

Low Cost Arduino Based Energy Efficient Home Automation System with Smart Task Scheduling

K. Raju, L. Shanmukha Rao



Abstract: home automation or smart home industry has been grown rapidly over the last few years and also it will ne continued in future due to its various benefits and demand in the market. In this paper a hardware of home automation system is presented that is inexpensive than available similar products in the market. The home automation system is developed that consisting of ultrasonic sensors, Arduino UNO, relay coil and connects controlled devices to a central hub or "gateway". It is efficient in operation, reduces the energy in operation and reduces the energy utilization with less maintenance cost.

Keywords: Ultrasonic sensor, Arduino UNO, Relay coil, Two-way Switch.

I. INTRODUCTION

Now a days, home automation has become one of the extremely attractive areas that plays an important role in day to day life. Different applications were developed under home automation scheme such as Appliance control and integration, Lighting control system, Leak and smoke detection, Security, Home automation for the elderly and disabled etc. Over a decade home automation market is increased at a faster rate throughout the world. With the use of large number of appliances the demand energy is increasing and the energy use must be optimized to reduce carbon dioxide emissions. From the last ten years, the usage of information technology in different sectors is increased rapidly which includes Home Appliances industry, Communication, Real Estate and many organizations within IT. The appliances used and energy consumed is different for different industries. The main goal of home automation system is to provide family with various services and applications in order to make family life enjoyable, comfortable, convenient and secure. The home network is limited to your home which provides home automation service with wire or wireless network equipment including household electric appliances such as refrigerator, microwave oven, A/V equipment, electric lamp etc. based on power line communication.

In the proposed architecture we have try to develop a home automation system consisting of ultrasonic sensor, arduino

UNO and relay coil that can perform similar operations to the existing products at significantly low cost.

Through the sensor an object entering and leaving the room is sensed and the information is send to the arduino UNO which send signal to the relay coil for further course of action.

II. RELATED WORK

David N. et al., [1] using Android based smart phone, home control and monitoring system architecture is proposed and implemented. It uses the micro web server and Bluetooth combo for communicating remote user and home appliance. Pandya B. et al.,[2] discuss the design and benefits of Smart Home Automation System. It uses Bluetooth as main communication device, hence it is wireless and flexible. It has unique feature for smart speech sense, which would decode users' sentences into appropriate commands.

Dmello A. et al.,[3]proposed a system which uses mobile phone as inbuilt facility for automation. This paper outlines different hardware and software units. Using C language, the complete software is developed.

Teymourzadeh R. et al., [4] by using mobile phone and GSM Modem, a home automation system is designed and a message is sent from the user mobile phone to GSM model as a text message using mobile network.

Gill K. et al.,In [5] Proposed and implemented a home automation system using new communication technology ZigBee. It minimizes the cost of the installation and cost of the system. The home network is limited to your home which provides home automation service with wire or wireless network equipment including household electric appliances such as refrigerator, microwave oven, A/V equipment, electric lamp etc, based on power line communication and camera based on UPnP.

Naresh Kumar and Praveer Singh [6]proposed architecture of Economical Home Automation System using Arduino. The appliances in the home are controlled from mobile phone which is connected to the Arduino through Bluetooth.

III. PROPOSED WORK

In the proposed architecture we have tried to develop a home automation system consisting of ultrasonic sensor, Arduino UNO and relay coil that can perform similar operations to the existing products at significantly low-cost home automation system typically connects controlled devices to a central hub or "gateway". The user interface for control of the system uses wall-mounted terminals, tablet or desktop computers, a mobile phone application, or a Web interface, that may also be accessible off-site through the room. That data sends to the Arduino.

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The sensors having four pins Trig pin, echo pin, power supply pins. The trig pin is the output pin and the echo pin is input pin to the Arduino. The signals releases by the trig pin. When any object is identified then the signal reflects back to the echo pin and sends signal to the Arduino. According to collected data, appliances are operated. When compared with PIR and IR proximity sensor the ultra-sonic sensor works very accurately and fast action. Also we can change its speed of action of calculation by programming. But other infrared sensors action should have to be controlled by manually.

Arduino board: Arduino is the micro controller which is operated according to the program which is inserted in the memory of the board. The components all connected to the Arduino are operated according to the program. Then the Arduino gives power supply to them also. The memory capacity is based on the selected board.

Relay: Relay is the heart of this project. It only switches the appliances. The relay can turn on the load up to 250v,10A range. It is the only actuator which can switch up to 250V. When the object detected by the sensor then the Arduino sends signal to the relay. Then, the relay switches ON or OFF the appliances according to the collected data.

Two way switch: The two way switch is given for manual operation. When the device switches on the appliance then we can switch it off by two way switch.

Operation: When object or person enters the house, the ultrasonic sensor senses the object and it sends signal to the Arduino. Arduino will send signal to the relay coil which switches ON the light. Similarly, when a person leaves the house ultrasonic sensor senses and sends signal to the Arduino which switches OFF the light. The same concept can be implemented for all the appliances at home. It can be controlled from remote location using Wifi module also. This proposed home automation system uses 9v battery and Arduino consumes very less energy.

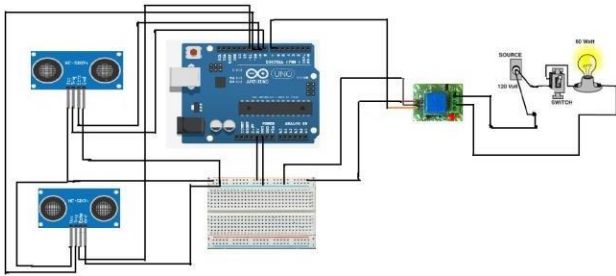


Fig 1. Hardware setup for home automation using arduino UNO

Home Automation using Arduino UNO Program

```
#define trigPin 8
#define echoPin 9
#define led 13
#define trigPin2 10
#define echoPin2 11
void setup() {
  Serial.begin (9600);

  pinMode(trigPin,
  OUTPUT);
  pinMode(echoPin,
  INPUT);
  pinMode(trigPin2,
```

```
OUTPUT);
  pinMode(echoPin2,
  INPUT); pinMode(led,
  OUTPUT);
}
void loop() {
  long duration, distance;
  digitalWrite(trigPin,
  LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin,
  HIGH);
  // delayMicroseconds(1000);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration =
  pulseIn(echoPin,HIGH);
  distance = (duration/2) /29.1;

  if (distance >= 200 || distance
  <=0){ Serial.println("Out
  ofrange");
  }
  else {
  Serial.print(distance);
  Serial.println(" cm");
  }
  delay(500);

  long duration2, distance2;
  digitalWrite(trigPin2,
  LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin2,
  HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin2,
  LOW);

  duration2 = pulseIn(echoPin2, HIGH);
  distance2= (duration2/2) / 29.1;
```

```
if (distance2 >= 500 || distance2 <=
  0){ Serial.println("Out of range");
  }
  else {
  Serial.print("Sensor2
  ");
  Serial.print(distance2);
  Serial.println("cm");
  }
  }
  if (distance < 4)
  {
```

```

if (distance2 < 4)
{
digitalWrite(led,HIGH);
}
}
else if (distance2 <4)
{
digitalWrite(led,LOW);
}
}

```

IV. CONCLUSION

Table 1: Price of Components Used

Components	Price(in Rupees)
Ultrasonic Sensor	160/-
Arduino UNO	450/-
Two Channel Relay Coil	150/-
Other Components(jumper cables, Bread Board, etc..)	150/-
Total Cost	910/-

The Arduino UNO based home automation system is cheap in cost, efficient in operation and reduces the energy bill when compared with conventional operation. The home becomes smart home and it minimizes the maintenance cost.

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