

## Arduino Aided Design And Programming Of Home Automation System

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### ABSTRACT

In recent times, it is obvious that everything is getting automatic and smarter. It is time to make our homes smarter and automated. We have limited resources which are mostly used during our chores in our household. In essence, now is the time to utilize our resources thriflily. This will effect switching of inhouse ac lines using relays. This work controls the switching of the relays using ATMEGA microcontroller via the Arduino platform. To be able to effectively monitor and control multiple switches remotely using a smart phone interfaced with the Arduino through a Bluetooth module. This system consist of a automated water pump, doors automation with password protected lock, anti-theft security, water tap and shower, light and primary fire protection using various sensors like LDR, IR, pressure, smoke, heat & object sensors controlled by mainly microcontroller. The goal of this system is to make our life more easy and safe as well as to save our resource and power.

Keyword: Programming, Bluetooth Module, Home Automation System, Arduino, microcontroller

### INTRODUCTION

Home automation is building automation for a home, called a smart home or smart house. A home automation system is designed to control the following; climate, lighting, appliances and entertainment systems. It can also control home security systems such as access control and alarm systems. At the pointing of connection to the internet, home devices are very necessary constituent of the Internet of Things ("IoT"). A home automation system connects the controlled devices to a central hub. The user interface which controls the system using a mobile phone application, wall-mounted terminals, a Web interface or tablet or desktop computers, which can also be accessed off-site by the use of the Internet.

In as much as there exist many competing vendors, there exist very few industry standards accepted worldwide and the smart home space is thereby heavily fragmented. It has also being observed that manufacturers often obstruct independent implementations by keeping away documentation and also by litigation.

The home automation market was observed to worth US \$5.77 billion in 2013, also predicted to reach US\$12.81 billion market value by the year 2020.

### EQUIPMENT REQUIRED FOR THE PROJECT

1. 12 volt / 40 amp DC relay
2. BC 547
3. IN4007
4. Resistors: 10k, 1k
5. 12 volts / 2 amp AC to DC adapter
6. Arduino board ( uno or nano )
7. Bluetooth module
8. Connectors
9. Imm cable 1 yard

10. Vero board
11. Soldering iron and lead
12. Lamp holders and lamps
13. Jumper wires

## METHODOLOGY

### WORKING PRINCIPLE OF THE AUTOMATED HOME SWITCHING SYSTEM

The relays are connected to a 12 volts DC supply and serve as switches for an external AC powered circuit. The relays however should be subject to some kind of control, therefore they are connected to BC 547 transistors which work as switches to complete the circuit thereby triggering the relays. To incorporate the control functionality into the system, the switching of the transistors is enabled by the Arduino. Powered by a 12 volts DC supply, the Arduino provides a 5 volt supply that passes through a 10k resistor and gives a base current just suited to bias the transistor.

The circuit diagram of is shown below:

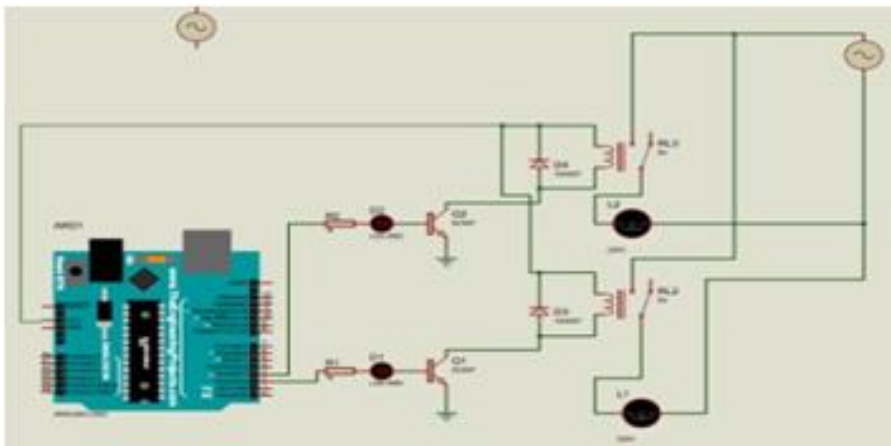


Fig 1.0: circuit diagram of home automation system

When the transistor switches, the relay in turn switches and the AC supply line is completed. The microcontroller on the Arduino is programmed with a code that allows it to control the overall switching of the circuit. The code is shown below:

```
#include <EEPROMh>
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String inputs;

#define relay1 2 //Connect relay1 to pin 9
#define relay2 3 //Connect relay2 to pin 8
#define relay3 4 //Connect relay3 to pin 7
#define relay4 5 //Connect relay4 to pin 6
#define relay5 6 //Connect relay5 to pin 5
#define relay6 7 //Connect relay6 to pin 4
```

```
#define relay7 8 //Connect relay7 to pin 3

#define relay8 9 //Connect relay8 to pin 2

void setup()
{
  Serial.begin(9600); //Set rate for communicating with phone

  pinMode(relay1, OUTPUT); //Set relay1 as an output
  pinMode(relay2, OUTPUT); //Set relay2 as an output
  pinMode(relay3, OUTPUT); //Set relay1 as an output
  pinMode(relay4, OUTPUT); //Set relay2 as an output
  pinMode(relay5, OUTPUT); //Set relay1 as an output
  pinMode(relay6, OUTPUT); //Set relay2 as an output
  pinMode(relay7, OUTPUT); //Set relay1 as an output
  pinMode(relay8, OUTPUT); //Set relay2 as an output

  digitalWrite(relay1, LOW); //Switch relay1 off
  digitalWrite(relay2, LOW); //Switch relay2 off
  digitalWrite(relay3, LOW); //Switch relay1 off
  digitalWrite(relay4, LOW); //Switch relay2 off
  digitalWrite(relay5, LOW); //Switch relay1 off
  digitalWrite(relay6, LOW); //Switch relay2 off
  digitalWrite(relay7, LOW); //Switch relay1 off
  digitalWrite(relay8, LOW); //Switch relay2 off
}

void loop()
{
  while(Serial.available()) //Check if there are available bytes to read
  {
    delay(10); //Delay to make it stable

    char c = Serial.read(); //Conduct a serial read

    if (c == '#'){

      break; //Stop the loop once # is detected after a word

    }
  }
}
```

```
inputs += c; //Means inputs= inputs+ c
}

if (inputs.length() >0)
{
    Serial.println(inputs);
    if(inputs == "A")
    {
        digitalWrite(relay1, LOW);
    }
    else if(inputs == "a")
    {
        digitalWrite(relay1, HIGH);
    }
    else if(inputs == "B")
    {
        digitalWrite(relay2, LOW);
    }
    else if(inputs == "b")
    {
        digitalWrite(relay2, HIGH);
    }
    else if(inputs == "C")
    {
        digitalWrite(relay3, LOW);
    }
    else if(inputs == "c")
    {
        digitalWrite(relay3, HIGH);
    }
    else if(inputs == "D")
    {
```

```
digitalWrite(relay4, LOW);  
}  
else if(inputs == "d")  
{  
digitalWrite(relay4, HIGH);  
}  
else if(inputs == "E")  
{  
digitalWrite(relay5, LOW);  
}  
else if(inputs == "e")  
{  
digitalWrite(relay5, HIGH);  
}  
else if(inputs == "F")  
{  
digitalWrite(relay6, LOW);  
}  
else if(inputs == "f")  
{  
digitalWrite(relay6, HIGH);  
}  
else if(inputs == "G")  
{  
digitalWrite(relay7, LOW);  
}  
else if(inputs == "g")  
{  
digitalWrite(relay7, HIGH);  
}  
else if(inputs == "H")
```

```
{
digitalWrite(relay8, LOW);
}
else if(inputs == "h")
{
digitalWrite(relay8, HIGH);
}
inputs="";
}
}
```

The Arduino is controlled remotely with a device (smart phone) which interacts with the Arduino via a Bluetooth module. On the device is an application that is adapted to function with the Arduino source code. The application and the source code were developed courtesy of Bee Project (Thailand).

#### **APPLICATION OF HOME AUTOMATION SYSTEM**

The entire home automation system affords the user the convenience of controlling power supply to individual appliances in the home by merely pressing a button on a smart phone. It eliminates the stress of manual switching but still accommodates manual switches if necessary.

- On a larger scale, systems requiring controlled switching for motors, machines, process plants etc. can be automated and even time-controlled switching can be implemented.
- Also, monitoring and control of such systems remotely can be achieved for much wider ranges by replacing the Bluetooth module with a wifi module.
- Heating, Ventilation and Air Conditioning (HVAC): Home energy monitors can be controlled with a remote control over the internet by incorporating it in a simple user interface which is simple.
- Lighting Control System: This is a "smart" network that uses one/more central computing devices to house the communication between the various lighting system inputs and outputs.
- Occupancy-Aware Control System: This can use smart meters and environmental sensors such as CO<sub>2</sub> sensors, in sensing the occupancy of the home which can be accommodated into the building automation system to activate automatic responses for building comfort applications and energy efficiency.
- Home Robots and Security: Additional services can be provided by a household security system linked to a home automation system. Such additional services can be remote surveillance of security cameras over the Internet, or access control and central locking of all the perimeter doors and windows.
- Leak detection, smoke and CO detectors

#### **CONCLUSION**

Our aim for this research is to assist the human race especially for the elderly and physically challenged people that deserve the opportunity to leave a normal life without any setback due to their situation. We also wish to save our energy. This paper is intended to provide a basic idea of how various home appliances can be controlled automatically.

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