respond to the user's needs and commands, which can be used to increase the everyday day to day life at home environments.

The main objective of this documentation is to design an embedded system to detect and recognize human voice commands, which is in turn used to change respective loads. The entire design is accomplished using a speech recognition software system along with an **Arduino Microcontroller** and **Relays**.

The software system is initially in standby mode waiting for an input command from the user. Once an input command is detected, it is analyzed by **V.I.K.I** software. If a known command is detected, the speech recognition function analyze or filter out that command, then it will sends respective digital representations to the Arduino microcontroller. The microcontroller then understand these data signals, compares them with a database and thus identifies the referred load and its desired state. The processing results are then displayed on the software pop message, which is primarily used to display the system states.

According to the load state identified, control signals are sent to respective relay circuits, thus actuating the appropriate loads. The original goals are the same. Ex: To control the home appliances using voice commands and they have been achieved such as "VIKI switch on the light". (Command)

ACKNOWLEDGEMENT

I would like to express my heart-felt thanks to Almighty my god for his kind blessing for completion of Advance automation System project successful.

I have taken efforts in this project. However, it would not have been possible without the kind support of many individuals. I would like to express my sincere thanks to all of them.

I would like to extend my special thanks of gratitude towards my parents & my colleagues for their kind co-operation & encouragement, which helped me in completion of this project.

I would like to express my sincere gratitude & thanks to my facilitator Mr. Anis Saboordeen. Who has dictation us time to time & advise us to perform and guidelines and suggestions to complete this project.

Above all, I would like to acknowledge to the all lectures, staff and other worker of BCAS city Campus. In all of them, for encouragement and kind inspiration each every actions when I was doing my project.

Finally, I would like to thank some website authors because their given to me an information, pictures, report etc. and inspiration helped it a lot. My thanks & appreciations go to my colleagues & people who have willingly helped me out with their abilities to complete my project tasks on time.

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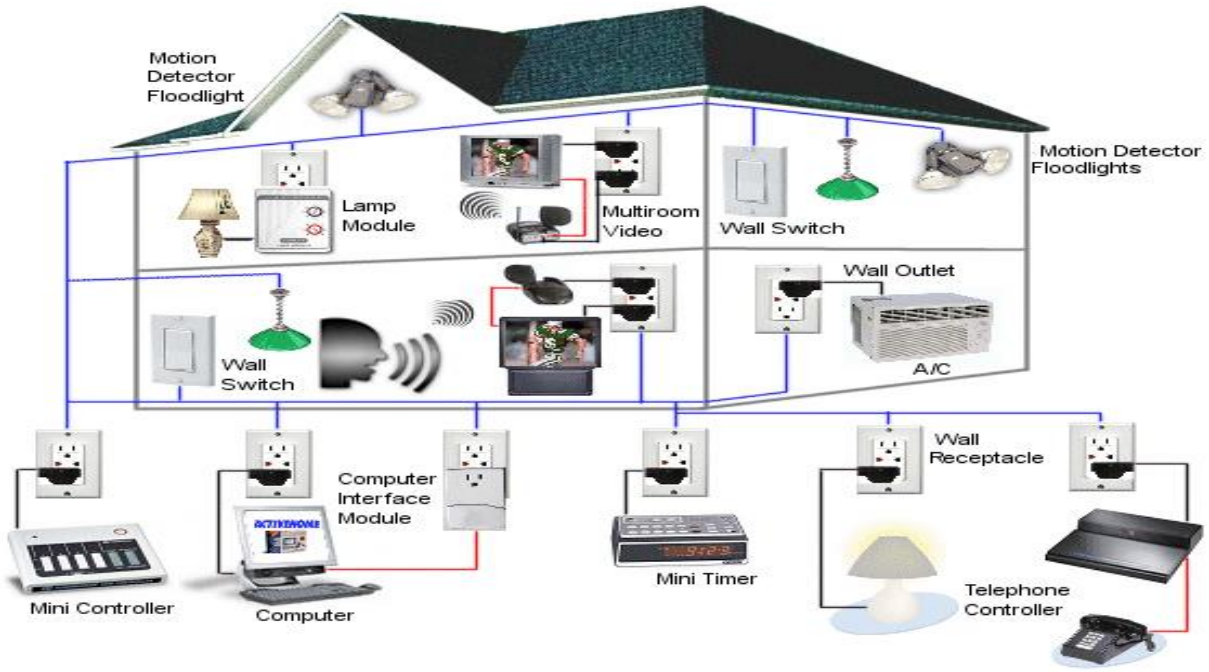
CHAPTER 1: INTRODUCTION



From the voice control system, we can adjust the whole home appliances or device. Such as lighting, fan and air conditioning, even individual electrical outlets. Home Automation is conveniences installed and designed to perform in your living place. Smart homes are often referred to as intelligent homes as they perform services that become part of our life. Many of the automated systems that silently perform their jobs unnoticed this is automation at its best.

Automation voice control takes many shapes and it plays a major role in our day to day life in our homes. For example we can take this movement, when you forget to lock a door in home, the message will come through system. As well as, a smart home system knows to turn off the air conditioning when a window is opened, calls you when your children come home from school unscheduled or tells you the main door was left open etc. In that situation, as your voice command will be change into your home lights dim, the blinds close and your TV turns on including all the right associated your home appliances, and you can check the indoor/outdoor temperatures, change your thermostat or close your blinds.

Constantly, other automated system may include to set the air conditioning to an energy saving mode when the house is unoccupied, and restore it to the normal setting when an occupant is about to return your home. According that, which I was develop an application (V.I.K.I) this may be designed to turn on/off appliance when a person ask to switch on/off that particular command. In advanced systems, I will provide to another modify project. it not only command mode the presence of a person ask a command but also identify who is that person will coming to you house and perhaps set appropriate cooling level, lighting, music levels or television channels, taking into account mind set of that person and other factors.

Most of the sophisticated systems can maintain their own details, such as inventory date, their usage by bar codes, or RFID tag, and maintain their database. To build an automated system that is truly efficient and easy to use. The design must be able to assemble disparate bits of technology into a streamlined whole. Apart from that a home automation system integrates all home appliances in a house with each other. With the help of the microcontroller, the cost of electronic control systems fell down rapidly. Smart control technologies were adopted by the building services in the worldwide, as they are user friendly to the end user. The elements of a demotic system are given below, which are;

- Software.
- Sensors.
- Hardware controllers.

OUR GOAL

To build a robust hardware design model to aid the control of home devices using speech recognition.

OBJECTIVES

- ✓ To develop a hardware model to control home devices.
- ✓ To accept control commands from users in the form of speech.
- ✓ To process the voice command for identifying speech and to generate corresponding control signals.
- ✓ To transfer the control signals to the corresponding device to perform the required task.

WHY WE NEED AUTOMATION

Smart Home Automation is also known as demotic. It is automation of the housework, home, or household activity. Home automation may include centralized control of lighting, and other appliances, to provide improved convenience, energy efficiency and security. Home automation for the disabled and elderly can provide increased quality of life for persons who might otherwise require caregivers or institutional care.

Many of the household jobs were automated by the development of special appliances. As the number of controllable appliances in the home increases, the ability of these devices to communicate with each other digitally becomes a useful and desirable feature. The consolidation of monitoring or control signals from appliances, basic services or fittings is an aim of home automation.

Home automation can also provide a remote interface to home appliances or the automation system itself, via telephone line, wireless transmission or the internet, to provide control and monitoring via a smart phone or web browser. A good example of a remote monitoring in smart home automation could be when a smoke detector detects a smoke or fire, and then all lights in the house will blink to alert any occupants of the house to the possible fire. If the house is equipped with a home theatre, an intelligent system make an audible announcement. The system could also call the house owner on their mobile phone to alert them, or inform it to the alarm monitoring company or the fire department.

TYPE OF HOEM AUTOMATION

The implementation of home automation can be divided into the following application categories which are;

HVAC
(Heating, Ventilation and Air Conditioning**)**

This solutions include humidity and temperature control. This is generally one of the most important aspects to a house owner. For example, an Internet controlled thermostat can both save money and help the environment, by allowing the house owner to control the building's heating and air conditioning systems remotely.

Lighting
Lighting control systems can be used to control household electric lights. Natural lighting control involves controlling LCD shades, window shades, awnings and draperies.

- Replace manual switching with Automation of on and off signals for any or all lights
- Change the ambient color of lighting via control of electronic dimmers or LEDs
- Regulation of illumination levels according to the level of ambient light available
- Extinguish all the lights

Security
Security with Home Automation, the consumer can select live video streams to watch their home. Security cameras can be controlled by the user to observe the activity around a house right from a touch panel or Monitor. This will give the intimation to the user through alarm or cell phone while identifying unauthorized entry by motion sensors. This system also has control and distribution of security cameras.

- Detection of possible intrusion.
- Sensors for detection of movement.
- Sensors for magnetic contact of door/window.
- Sensors for glass breaking.
- Sensors for identifying change in pressure.
- Simulation of presence.
- Detection of gas leaks, water leaks, fire.
- Precise and safe closing of blinds.

AUTOMATION CONTROL METHODS

A multiple intelligent devices or centralized controller can be used around the home. Besides the upcoming standardization of home automation hardware, there is also the issue of the control software. In older systems, the control of each home automation system needed to be done separately, and there was thus no central control system.

This sometimes led to a great amount of remote controls, one being needed to control each individual part of the system. However, with the new generation of home automation systems, central control can be foreseen. The control can be achieved by the following ways, which are;

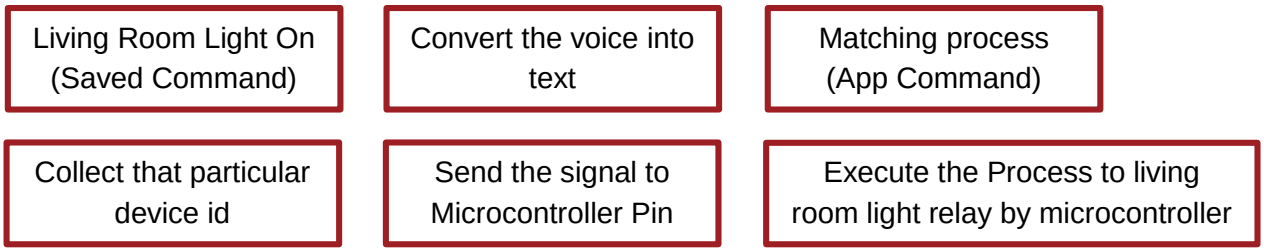
i. Centralized control.
ii. Voice control.
iii. Predefined user setting
iv. Independent sensors

Centralized control

A centralized control is an autonomous control of the home devices aided by a central home point. A central home point is a main located in a private residence providing smart-living services to the user with the help of intelligent home devices. The devices are interfaced directly with this central controller and are independent from each other. Also multiple devices can be added or removed without any disruption of the entire system.

Voice control

This control method offers a more user interactive approach in delivering control commands. The principle of voice/speech recognition is employed as the basic concept. The term "voice recognition" means the systems t must be trained to a particular speaker's voice. VIKI Application include Speech recognition. It can be understand voice command user interfaces such as call appliance control, play music, Storytelling, search, speech-to-text processing, etc. The concept of speech recognition involves the study of speech patterns of various individuals. All the patterns contain basic similarities, which can be convert voice to text into a system. System can be analysis the word, then it will process which device other function wants to execute to the microcontroller.
For example: To need to switch on the light.



Predefined user setting

The occupants define various settings of the entire system into 'profiles'. These profiles can be selected to be different for every user and contain settings of various devices such as

- ➔ Customize the location (Home Rooms).
- ➔ Customize the Appliance (Add/Edit/Delete Device).
- ➔ Add / Edit / Delete device configuration.
- ➔ Device can be Enable / Disable mode
- ➔ Device can be mange lighting level

As well as, we can be add profile to change all setting automatically, example, a profile 'SLEEP' can be made which would switch off all the room lighting, adjust air conditioning to a mild level, and switch off any unwanted running appliances.

Independent sensors

A smart home can also comprise of smart devices which have their own proprietary standards. In such a case the setup would consist of independent sensors which aid and respond only to a few selected devices. This kind of installation does not form a network, but forms multiple independent modules, modules comprising of a set of sensors corresponding with a smart device. An example can be of a motion detect system which automatically detects the presence of people in front of the house door and it will be switches on the hood area lights if that light off mode, this system of detection aids only the motion system and does not actuate any other device.

Methodology

I intend to give a voice/speech input command to the system which has an in-built microphone that captures the input and transmits it to the VIKI application. The speech sample is then analyzed after which a command is sent by the Application to which signal wants to pass the microcontroller. The signal received by the microcontroller is then displayed on the application by pop message. The command signal that goes to the Arduino microcontroller is also made to toggle the bits/pins on an output port which are in turn connected to the relay circuit. The relay circuit consists of an isolation system and the relay along with the loads. Thus when the microcontroller sets on output bit to activate a load, the relay circuit triggers the respective relay to actuate the load. And the opt couplers present in the circuit isolate the main system from these high voltage loads. Thus the system successfully isolates and controls loads based on an input speech command

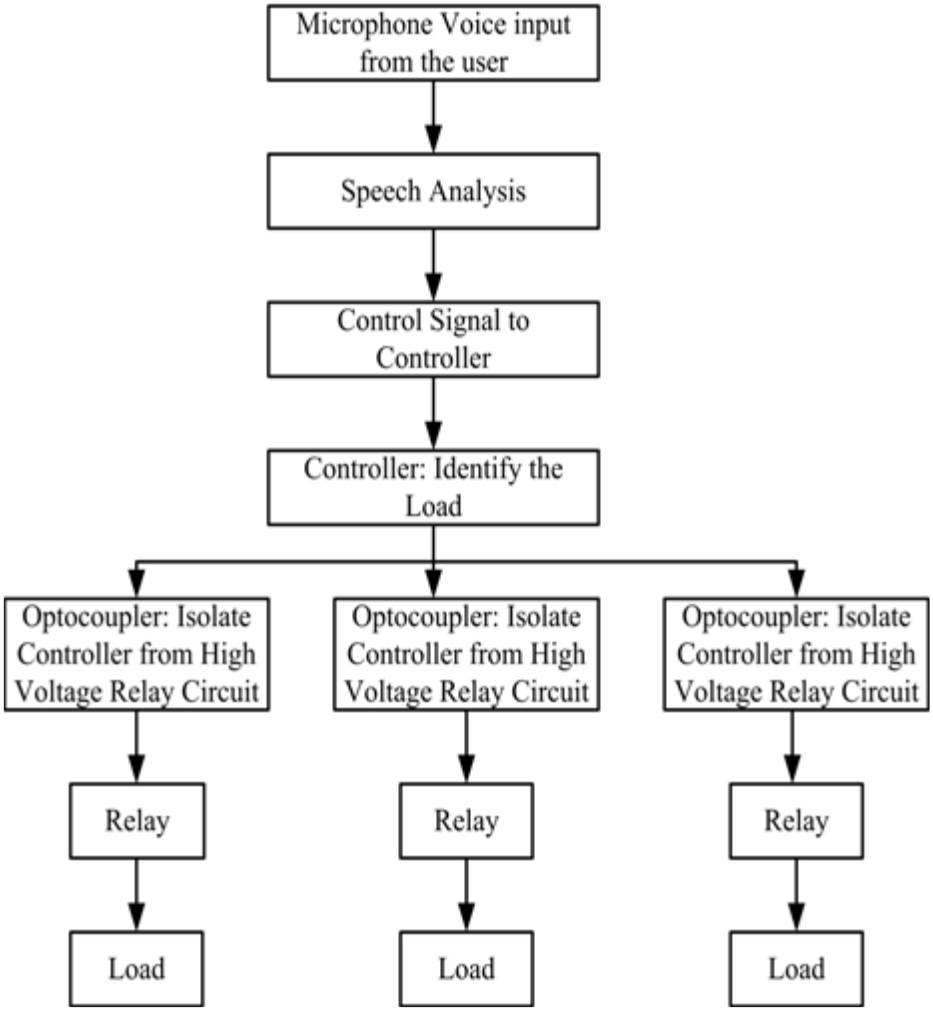


FIGURE 1: BLOCK DAIGRAM

CHAPTER 2: LITERATURE SURVEY / RESEARCH

This chapter will focus on existing systems and research topics related to Smart home automation. At the time, problems associated with existing solutions and how they are addressed by this system will further be discussed. Finally it will be elaborated on the technologies labored in developing this system. Also there related project has been complete by some which are shown below.

1. **Advance Home Automation Using FPGA Controller**

In this paper, author introduced a new technology with Field Programmable Gate Array (FPGA) controller, Bluetooth and Android phones. It is wireless technology. VHDL language is used for a Xilinx Spartan-3E. V means VHSIC (Very High Speed Integrated Circuit). FPGA Controller is based on Basys2 development board. FPGA has a many input and output pins so it can connect number of home equipment's. FPGA is used for controlling home equipment's. Bluetooth is used for monitoring equipment by wireless technique. Android phone is used for speech recognition. DC motor, stepper motor, a LED are connected to FPGA. A microcontroller has less number of input and output pins than FPGA Controller. Main aim of this paper is to increases the speed using parallel communication.

Source: (Sweatha K N, Poornima M, Vinutha M H, 2013)

2. **GSM Based Home Automation System Using App**

Inventor for Android Mobile Phone In this paper, author introduced Home automation based on GSM system using App-inventor for Android mobile. In App inventor, programmer has to design different blocks than design the source code like in Lab VIEW software.

Programming is not essential. The main aim of this paper is to have ease in programming using App inventor and security using GSM. App inventor is a platform to design a new smart phone apps using android. User has to login first online then start to design both part the screen objects (Designer) and the programming logics (blocks). User can control home equipment using GSM by each corner of world. In hardware, ULN2803 octal peripheral driver array, ATMEGA328 Arduino board with microcontroller, GSM Modem, Relay and some other small components are used. Arduino board worked as a transceiver. It has 23 I/O lines. In this paper hardware and software part is done individually.

Source: (Mahesh N, Jivani, 2014)

3. **Android Based Appliances Control System**

In this paper, controlling fan speed and light intensity is specialty of the project. This paper hold two parts, hardware part called process unit and software part called monitoring unit. Process unit contain Bluetooth module LM400, LCD, dimmer circuit, and microcontroller PIC16F877 (40 pin IC). Monitoring unit contain only smartphone. For better efficiency dimmer circuit is designed using SCR. Home appliances can control using android phone which has Bluetooth application. Bluetooth module is used for communication. It is wireless technology. Dimmer circuit is used for controlling the fan speed and intensity of light.

Source: (Belgi Y.G, Avatade P.G, Deshmukh P.V, Sakhare A.M, Shinde A.J, Prof. Patil J.M, 2013)

4. Bluetooth Based Home Automation and Security System Using ARM9

In this paper, the two microcontroller development boards viz ARM 7 and ARM 9 were used. ARM 9 (S3C2440A) is in transmitter side and ARM 7 (LPC2148) is in receiver side. Operating system Wince6.0 is used for designing the application on ARM9. In hardware parts ARM7, ARM 9, ULN2003, Relays, Bluetooth module are used. VB.NET is used for designing apps. Graphical User Interface module and Serial Port Profile modules are used in software part. Bulb, fan is controlled using Bluetooth, ARM – MDK kits acts as a processor. It is cost effective project.

Source: (D.NARESH, B.CHAKRADHAR, S.KRISHNAVENI, 2013)

5. Home Appliances Control System Based on The Android Smartphone

Design and Realization of Home Appliances Control System Based on The Android Smartphone present the information about the remote appliances control system based on the Android smart phone is designed and realized. A user logs into the smart phone interface, and clicks the buttons gently to send message commands which will be transmitted to home information Centre through the GSM network. Then the PIC processor recognizes the specified command, and controls the home appliance switches in the wireless radio frequency manner to achieve remote control of appliances ultimately. Exploiting Bluetooth on android mobile devices for home security application present the information about mobile devoice has been integrated into our everyday life. Home automation and security are becoming increasingly prominent features on mobile devoices the mobile devoice and security system communicates via Bluetooth because a short-range-only communication system was desired. With the help of android mobile we can control task such as locking the doors, turning on/off lights remotely.

Source: (Khadke, 2014)

6. Home Automation System via Zigbee Technology

These systems use PC, mobile internet, GSM Bluetooth and ZigBeenetwork etc. In such applications voice recognition technology is used. In this paper a method is devised which control the home appliances through voice commands. For that purpose a mobile application is developed that convert the user voice command into SMS and send through GSM network. Such application is developed using java for mobile technology and MPLAB for microchip family of controller. This proposed system is affordable to everyone, cheap and easy to install.

Source: (Faisal Baig, Saira Beg, Muhammad Fahad Khan, 2013)

Conclusion

Concluding, I would say how this project will worth full when we comparing these kind of project. The Intelligent Home System is a voice-controlled home automation system which controls home appliances over a VIKI software. Voice controlling enables users a sense of comfort as no direct operation with the home automation system is required. VIKI helps in achieving a rapid rate, low power consumption to communicate with the devices. The future work for Intelligent Home System can be porting the system to the cloud so that any device eventually could be used to control and monitor the Intelligent Home System remotely over cloud.

CHAPTER 3: ANALYSIS / DETAILED INVESTIGATION

Current System Drawbacks

Now a day's people are turn to new technology day to day life. Even though some of things until not change. For example if I having a home, each appliance operate by manually, such as people want to switch on light or fan, it's control by the switch port, even can control with our smart phones, Sometimes this is comfortable for someone at the same time some elder peoples don't like this system.

Constantly, as time is proceeding ahead, technology is developing and evolving every single moment. No one can claim something to be "latest" because the moment someone does so we can see the presence of something newer and better in front of our very own eyes. We endeavor to cope up with the dynamic changes but it is pretty difficult due to lack of availability of adequate and sufficient resources and technology. Two of the basic fundamental intentions of technology are to make things that are not complicated to be understood by the user and makes working of the user more convenient. Things are simple when the interface between human and technology is least complex. It is an outmost effort by scientists to make the interfacing system more and more convenient for the users. Revolution made by the new technology made our modern life easier as it endowing with new services and related commerce with more and more availability.

Below shows some data collected from internet how home automation is impacting our life in saving our resources and cost.

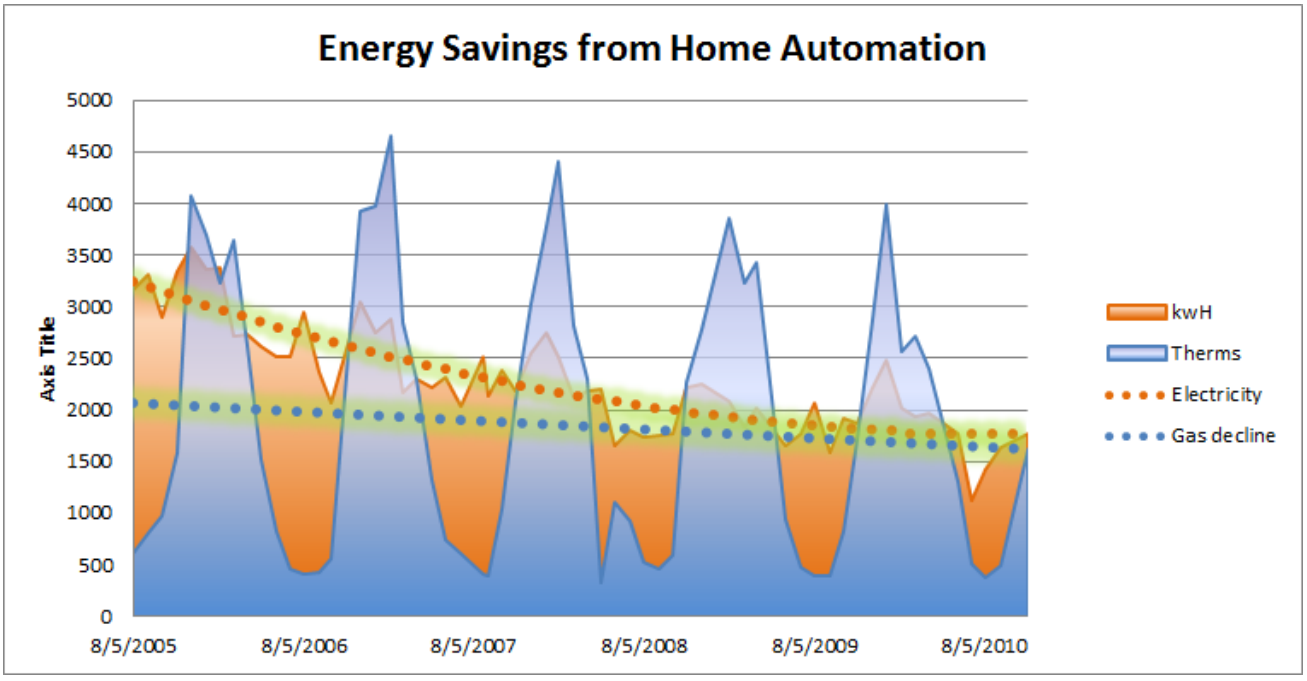


FIGURE 2: ENERGY SAVING

Source: (Ian, 2015)

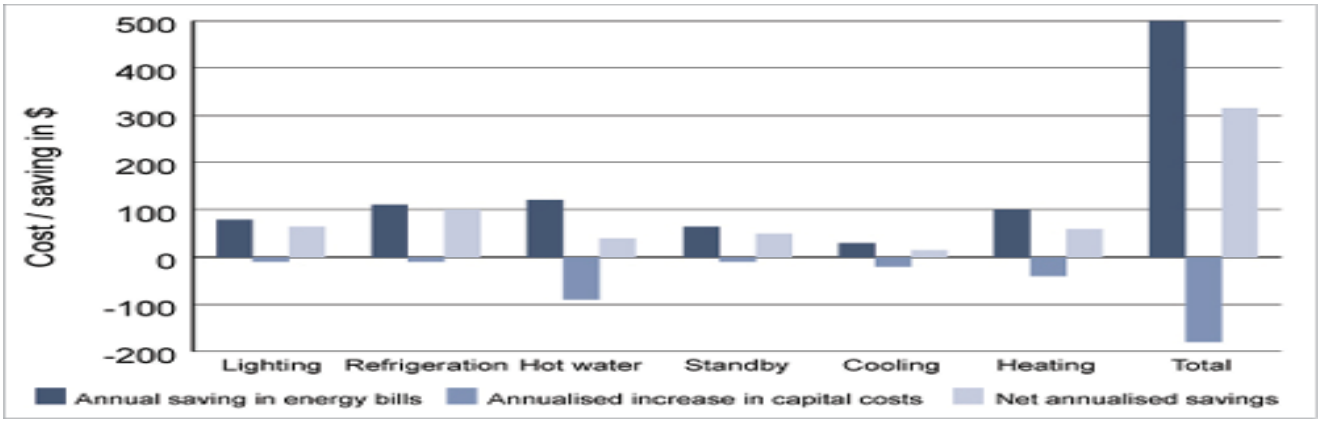


FIGURE 3: COST SAVED BY HOME AUTOMATION WORLDWIDE

Source: (Reardon, 2013)

Proposed solution for each drawbacks

The VIKI system is based on voice controlling technology to revolutionize the standards of living. This system provides ideal solution to the problems faced by home owners in day to day life. The system will be extern to wireless connection therefore more adaptable and cost-effective. The system uses voice controlling technology thus providing ubiquitous access to the system for automated appliance control. When we looking at the advantages of less investment, low cost, high reliability, but also has good expansibility and practicability, the intelligent of the future development of home appliances. Short command sent by user to the system hardware circuit level component based on command send and receive functions can be completed. The aim of the documentation is to investigate a cost effective solution that will provide controlling of home appliances remotely. The motivation is to facilitate the users to automate their homes having ubiquitous access.

The system provides availability due to development of a low cost system. In addition there was a need to automate home so that user can take advantage of the technological advancement in such a way that a person getting off the home or office does not get melted with the hot climate. Person can easily activate home appliances into just one command. Therefore this documentation proposes a system that allows user to be control home appliances ubiquitously via voice command using VIKI software.

Project Progress plan

ID	Task Mode	Task Name	Start	Finish	Duration
1		**Home Automation**	**Fri 15-09-18**	**Fri 15-11-20**	**46 days**
2		Initializing the project	Fri 15-09-18	Fri 15-10-16	21 days
3		Interim project	Mon	Mon	1 day
4		progressing with the	Tue 15-10-20	Fri 15-11-06	14 days
5		Interim project	Mon	Mon	1 day
6		finalising the project	Tue 15-11-10	Fri 15-11-13	4 days
7		Final project report and	Mon	Mon	1 day
8		Final Project	Fri 15-11-20	Fri 15-11-20	1 day

FIGURE 4: Project Progress Plan

Project Cost Analysis

TABLE 1: COST ANALYSIS

Product	Qty	Price	Total	Total Rs.	Remarks
LCD 20X4	1	29.95	29.95	4222.95	https://www.sparkfun.com/products/9568
Arduino Mega 2560 R3	1	45.95	45.95	6478.95	https://www.sparkfun.com/products/11061
AM2302 (Wired DHT22) temperature-humidity sensor	1	15.00	15.00	2115.00	https://www.adafruit.com/products/393
LPG Gas Sensor – MQ-6	1	4.95	4.95	697.95	https://www.sparkfun.com/products/9405
Magnetic Sensor	1	8.00	8.00	1128.00	
PIR Sensor	1	12.00	12.00	1692.00	
Selenoid – Door Clock	1	13.00	13.00	1833.00	
SparkFun MOSFET Power Controller	4	6.95	27.80	3919.80	https://www.sparkfun.com/products/11214
Bluetooth HC6	1	18.00	18.00	2538.00	
Plug Base	4	3.00	12.00	1692.00	
Peristaltic Liquid Pump with Silicone Tubing	1	24.95	24.95	3517.95	https://www.adafruit.com/products/1150
Key Pad	1	4.00	4.00	564.00	
Buzzer	1	0.50	0.50	70.50	
LED RGB	1	0.50	0.50	70.50	
Jumper Wire M-F 2, M-M 1	3	12.00	36.00	5076.00	
Shipping				25100.00	
Total				**38116.60**	

CHAPTER 4: DESIGN

SYSTEM OVERVIEW, ARCHITECTURAL DESIGN

Hardware Overview Design

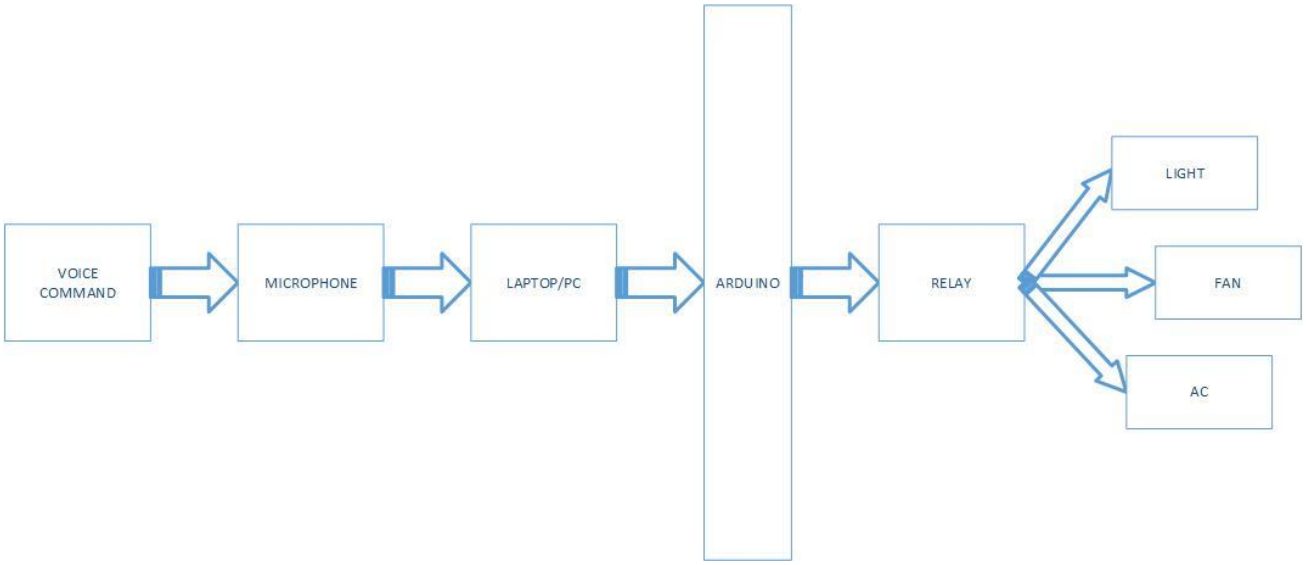


FIGURE 5: BLOCK DIAGRAM OF HOME AUTOMATION SYSTEM THROUGH VOICE COMMAND

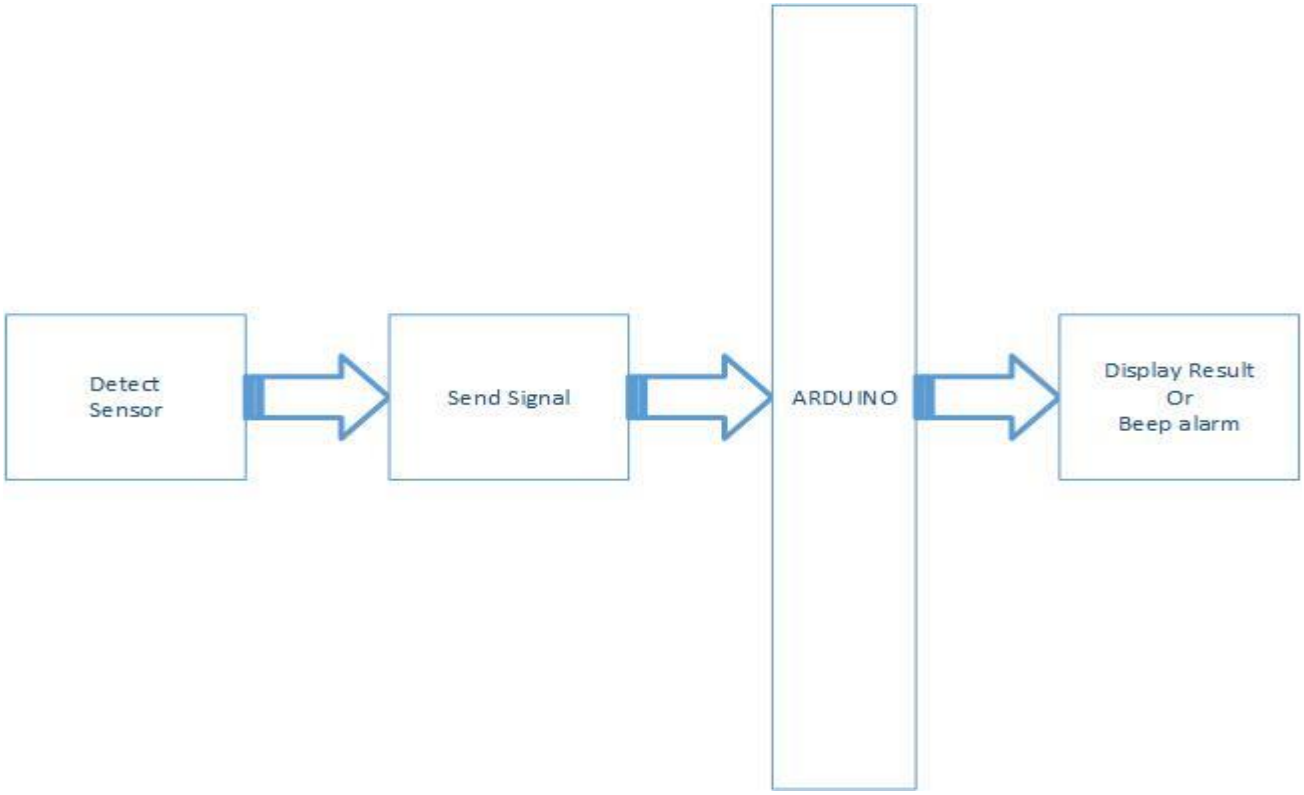


FIGURE 6: BLOCK DIAGRAM OF HOME AUTOMATION SYSTEM THROUGH SENSORS

According to the diagram, when we look at figure5 diagram, it says how system get the input form user and execute respective digital representations device. From the beginning, VIKI Software system is initially in standby mode waiting for an input command from the user. Once an input command is detected, it will be analyzed into database command. If a known command is detected, the computer speech recognition analyze or filter out that command, then it will sends respective digital representations to the Arduino microcontroller. The microcontroller will understand those data signals, compares them with a database and thus identifies the referred load and its desired state. The processing results are then displayed on the software pop message, which is primarily used to display the system states.

Constantly, Figure6 diagram, says how system sensor function working. The microcontroller is initially waiting for detection signal from each sensor. Once detect the signal, it will be send respective code and load that particular function or display on pop message in VIKI system software.

Used hardware ARCHITECTURAL diagram

1. Led

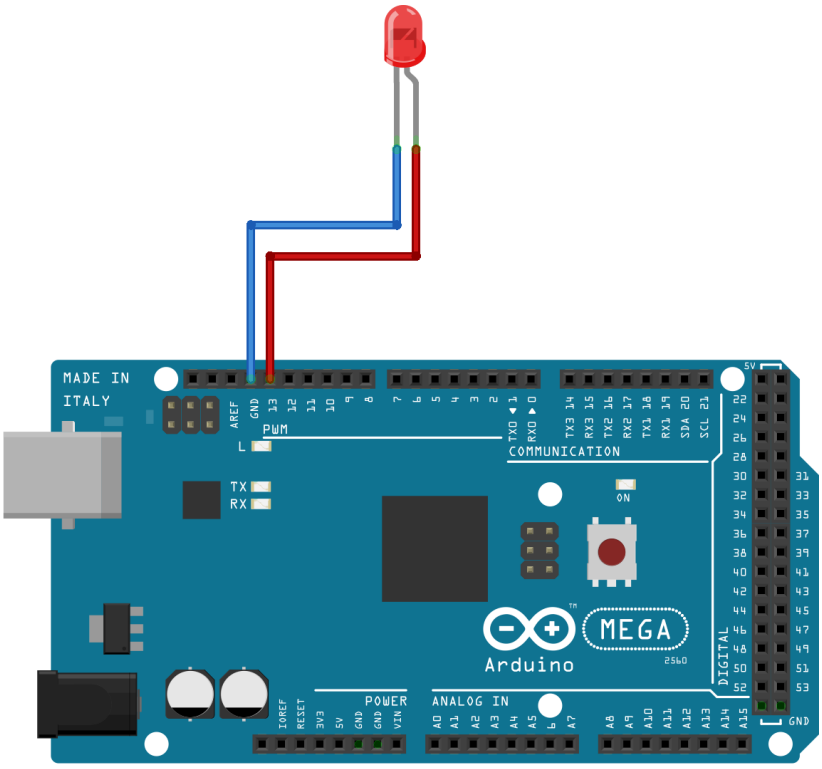


FIGURE 7: LED DIAGRAM

Sample Code:

```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repeatedly.
 */

void setup ()
{
          // initialize digital pin 13 as an output.
          pinMode (13, OUTPUT);
}

void loop ()
{
          digitalWrite(13, HIGH);   // turn the LED on (HIGH is the voltage level)
          delay(1000);              // wait for a second
          digitalWrite(13, LOW);    // turn the LED off by making the voltage LOW
          delay(1000);              // wait for a second
}
```

2. Buzzer

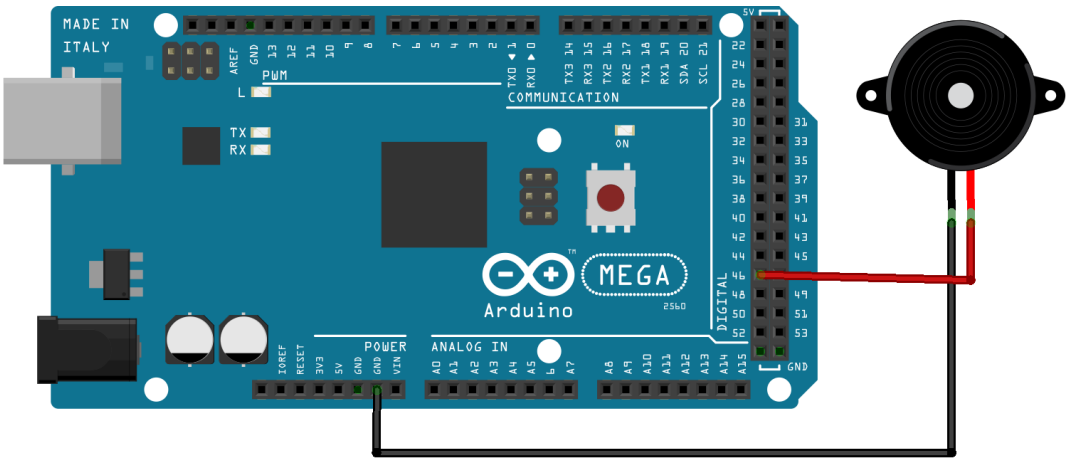


FIGURE 8: BUZZER DIAGRAM

Sample Code:

```
/*
  Buzzer
  Turns on an buzzer beep on for one second, then off for one second, repeatedly.
 */

void setup ()
{
          // initialize digital pin 46 as an output.
          pinMode (46, OUTPUT);
}

void loop ()
{
          digitalWrite(46, HIGH);   // turn the Buzzer on (HIGH is the voltage level)
          delay(1000);              // wait for a second
          digitalWrite(46, LOW);    // turn the Buzzer off by making the voltage LOW
          delay(1000);              // wait for a second
}
```

3. Temperature Sensor

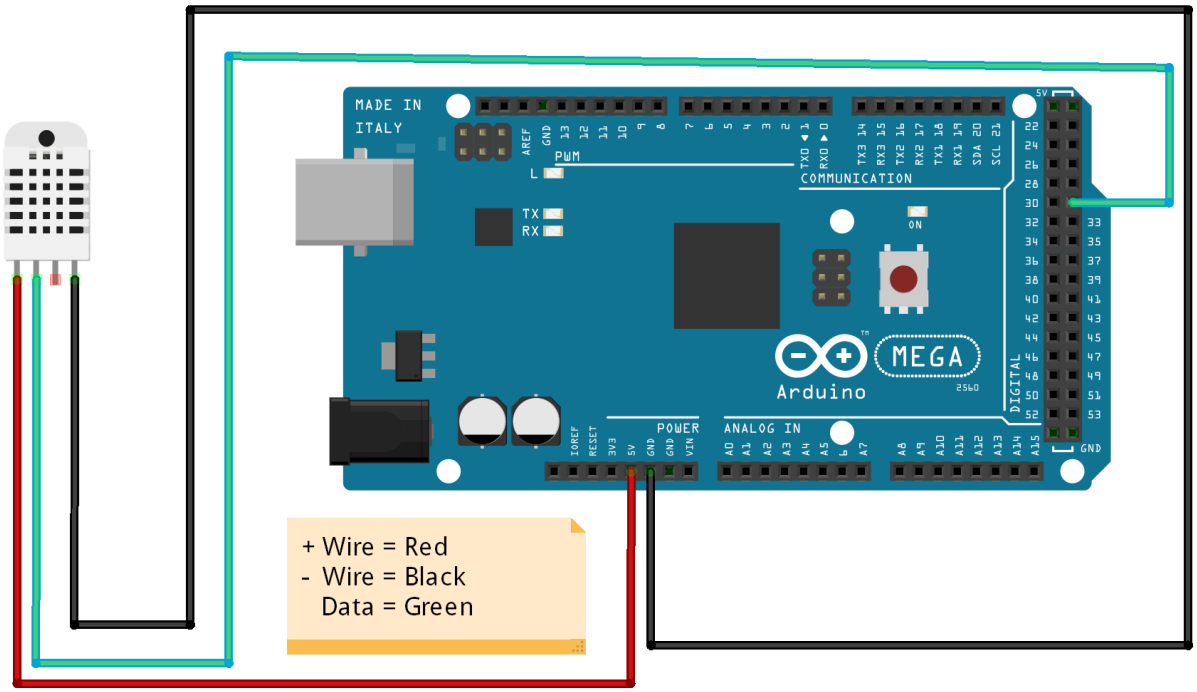


FIGURE 9: TEMPERATURE SENSOR DIAGRAM

Sample Code:

```
#include <dht.h>
#define dht_apin 31        // Analog Pin sensor is connected to
dht DHT;

void setup()
{
  Serial.begin(9600);
 delay(500);      //Delay to let system boot

 Serial.println("DHT11 Humidity & temperature Sensor\n\n");
 delay(1000);    //Wait before accessing Sensor

}

void loop()
{
   DHT.read11(dht_apin);          //Start of Program

   Serial.print("Current humidity:");
   Serial.println(DHT.humidity);
   Serial.print("% ");
   Serial.print("Temperature: ");
   Serial.println(DHT.temperature);
   Serial.print("oC");
   delay(1000);
}
```

4. Solenoid

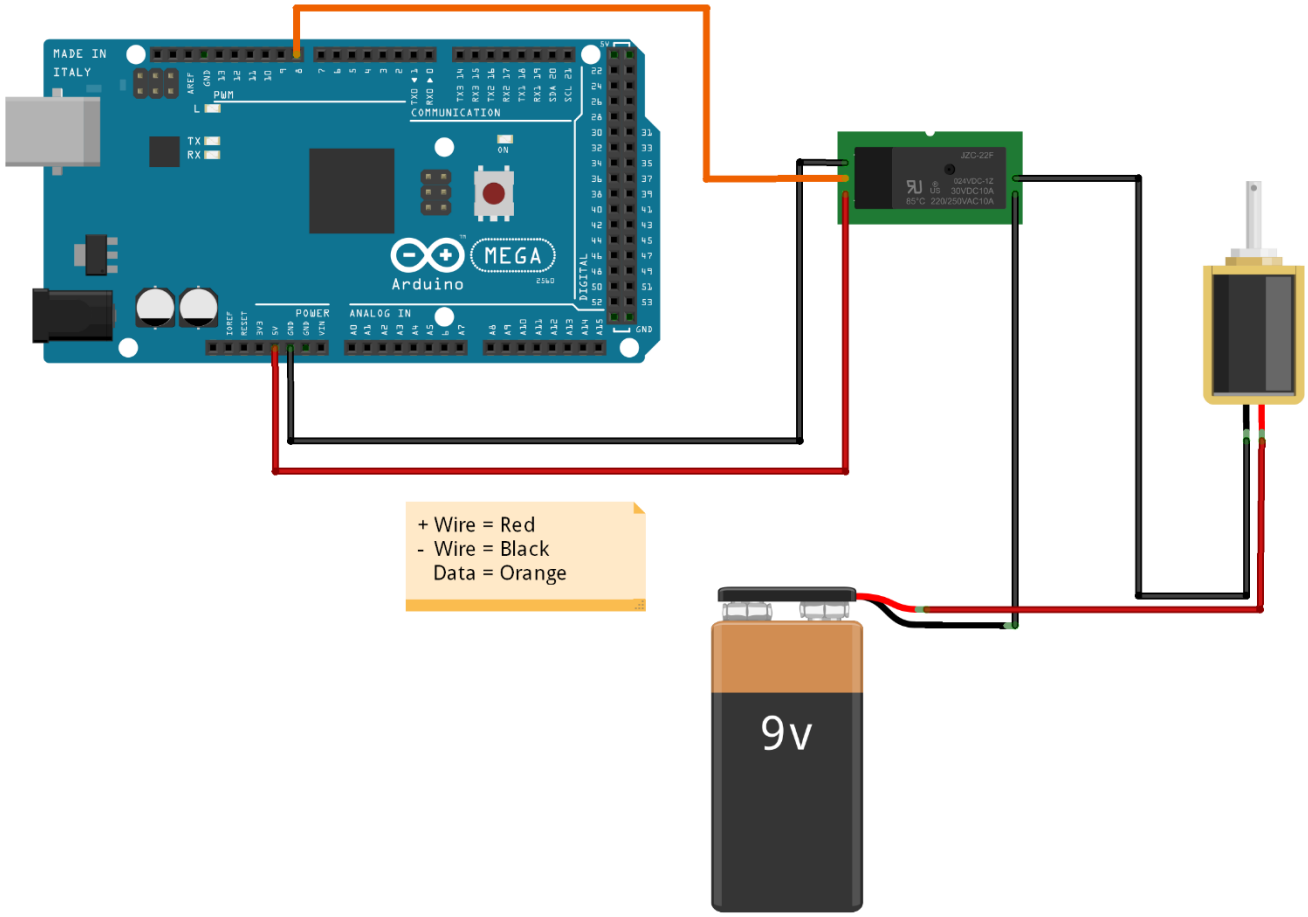


FIGURE 10: SOLENOID DIAGRAM

Sample Code:

```
/*
  Solonoid
  Open one second, then off for one second, repeatedly.
*/

void setup()
 {
  // initialize digital pin 8 as an output.
  pinMode(8, OUTPUT);
}

void loop()
{
  digitalWrite(8, HIGH);   // Close lock (HIGH is the voltage level)
  delay(1000);             // wait for a second
  digitalWrite(8, LOW);    // Open the lock
  delay(1000);             // wait for a second
}
```

5. Servo motor

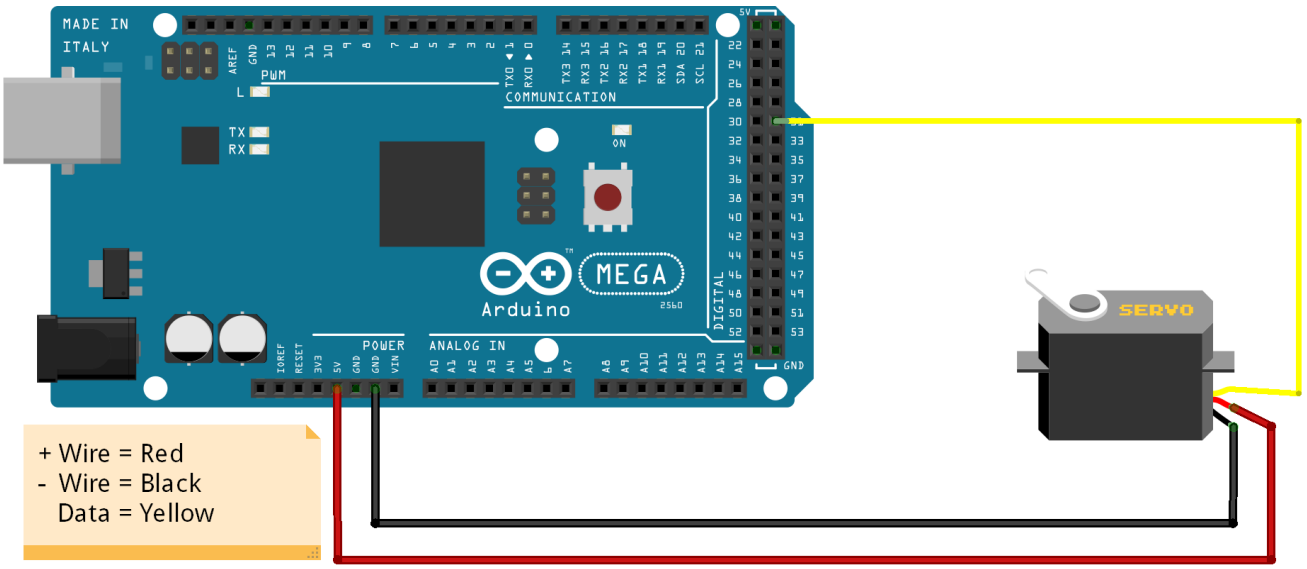


FIGURE 11: SERVO MOTOR DIAGRAM

Sample Code:

```
#include <Servo.h>

int data;
Servo myservo;

void setup()
{
        myservo.attach(28);
        Serial.begin(9600);
}

void loop()
{

        if (Serial.available())
        {
            data = Serial.read();
            Serial.println(data);
                if (data == 'A')
                {
                    myservo.writeMicroseconds(180);
                }
                else if (data == 'a')
                {
                    myservo.writeMicroseconds(1530);
                }
        }
  }
```

6. Solid state Relay

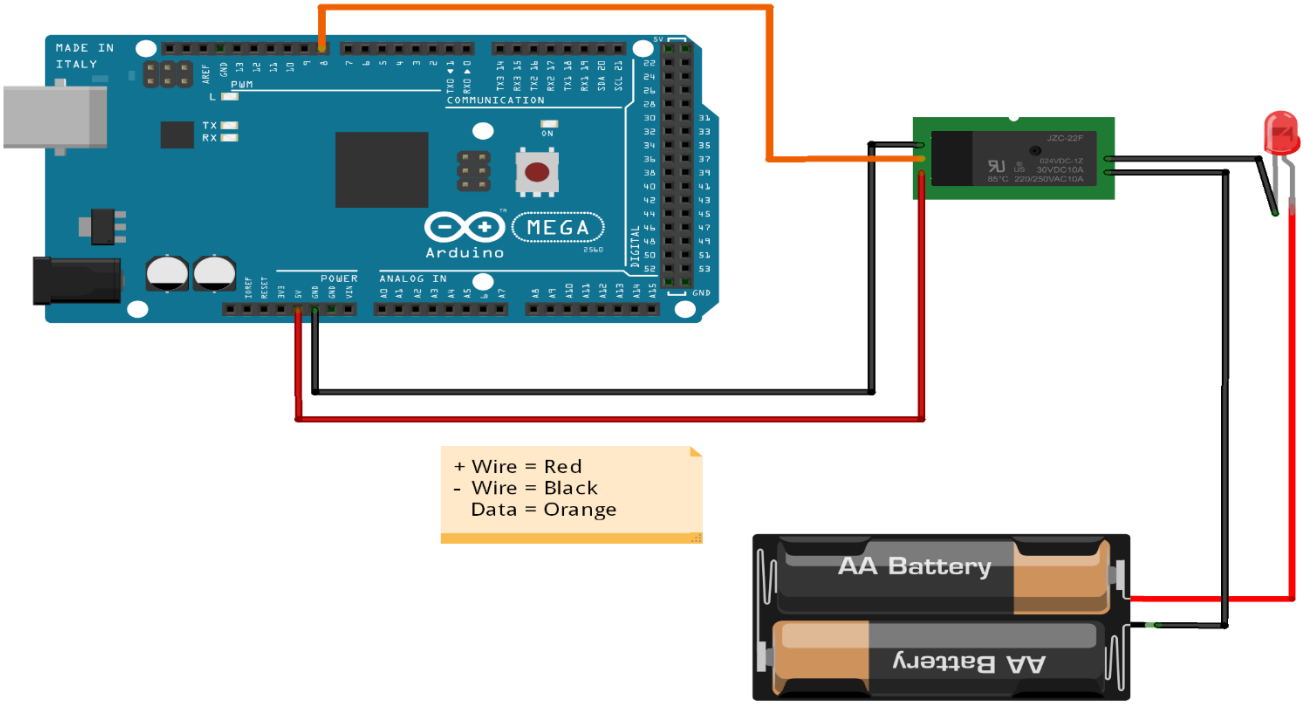


FIGURE 12: SOLID STATE RELAY DIAGRAM

Sample Code:

```
//Include libraries here
#include<Wire.h>

#define RELAY_ON  1
#define RELAY_OFF 0

#define Relay_1   8    // arduino digital I/0 pin number might need to change
int waittime;    //Delay between changes

void setup()
{
        waittime = 1000;
        digitalWrite(Relay_1, RELAY_OFF);
        pinMode(Relay_1,OUTPUT);
        delay(4000);    //Check that all relays are inactive at reset
}

void loop()
{
        digitalWrite(Relay_1,RELAY_ON);     //set the relay ON
        delay(waittime);                    // wait for a second

        digitalWrite(Relay_1, RELAY_OFF);  //turn the relay OFF
        delay(waittime);
}
```

7. Soil moisture

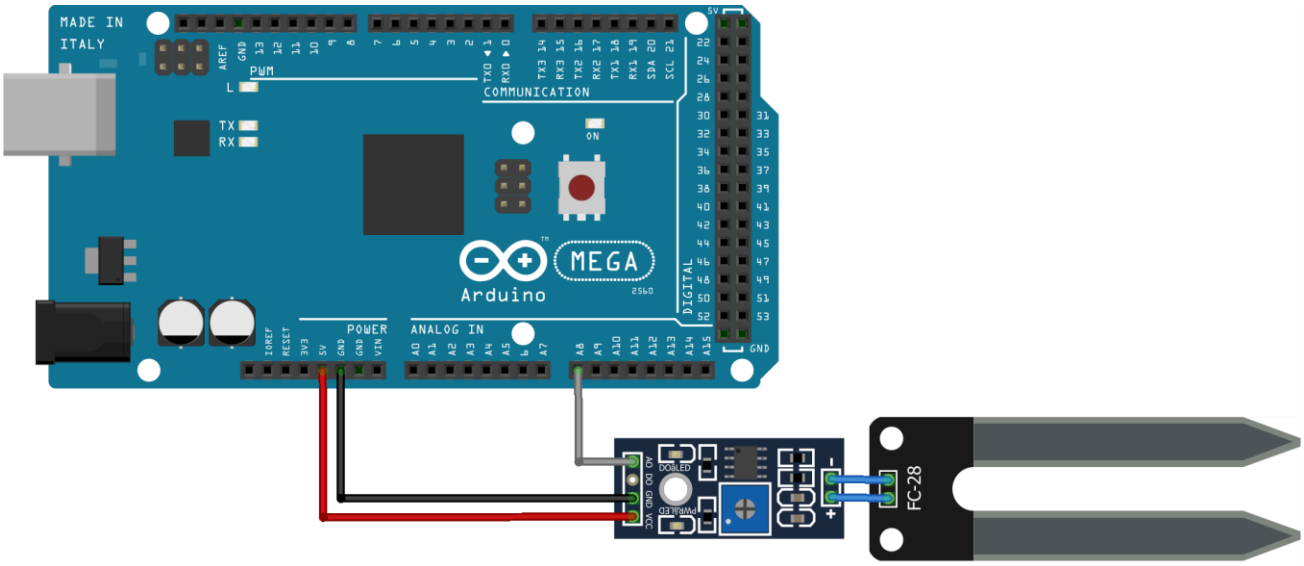


FIGURE 13: SOIL MOISTURE DIAGRAM

Sample Code:

```
void setup()
{
	Serial.begin(9600);
}
void loop()
{
	// read the input on analog pin A8:
	int sensorValue = analogRead(A8);

	Serial.println(sensorValue);
	delay(100);
}
```

8. Gas Sensor

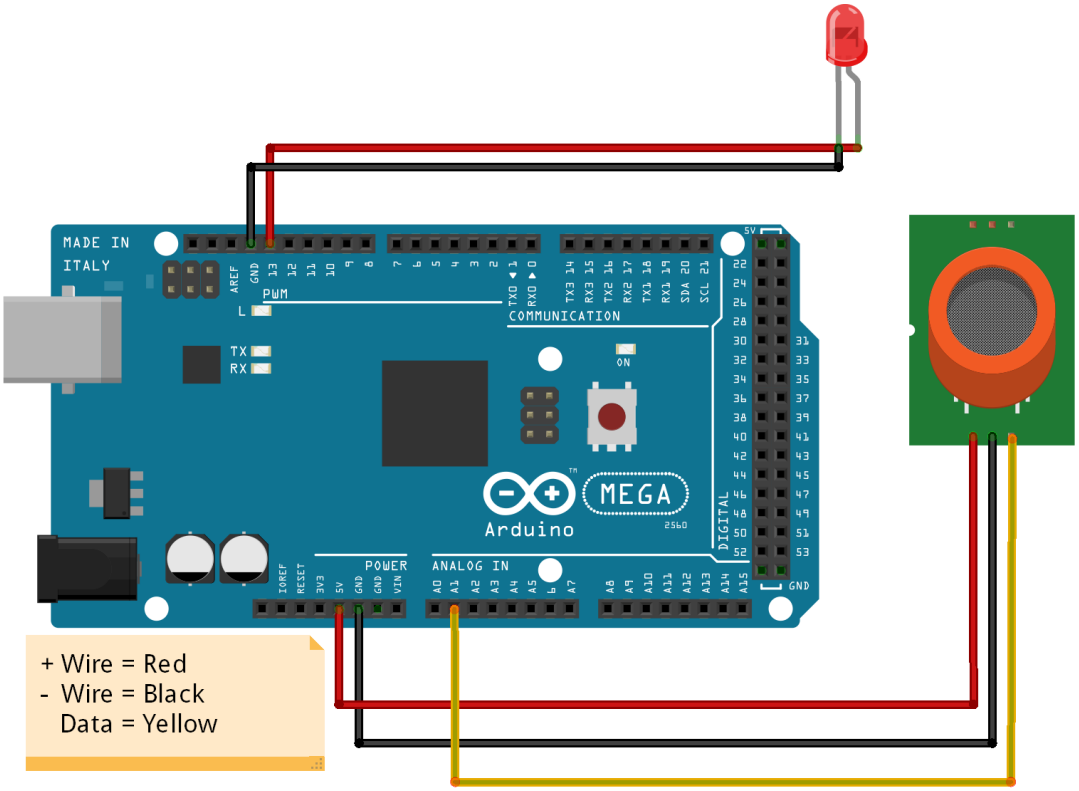


FIGURE 14: GAS SENSOR DIAGRAM

Sample Code:

```
const int analogInPin = A1;    // Analog input pin that the potentiometer is attached to
const int ledPin = 37;             // LED connected to digital pin 13
int sensorValue = 0;

void setup()
{
  Serial.begin(9600);
  pinMode(ledPin, OUTPUT);      // sets the digital pin as output
}

void loop()
{
   sensorValue = analogRead(analogInPin);

          // determine alarm status
          if (sensorValue >= 750)
          {
               digitalWrite(ledPin, HIGH);   // sets the LED on
          }
          else
          {
               digitalWrite(ledPin, LOW);    // sets the LED off
          }


           // print the results to the serial monitor:
          Serial.print("sensor = " );
           Serial.println(sensorValue);

           // wait 10 milliseconds before the next loop
          // for the analog-to-digital converter to settle
          // after the last reading:
           delay(10);
}
```

9. PIR Sensor

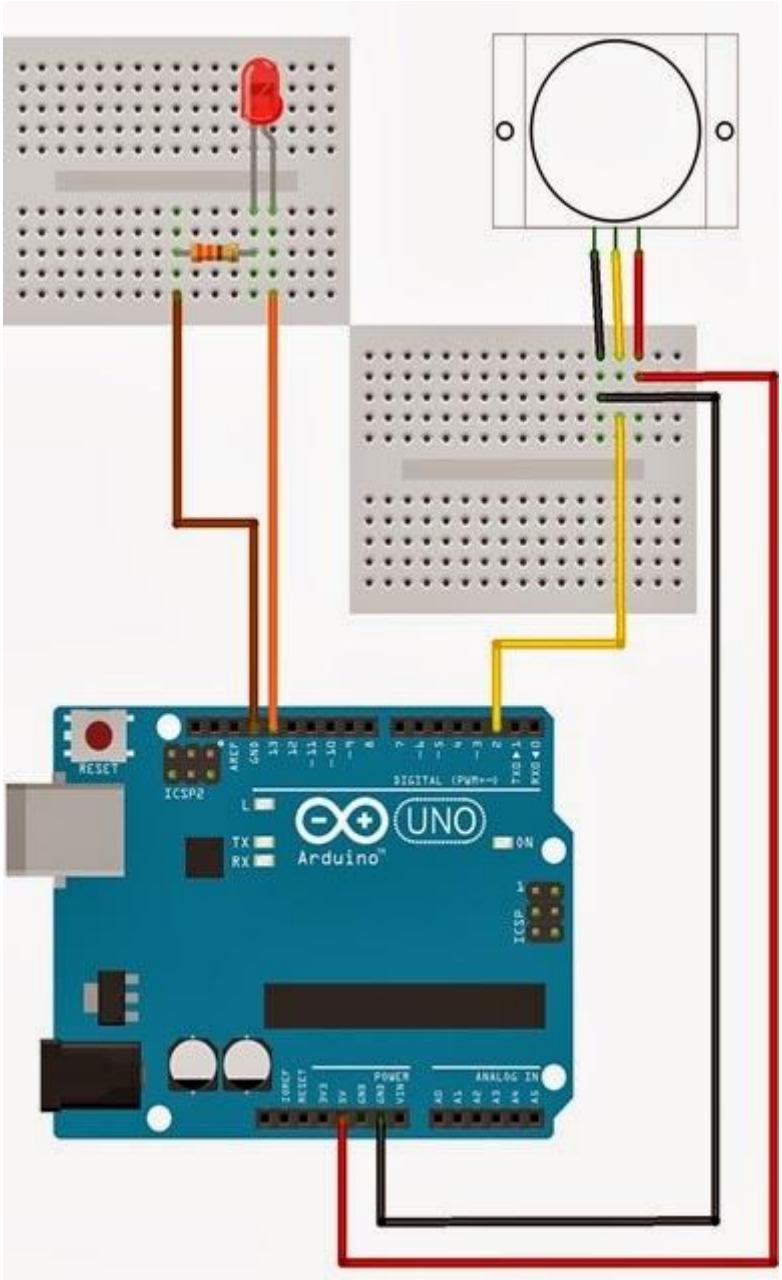


FIGURE 15: PIR SENSOR DIAGRAM

Sample Code:

```
int led = 13;                // the pin that the LED is atteched to
int sensor = 2;              // the pin that the sensor is atteched to
int state = LOW;             // by default, no motion detected
int val = 0;                 // variable to store the sensor status (value)

void setup()
{
  pinMode(led, OUTPUT);      // initalize LED as an output
  pinMode(sensor, INPUT);    // initialize sensor as an input
  Serial.begin(9600);        // initialize serial
}

void loop()
{
  val = digitalRead(sensor);   // read sensor value
  if (val == HIGH) {           // check if the sensor is HIGH
    digitalWrite(led, HIGH);   // turn LED ON
    delay(100);                // delay 100 milliseconds

    if (state == LOW) {
      Serial.println("Motion detected!");
      state = HIGH;            // update variable state to HIGH
    }
  }
  else {
      digitalWrite(led, LOW);  // turn LED OFF
      delay(200);              // delay 200 milliseconds

      if (state == HIGH){
        Serial.println("Motion stopped!");
        state = LOW;           // update variable state to LOW
    }
  }
}
```

10. Raindrop Sensor

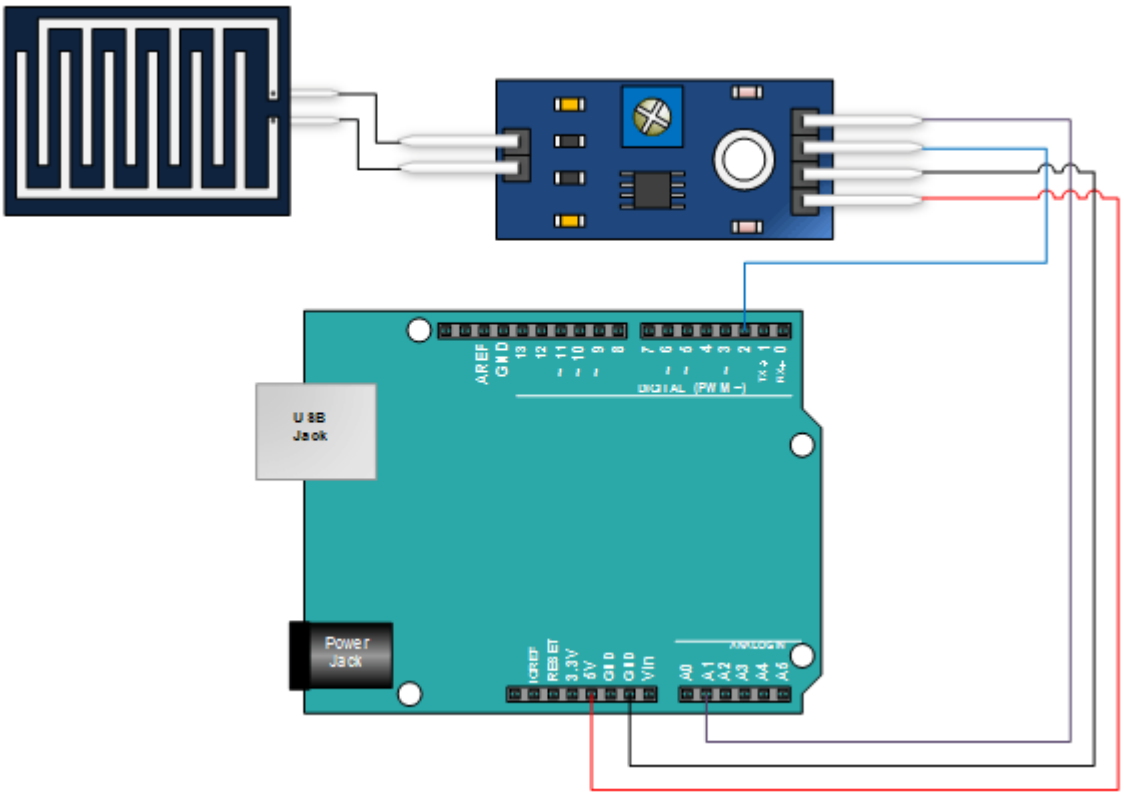


FIGURE 16: DRAINDROP SENSOR

Sample Code:

```
int nRainIn = A1;
int nRainDigitalIn = 2;
int nRainVal;
boolean bIsRaining = false;
String strRaining;


void setup()
{
        Serial.begin(9600);
        pinMode(2,INPUT);
}

void loop()
{
  nRainVal = analogRead(nRainIn);
  bIsRaining = !(digitalRead(nRainDigitalIn));

  if(bIsRaining)
  {
    strRaining = "YES";
  }
  Else
  {
    strRaining = "NO";
  }

  Serial.print("Raining?: ");
  Serial.print(strRaining);
  Serial.print("\t Moisture Level: ");
  Serial.println(nRainVal);
  delay(200);

}
```

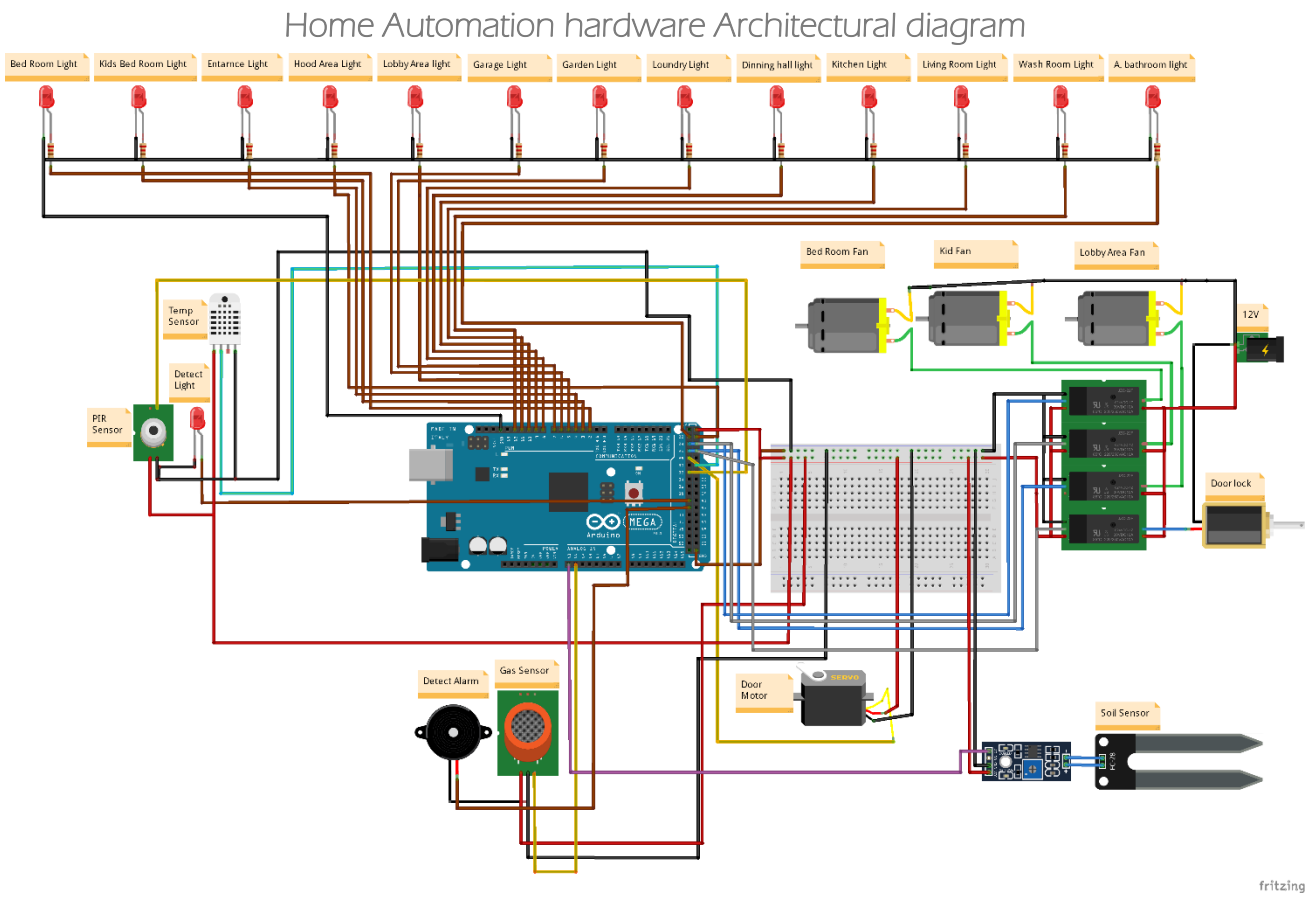


FIGURE 17: HOME AUTOMATION SYSTEM

Sample Code:

```
//Include libraries here for 2-Solid State Relay
#include<Wire.h>
#include <Servo.h>
#include <dht.h>

dht DHT;
Servo myservo;

int data;
int tempPin = 31; // Temp sensor pin is connected to ardiuno
int val;

#define RELAY_ON  0
#define RELAY_OFF 1
```

```
#define Relay_1   24    // arduino digital I/0 pin number might need to change
#define Relay_2   25
#define Relay_3   26
#define Relay_5   28
#define Relay_6   29
#define Relay_7   30
#define Relay_8   31

void setup() {

  Serial.begin(9600);
  myservo.attach(28);

  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(7, OUTPUT);
  pinMode(8, OUTPUT);
  pinMode(9, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(11, OUTPUT);
  pinMode(12, OUTPUT);
  pinMode(22, OUTPUT);
  pinMode(24, OUTPUT);
  pinMode(23, OUTPUT);
  pinMode(25, OUTPUT);
  pinMode(26, OUTPUT);
  pinMode(27, OUTPUT);
  pinMode(29, OUTPUT);
  pinMode(30, OUTPUT);
  pinMode(32, OUTPUT);
  pinMode(33, OUTPUT);
  pinMode(34, OUTPUT);

  digitalWrite(Relay_1, RELAY_OFF);
  digitalWrite(Relay_2, RELAY_OFF);
  digitalWrite(Relay_3, RELAY_OFF);
  digitalWrite(Relay_5, RELAY_OFF);
  digitalWrite(Relay_6, RELAY_OFF);
  digitalWrite(Relay_7, RELAY_OFF);
  digitalWrite(Relay_8, RELAY_OFF);
  digitalWrite(27, LOW);

}//end "setup()"
```

```
void loop() {

  //Start of Program
  DHT.read11(tempPin);
  //  Serial.print("Humidity: ");
  //  Serial.println(DHT.humidity);
  //delay(1000);
  //Serial.print("Temperature: ");
  Serial.println(int (DHT.temperature));
  //delay(1000);

  if (Serial.available())
  {
    data = Serial.read();
    if (data == 'A')
    {
      digitalWrite(22, HIGH);
    }
    else if (data == 'a')
    {
      digitalWrite(22, LOW);
    }
    else if (data == 'B')
    {
      digitalWrite(2, HIGH);
    }
    else if (data == 'b')
    {
      digitalWrite(2, LOW);
    }
    else if (data == 'C')
    {
      digitalWrite(3, HIGH);

    } else if (data == 'c')
    {
      digitalWrite(3, LOW);
    }
    else if (data == 'D')
    {
      digitalWrite(4, HIGH);
    }
    else if (data == 'd')
    {
      digitalWrite(4, LOW);

    }
```

```
 else if (data == 'E')
 {
   digitalWrite(5, HIGH);
 }
 else if (data == 'e')
 {
   digitalWrite(5, LOW);
 }
 else if (data == 'F')
 {
   digitalWrite(6, HIGH);

 } else if (data == 'f')
 {
   digitalWrite(6, LOW);
 }
 else if (data == 'G')
 {
   digitalWrite(7, HIGH);
 }
 else if (data == 'g')
 {
   digitalWrite(7, LOW);
 }
 else if (data == 'H')
 {
   digitalWrite(8, HIGH);
 }
 else if (data == 'h')
 {
   digitalWrite(8, LOW);
 }
 else if (data == 'I')
 {
   digitalWrite(9, HIGH);
 }
 else if (data == 'i')
 {
   digitalWrite(9, LOW);
 }
 else if (data == 'J')
 {
   digitalWrite(10, HIGH);
 }
```

```
else if (data == 'j')
{
  digitalWrite(10, LOW);
}
else if (data == 'K')
{
  digitalWrite(11, HIGH);
}
else if (data == 'k')
{
  digitalWrite(11, LOW);
}
else if (data == 'L')
{
  digitalWrite(12, HIGH);
}
else if (data == 'l')
{
  digitalWrite(12, LOW);
}
else if (data == 'M')
{
  digitalWrite(22, HIGH);
}
else if (data == 'm')
{
  digitalWrite(22, LOW);
}
else if (data == 'N')
{
  digitalWrite(23, HIGH);
}
else if (data == 'n')
{
  digitalWrite(23, LOW);
}
else if (data == 'O')
{
  digitalWrite(Relay_1, RELAY_ON);
}
else if (data == 'o')
{
  digitalWrite(Relay_1, RELAY_OFF);

}
```

```
else if (data == 'P')
{
  digitalWrite(Relay_2, RELAY_ON);
}
else if (data == 'p')
{
  digitalWrite(Relay_2, RELAY_OFF);
}
else if (data == 'Q')
{
  digitalWrite(Relay_3, RELAY_ON);
}
else if (data == 'q')
{
  digitalWrite(Relay_3, RELAY_OFF);
}
else if (data == 'R')
{
  digitalWrite(27, LOW);
}
else if (data == 'r')
{
  digitalWrite(27, HIGH);
}
else if (data == 'S')
{
  myservo.writeMicroseconds(180);
}
else if (data == 's')
{
  myservo.writeMicroseconds(1530);
}
else if (data == 'T')
{
  digitalWrite(29, HIGH);
}
else if (data == 't')
{
  digitalWrite(29, LOW);
}
else if (data == 'U')
{
  digitalWrite(30, HIGH);
}
```

```
    else if (data == 'u')
    {
      digitalWrite(30, LOW);
    }
    else if (data == 'V')
    {
      digitalWrite(31, HIGH);
    }
    else if (data == 'v')
    {
      digitalWrite(31, LOW);
    }
    else if (data == 'W')
    {
      digitalWrite(32, HIGH);
    }
    else if (data == 'w')
    {
      digitalWrite(32, LOW);
    }
    else if (data == 'X')
    {
      digitalWrite(33, HIGH);
    }
    else if (data == 'x')
    {
      digitalWrite(33, LOW);
    }
    else if (data == 'Y')
    {
      digitalWrite(34, HIGH);
    }
    else if (data == 'y')
    {
      digitalWrite(34, LOW);
    }
  }
}
```

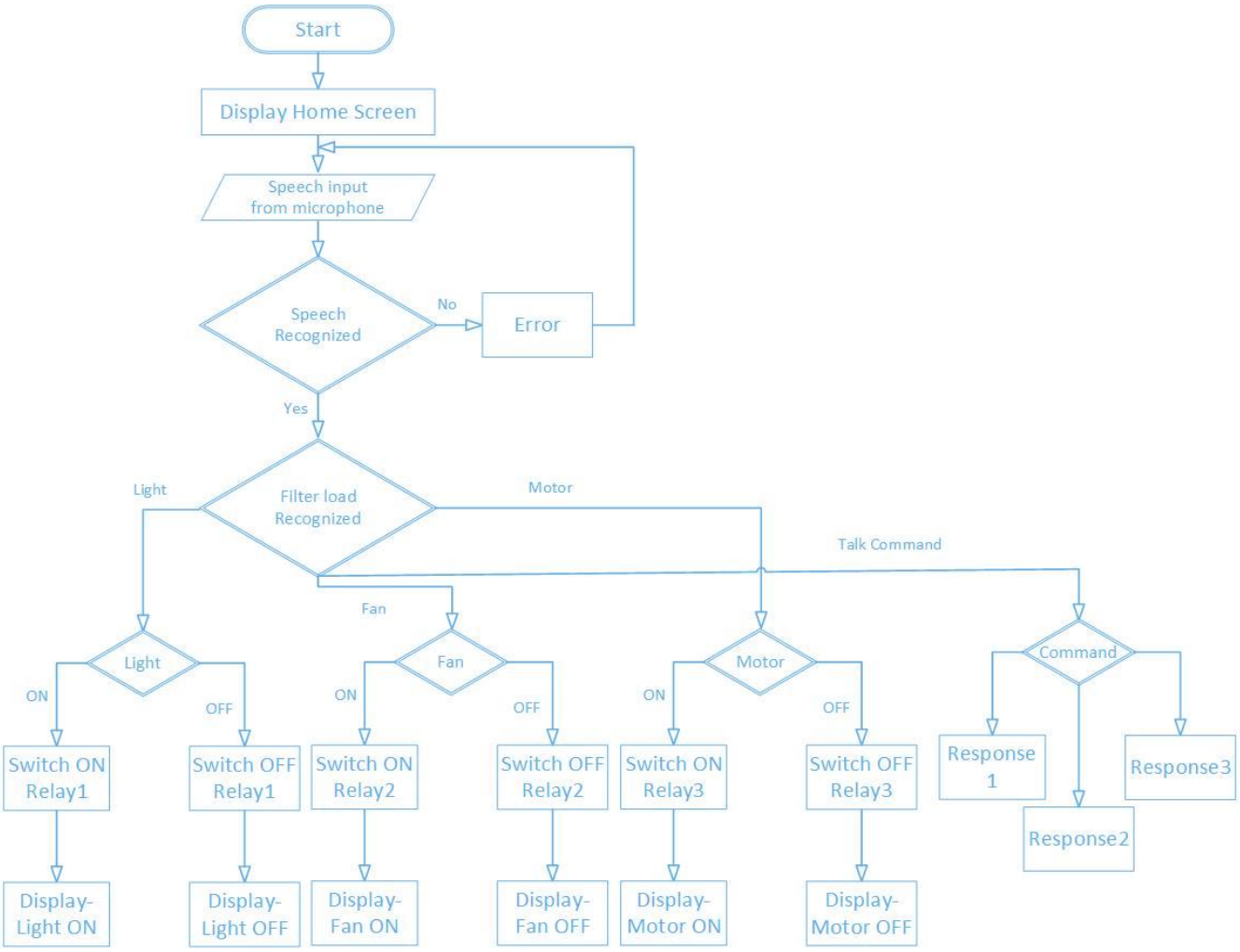


FIGURE 18: SYSTEM FLOWCHART

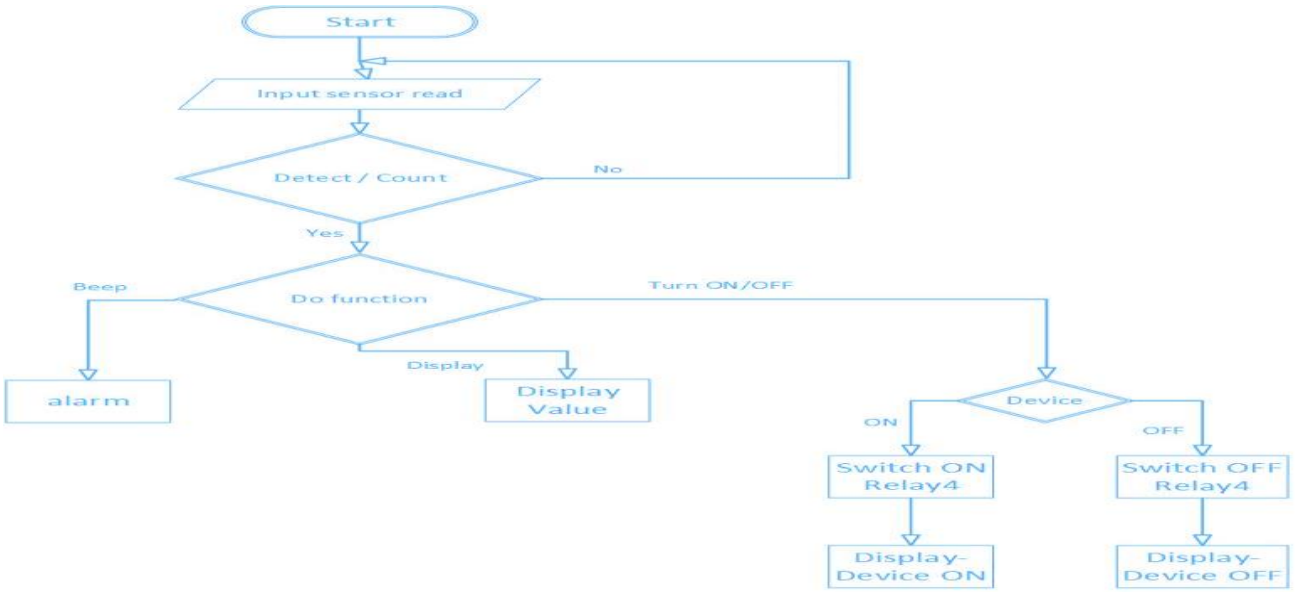


FIGURE 19: SENSOR FLOWCHART

Finally, I would say, how microcontroller controlling home appliance, it is based on the microcontroller signal, then Relay will get the signal and send the power to each particular device and print the message. This how system work in smart home automation.

Software Design

1. Splash Screen

FIGURE 20: SPLASH SCREEN

2. Home Screen

FIGURE 21: HOME SCREEN

3. Device Setting

FIGURE 22: LOGIN SCREEN

FIGURE 23: LOGIN SCREEN [II]

FIGURE 24: SETTING HOME SCREEN [III]

FIGURE 25: DEVICE STATUS

FIGURE 26: AUTO SETTING

FIGURE 27: CONFIGURATION

FIGURE 28: CONFIGURATION - ADD DEVICE

FIGURE 29: CONFIGURATION - EDIT DEVICE

FIGURE 30: CONFIGURATION - DELETE DEVICE

4. Command Setting

FIGURE 31: ADD COMMAND

FIGURE 32: ADD PROFILE

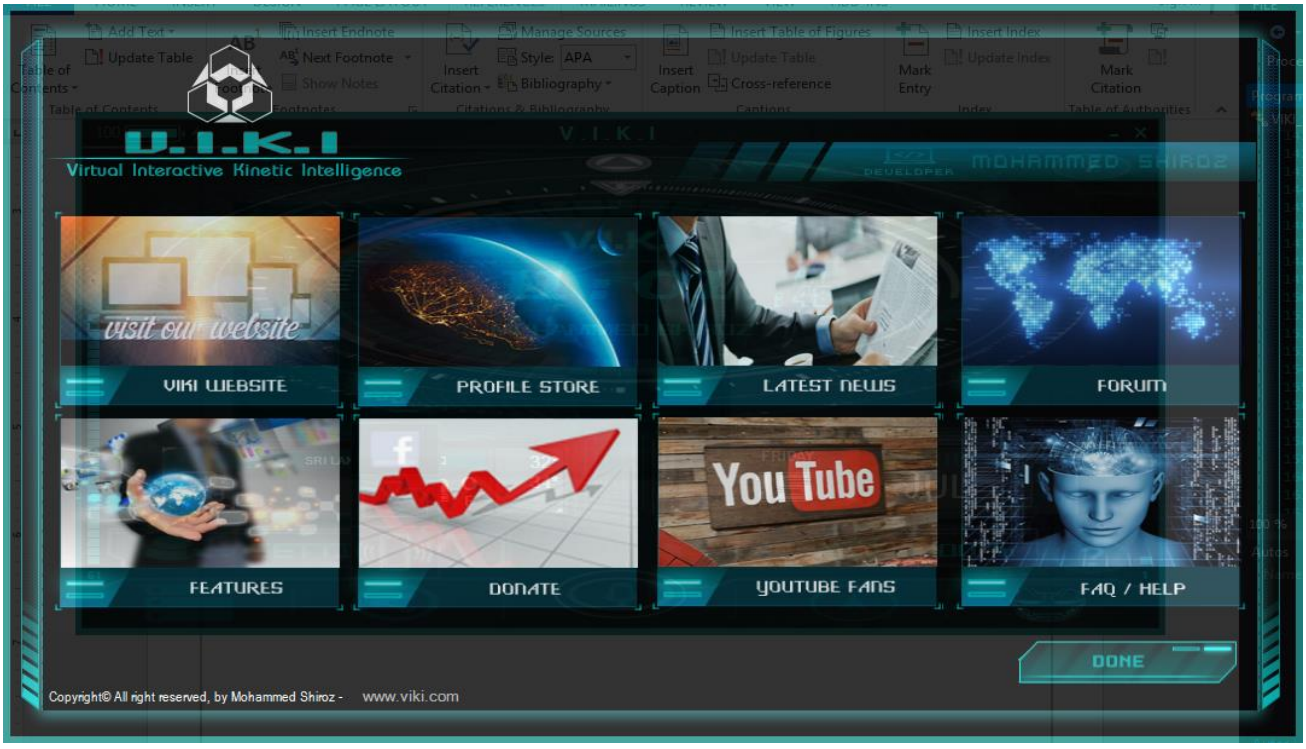


FIGURE 33: FAQ

FIGURE 34: DEMO VEDIO

FIGURE 35: SOCIAL SHARE

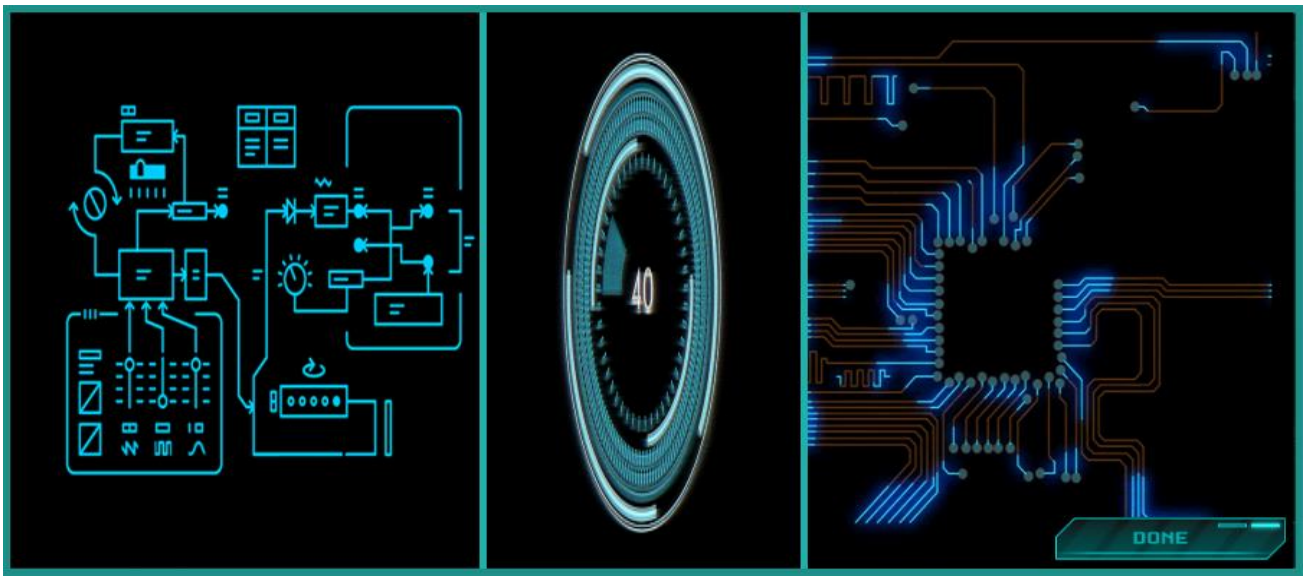


FIGURE 36: ELECTRICAL STATUS

CHAPTER 5: IMPLEMENTATION

Lots of work has already done in the field of Advance home automation. It helps to create more user friendly system. It is automation of the home, housework or household activity. In this Home automation may include centralized control of lighting, Fans, gate door, security lock and other appliance, and it has providing customizable setting (if applicable can add device), to provide improved convenience, comfort, energy efficiency and security.

Home automation is such a field where we always want the best and want the easiest one as it's our home. We look forward to a system to install in our home so that it's easily interfaced with our daily used devices. So this project has high scope of getting implemented in each and every house.

As time passes, visions of the future ultimately face reality. In computer history, the time scale of "yesterday's tomorrows" takes place on the exponential substrate of Moore's Law, giving predictions a half-life unknown in almost any other field.

Constantly, I would say, what are the steps took this project, while doing project;

Steps

1. Gather all requirements
    a. Order Device
    b. Collect wood, Nails, pipe, hooks, etc.
    c. Buy some sort of Form board, other board etc.
    d. Tools

2. Make Square box using wood.
3. Fix computer element into the box
4. Set Power code extension etc.
5. Planning & Drawing Sketch house blue print.

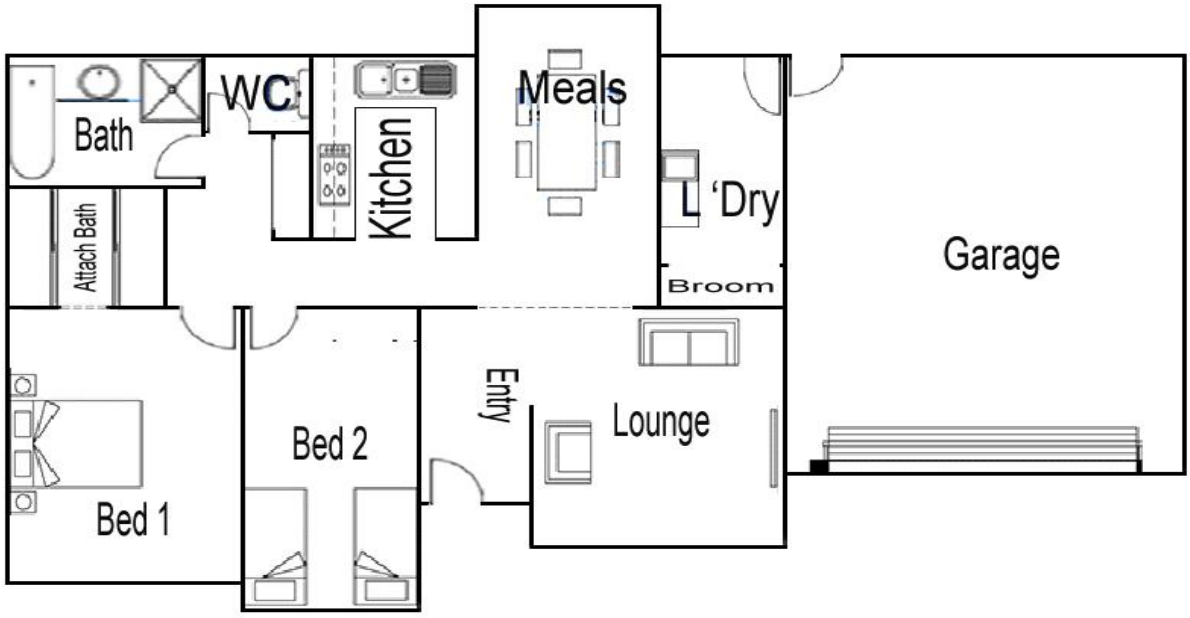


FIGURE 37: HOUSE BLUE PRINT

6. Applying to board
7. Cut the form board into small pies and apply that board.
8. Make Model House

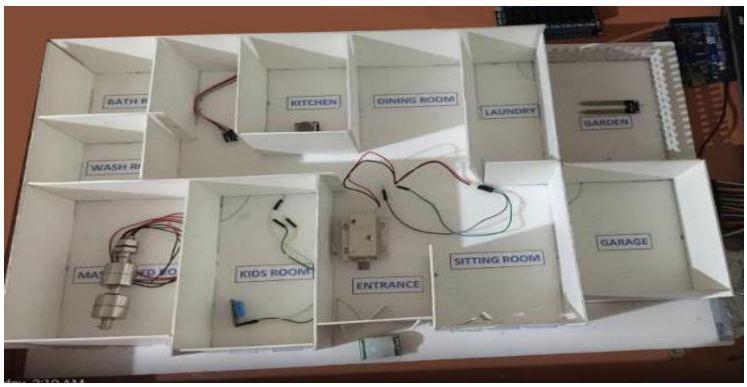


FIGURE 38: MODEL HOUSE

9. Wiring the house & apply device.
    a. Led
    b. Fan
    c. Sensor
    d. Motor
    e. Grouping wire.

10. Fix water automated system into box

11. Program all device into microcontroller using Arduino IDE.

FIGURE 39: ARUINO IDE

12. Program C# GUI Interface application using visual studio 2012 IDE. (V.I.K.I)

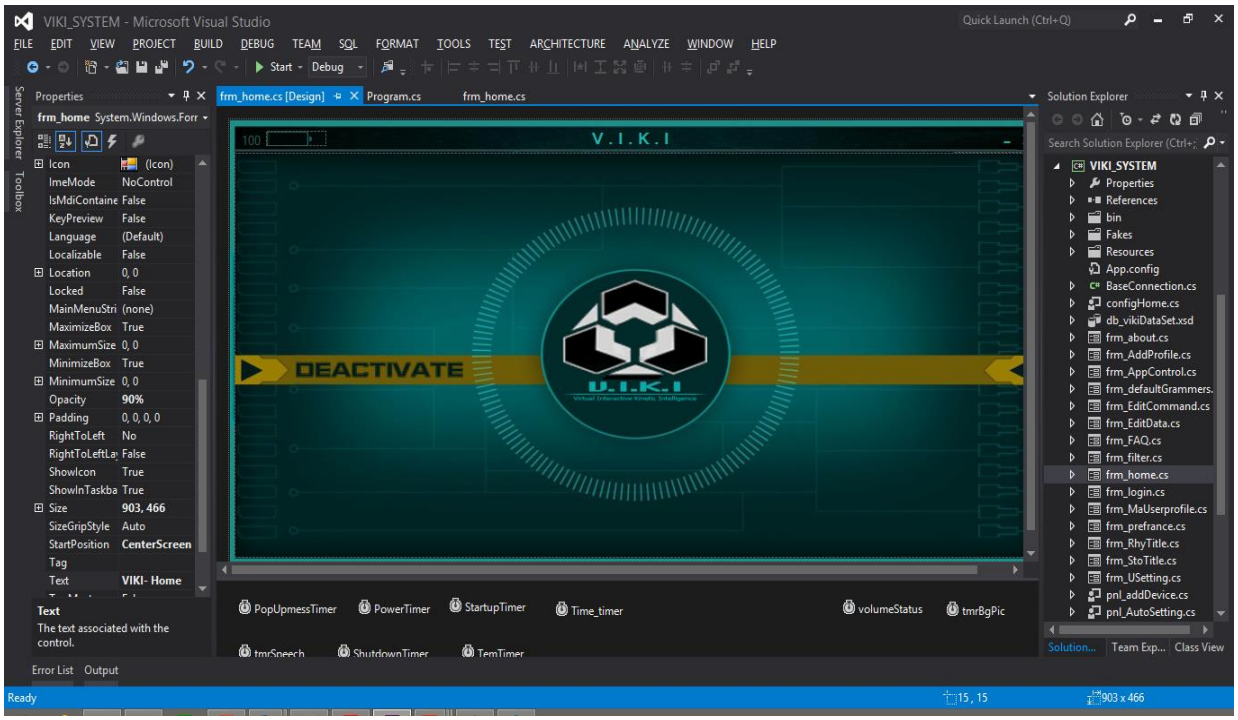


FIGURE 40: VISUAL STUDIO IDE

13. Configure all device into VIKI application.
14. Test
    a. Device Configuration
    b. Arduino microcontroller.
    c. Led
    d. Fan
    e. Sensor
    f. Sound & Voice

15. End the Project

Some system sample picture

FIGURE 41: MODEL HOUSE

FIGURE 42: FULL BOX BACK STRUCTURE

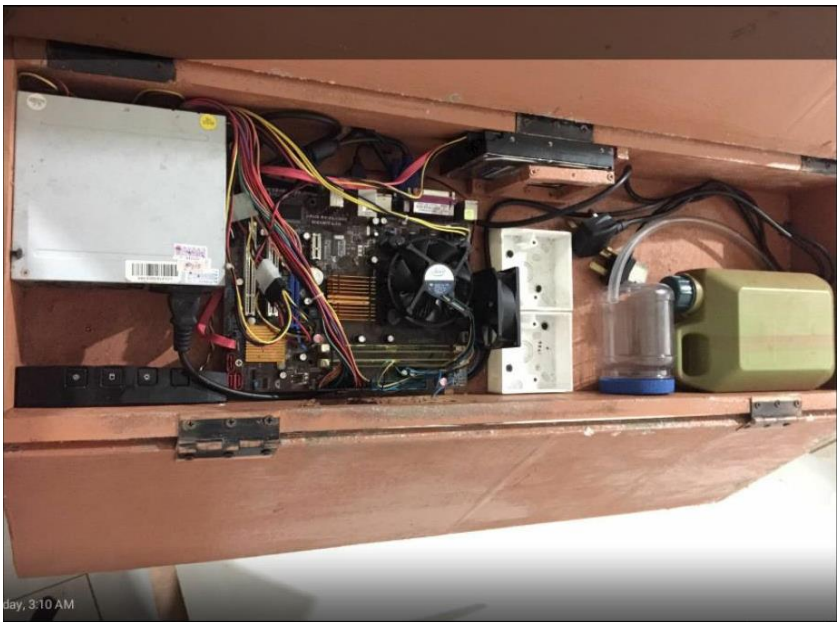


FIGURE 43: PC MODELING

Description of the software and components used

SOFTWARE

I. Visual Studio 2012 (IDE)
II. Arduino

HARDWARE

1) Arduino Mega

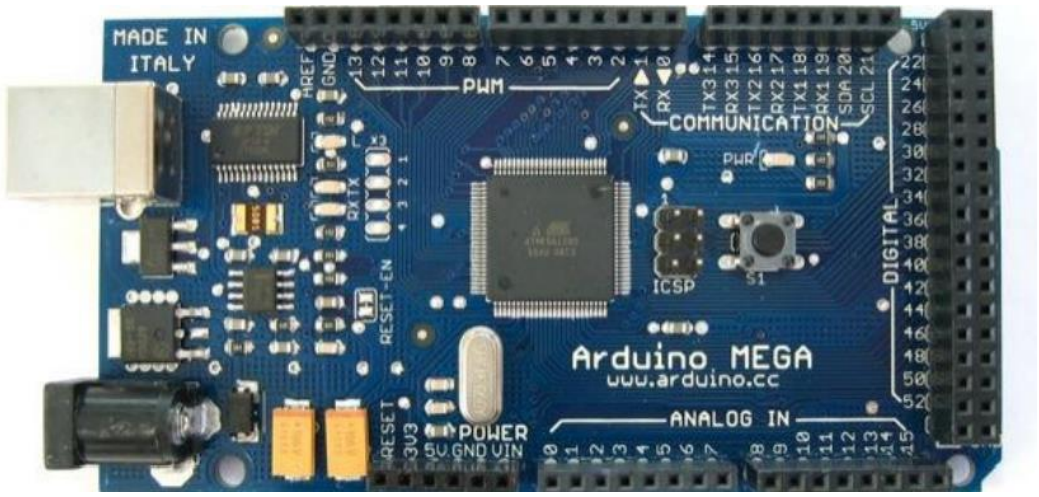


FIGURE 44: ARDUINO MEGA

Arduino MEGA Configuration

Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	54 (of which 15 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	128 KB of which 4 KB used by boot loader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz

TABLE 2: ARDUINO CONFIGURATION

Circuit Diagram

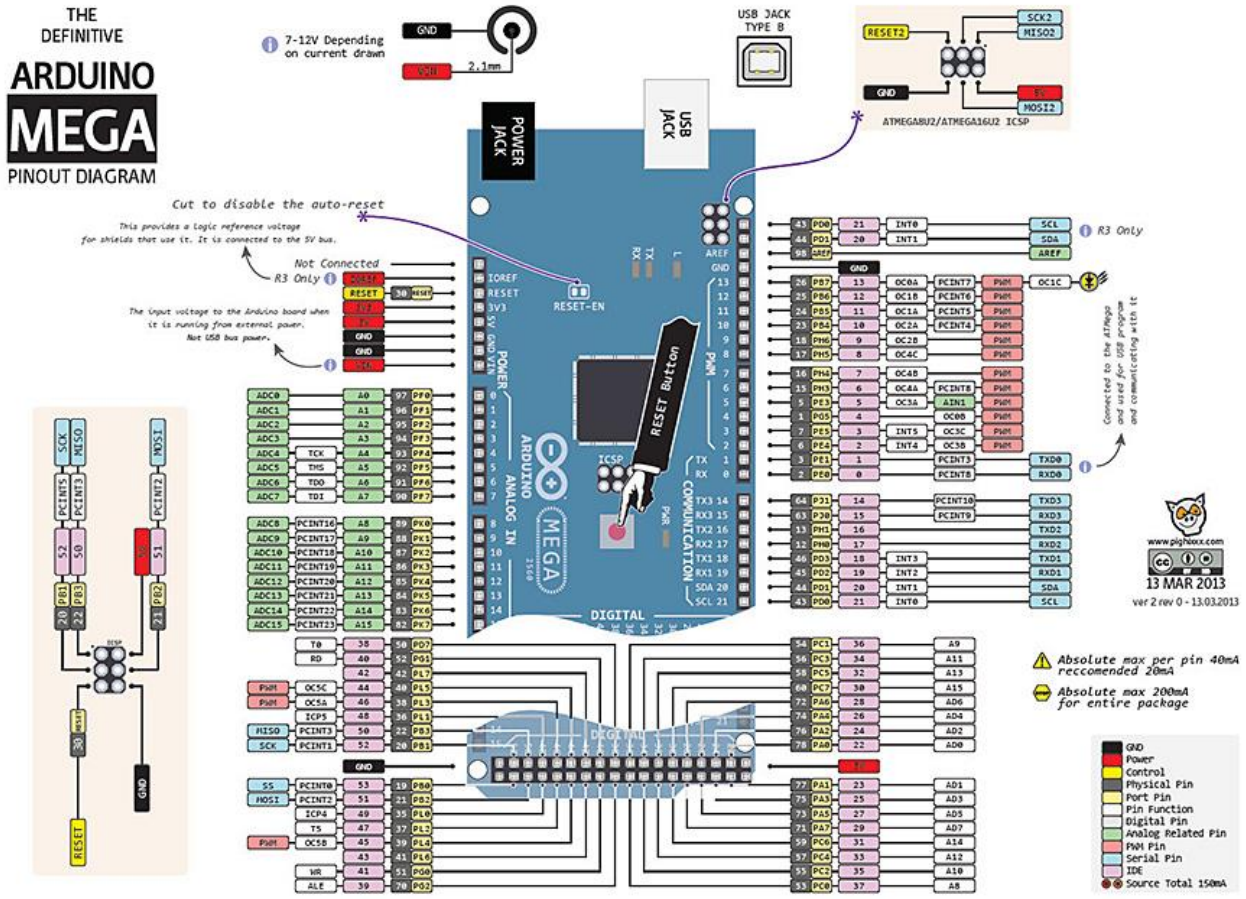


FIGURE 45: ARDUINO CIRCUIT DAIGRAM

Source: (LLC, 2016)

Description

Arduino is a device which can make computer more sensible and manageable comparison to physical world rather than desktop computer. It is very popular and easy to use Programmable board for creating projects as Arduino is an open source microcontroller based development board which develop environment for writing software for the board. It's also most common microcontroller board for advanced users and all kinds of more determined projects.

2. Relay

Relay Configuration

Channel	8
Control Voltage	5V
Static Current	0mA
Working Current	12.5mA
Trigger Voltage	0-1.5V
Trigger Current	2mA

TABLE 3: 8 SOLID STATE RELAY

Circuit Diagram

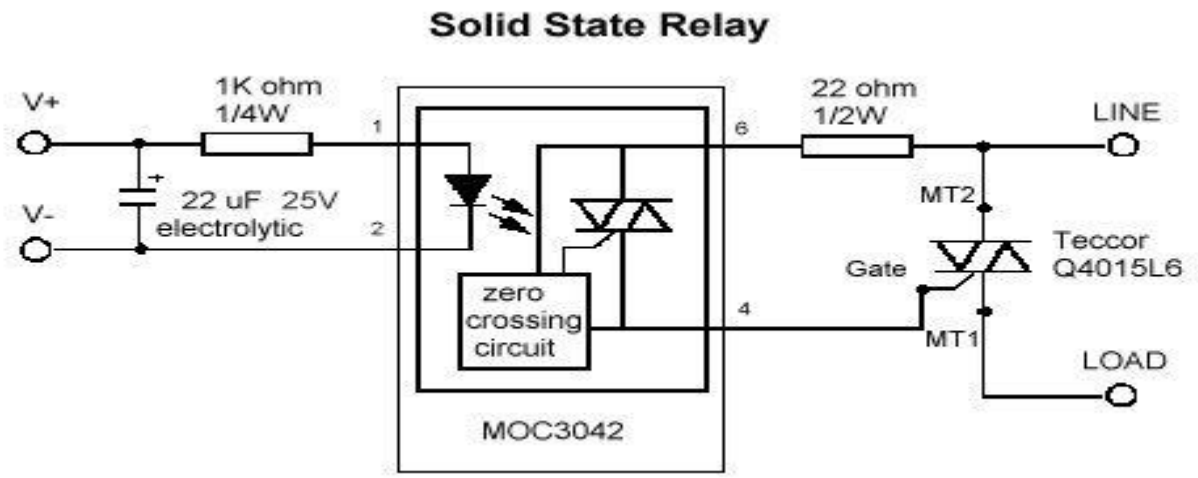


FIGURE 46: SOLID STATE RELAY DIAGRAM

Source: (www.galco.com, 2016)

Description

A relay is an electrical switch that opens and closes under control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. It was invented by Joseph Henry in 1835. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered, in a broad sense, to be a form of electrical amplifier.

A relay switch can be divided into two parts: input and output. The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage. Commonly used relays are available in different configuration of operating voltages like 6V, 9V, 12V, 24V etc.

Final word, this how smart home automation system project completed. Each steps are perfectly plan and execute until complete this project.

3. Temperature Sensor

FIGURE 47: TEMPERATURE SENSOR

Note: Calculate the house temperature and humanity.

4. PIR Sensor

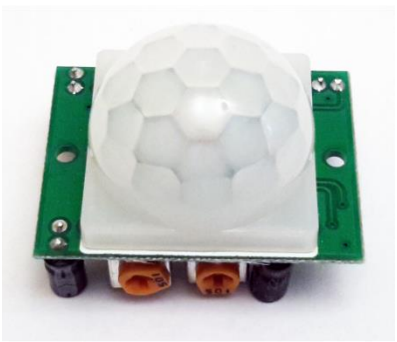


FIGURE 48: PIR SENSOR

Note: Detect the object when we show any object

5. Servo Motor

FIGURE 49: SERVO MOTOR

Note: To use for Open the Garage door

6. Soil Moisture Sensor

FIGURE 50: SOIL MOISTURE SENSOR

Note: Identify the soil moisture level

7. Gas Sensor

FIGURE 51: GAS SENSOR

Note: Detect the LPG Gas and alarming.

8. Raindrop Sensor

FIGURE 52: RAINDROP SENSOR

Note: To identify rainy status in outside.

9. Solenoid lock

FIGURE 53: LOCK

Note: Lock the door

10. Solenoid valve

FIGURE 54: VALVE

Note: Hold the water into the pipe (Cut off)

11. Flow Sensor

FIGURE 55: FLOW SENSOR

Note: Calculate the water flow

12. ‘Water pump

FIGURE 56: PUMP

Note: Pump the water

CHAPTER 6: TESTING

NO	Test Case	Expected Result	Test Result	Comments
SOFTWARE				
01	Input Voice command	Verify the command	Say error message.	The error must be caught and through as message.
02	login	Check username & password.	Verify Username & Password.	User can login if he or she enters existing data correctly. Otherwise user is not allowed to login and error message is shown and terminating system.
03	Add device Configuration.	Add device Configuration	Device need to add into database.	User can add device configuration.
04	Edit device Configuration.	Retrieve the database & Edit device Configuration.	Device need to edit & update into database.	User can modify the existing device configuration.
05	Delete device Configuration.	Retrieve the database & remove device Configuration.	Device need to remove form database & update setting.	User can delete the existing device configuration.
06	Check Currently available device	Retrieve the database data.	Need to display available device configuration.	User can check currently using device configuration..
07	Check the update	Go to VIKI website.	Update the system	
08	Add/ Edit/ Delete Command	Add /Edit/ Delete command into database.	Check the existing command & update system command database.	User can give instruction as command and response to VIKI.
09	Check Enable/ Disable Voice input	Listening Enable / Disable mode.	System need understand instruction.	User can controlling voice enable disable mode.

HARDWARE				
10	Recognize command	To Identify device pin & do the function.	Device ON/ OFF.	Check the device function working or not.
11	Check Temperature sensor	Detect the current temperature in room.	Do sensor activity.	To calculate room temperature.
12	Check PIR sensor	Detect the object.	Beep sound On.	To identify the new detect object.
13	Check Gas sensor	Detect gas smell.	Alarming & send message.	To identify the gas leak smell.
14	Check Rain drop sensor	Detect rain status.	Alarming & send message.	To identify the rain status in the outside.
15	Check Soil sensor	Calculating soil status.	Display Status	To measure the soil status.
16	Check solenoid	Lock and unlock	Lock and unlock	To use for lock or unlock the door.
17	Check the server motor	Open & Close the door	Open or Close	To open the door close the door
18	Check water level sensor	Measure the water level.	Water level	This use for control water tang water level.
19	Check solenoid valve	Identify the signal to open the water valve.	Open & Close the water level.	This use for controlling water cut off & cut on the water pipe.
20	Check water measure unit	Measure the water pumping	Count the water capacity.	To Count the water capacity in the tang.

CHAPTER 7: EVALUATION

The Advance Home automation is successfully implemented as best prototype. This project is mainly developed for those who want to live in smart home anywhere. In current system there is no chance to make like this smart home automation system. But in this system I can definitely say, it will be good for every one anywhere and any situation. I have taken the voice command input from microphone. This command is processed to recognize the speech. Based on the serial communication signal to microcontroller generates control signals for the relays which lead to many loads.

This working model has been tested on a variety of input patterns from people belonging to different age group, gender. Speech recognition system is very apt for the chosen words and identifies it efficiently with an overall success rate of 78.3%. The words used here are easy to speak and thus are used. Thus the drawback is eliminated. This work can be extended to controlling the light capacity as well as the fan speed. By using regulators and more controllers, the amount of current sent to the load can be controlled, thus we can dim or brighten a room using only speech.

In addition, Home owners can come to an ideal environment coming from their daily activities. Technique used in this system is not complex. In future many more features can be added in it like home appliances can be controlled by using server transferring voice control call by implementing more secure and efficient techniques. Which are some are the features given below.

1. **Security door lock system** - Set up unique entry codes for everyone in the house, or unlock the front door for someone even when we're not there to greet them. We can even open or close the garage door remotely.

2. **Home alarm system** –This system has GSM interface, so that we can get SMS alert from our home when the security fails. It will helps to protect from theft. The system has 1 motion sensor, 2 magnetic sensor for doors and 1 temperature sensor. The whole system is controlled by atmega8 microcontroller. It continuously reads the sensors and if any of the sensor fails then it will send an SMS to the house owner and will also buzzer will blow at the same time. Even we can use it as like our family has left for the day but forgot to lock the door or arm the system. We will receive an alert SMS and we can just easily lock up and activate our system from our smart phone.

3. **Security camera** – In this system we will get a notification and video recording will start anytime there is motion detected at our front door or take a snap shot so we can see who's knocking.

4. **Gas Detector** – The main object of this system is to perceive hazardous circumstances that could damage life, property and resources such as a fire, an explosion, a chemical spill or radiation. It will help to detect smoke and will send call to the owner's number at the same time. As well it automatically activates safety measures like, opening window turns on the exhaust fan and sprinkler.

5. **Mobile Application** – In case of controlling many appliances, like in hotels. We can go for mobile application, so that we don't need to memorize all the number of the all fans and lights. We just need to set all the appliances with specific icon in the mobile phone through mobile application. So when we need to control them, we just have to press the icon.

6. **Interfacing Lots Of Number** – If anything goes wrong and system need to alert me through SMS but system facing poor network. In this case we can adjust and save more mobile numbers, so that system can access many numbers at same time.

CHAPTER 8: CONCLUSION

Now-a-days home is equipped with various machineries and equipment's which provides various facilities to human life. Most used devices at home are electrical light, electric fan, air conditioner and refrigerator etc. These are to be controlled and operated by human beings. However this may not be possible all the time. Operator may not be at home and may be somewhere in a different place and if the necessity arises to control these home appliances there must be some source to control and monitor the home appliances. This necessity made the invention of new product which controls the home appliances.

I introduce a new mechanism call "Advance Home Automation System" as Voice Command Control using VIKI Application, which control home appliances and make our work easier. Home appliances controlling are using voice recognition software (V.I.K.I). Application creates a friendly environment to the user. When we look at the main advantages of this system is reducing power wastage saving time and also for security purposes. In this documentation I introduced a low cost, flexible solution to the home automation. The novel approach in this document discusses the migration of the initial control mechanism of devices with simple functionality to more complex devices which has not been discussed at this level before. The users are expected to acquire login and password to access to modify device configuration. This adds protection from unauthorized accesses. All these choices of devices were the least possible alternatives making the whole system a low cost solution to the home automation.

Upcoming Automation: Future will be of Automation of each and every single product. Each and every product will be smart devices that we use on a daily basis and that will be controlled through a smart chip called microcontrollers. All home appliances will be controlled either by PC or hand held devices like PDA or mobile handsets with high proficiency and efficiency. The project can be implemented in real life and very easy to install. Simplify project and deployment is also the aim of the project. Improving life style and saving money and energy is most desirable objective of this work. Reliability is the vital factor for why choosing our project as we are dependent of the two most reliable thing laptop and mobile phone for our system 24/7 working, since we are under network tower. No risk, as no shocking hazard. Hereby we come to an end of our project "ADVANCE HOME AUTOMATION SYSTEM". This project can be used anywhere either at home or offices. This is also cost efficient. Thus by this attempt of ours the ON/OFF processes of many devices was successfully carried out by just using two separate methodologies.

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