

Kathmandu University

Department of Computer Science and Engineering

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COMP[306]

A Report on 'Lab Work 3'

Home Automation System

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Qlab3

1. Using microcontroller, half adder, full adder, and logic gates, choose any one of the following and simulate using Proteus Simulation Software.

- ***Home automation System:*** *Design a home automation system using an embedded system. Use sensors and actuators to control various home appliances such as lights, fans, and doors. Implement the control logic using a microcontroller and simulate the system in Proteus.*

Objective:

To Design a Home Automation System

Components Required:

- Logic-state
- Arduino Uno
- Sensors
 - a. DHT11
 - b. MQ-2
 - b. PIR sensor
 - d. LDR sensor
- Output Devices
 - a. LM016L – 16 X 2 Alphanumeric LCD
 - c. LED
 - b. MOTOR
 - d. BUZZER
- Virtual Terminal
- Components
 - a. NPN Transistor
 - b. Relay
 - c. Grounds
 - d. Power
 - e. Resistors
 - f. wire)

Logic:

This home automation system works on the works based on some logic which are given below:

- If the temperature of the room exceeds 30 degrees Celsius, the fan will automatically turn on and conversely, when the temperature falls below 30 degrees, the fan will automatically turn off.
- If the LDR sensor values drop below 60 (Simulating nighttime), the bulb will automatically turn on and if it is greater than 60, bulb will automatically turn off.
- If the Gas sensor detects any smoke, it will automatically turn on the buzzer and notify the user.
- If any motion is detected by the motion sensor, it will automatically notify the user.
- All of the outputs will be displayed on the output terminal and LCD for the user's convenience.

Circuit Diagram and Screenshots

The following circuit diagrams are exported from proteus simulation:

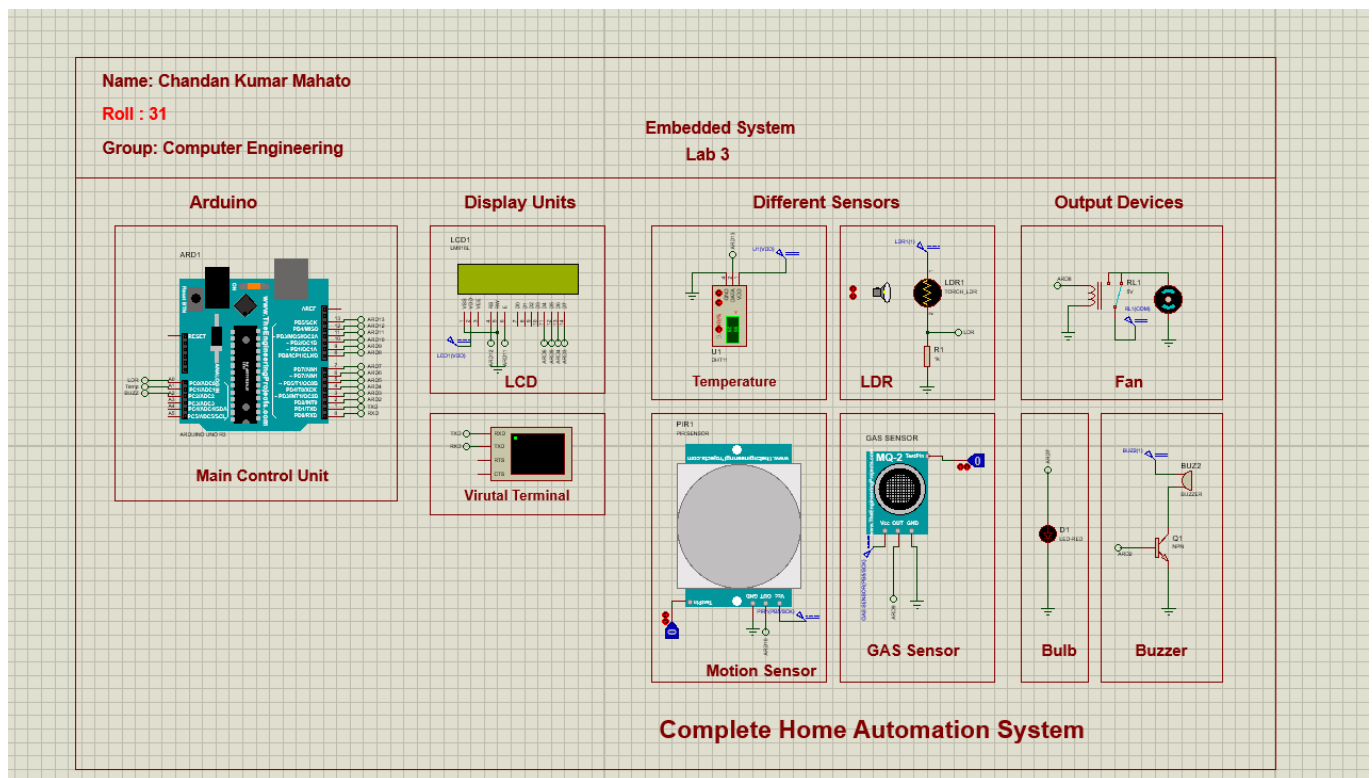


Fig: Overall Circuit diagram

Source code for Arduino

```
#include <LiquidCrystal.h>
#include <DHT.h>
DHT dht(13,DHT11)
const int rs = 12, en = 11, d4 = 6, d5 = 5, d6 = 4, d7 = 3;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

int GasSensor = 9;
int ledPin = 7;
int fan = 8;
int buzzer = 2;
int LdrSensor = A0;
int TempSensor = 13;
int PIRSensor = 10;
int pirState = LOW;
int gasState = LOW;
```

```
int val = 0;
int val1 = 0;
float val2 = 0;
float temp = 0;
float humidity = 0;
boolean replaytemp = true;
boolean replayldr = true;
boolean replaysmoke = true;
boolean replaymotion = true;

void setup()
{
    Serial.begin(9600);
    dht.begin();
    Serial.println("Home automation system by Chandan Mahato.");
    Serial.println(" ");
    lcd.begin(16, 2);
    lcd.clear();
    pinMode (GasSensor, INPUT);
    pinMode (TempSensor, INPUT);
    pinMode(ledPin, OUTPUT);
    pinMode(fan, OUTPUT);
    pinMode(buzzer, OUTPUT);
    pinMode(PIRSensor, INPUT);
    lcd.setCursor(0, 0);
    lcd.print("Embedded Lab");
    lcd.setCursor(0, 1);
    lcd.print("Chandan Mahato");
    delay(1000);
    lcd.clear();
    lcd.setCursor(1, 0);
    lcd.print("Home Automation");
    lcd.setCursor(5, 1);
    lcd.print("System");
    delay(500);
    lcd.clear();
}

void loop()
{
    tempSensor();
    ldrSensor();
    pirSensor();
    gasSensor();
}
```

```

}
void pirSensor() {
    val = digitalRead(PIRSensor);
    if (val == HIGH ) {
        if (pirState == LOW)
        {
            Serial.println("Motion Detected.");
            Serial.println("");
            lcd.setCursor(0, 1);
            lcd.print("Motion detected!");
            delay(1000);
            lcd.clear();
            pirState = HIGH;

        }
    } else {
        if (pirState == HIGH){
            Serial.println("No Motion Detected");
            Serial.println("");
            delay(500);
            pirState = LOW;
        }
    }
}

void gasSensor() {
    val1 = digitalRead(GasSensor);
    if (val1 == HIGH ) {
        if (gasState == LOW)
        {
            Serial.println("Smoke Detected");
            Serial.println("Turning Buzzer on.");
            Serial.println("");
            replaysmoke = false;
            lcd.setCursor(0, 1);
            lcd.print("Smoke detected!");
            digitalWrite(buzzer, HIGH);

            delay(1000);
            lcd.clear();
            digitalWrite(buzzer, LOW);
            delay(500);
        }
    }
}

```

```

        gasState = HIGH;

    }
} else {
    if (gasState == HIGH){
        Serial.println("No Smoke Detected");
        Serial.println("Its safe now.");
        Serial.println("");
        digitalWrite(buzzer, LOW);
        delay(500);
        gasState = LOW;
    }
}
}

void tempSensor(){
    temp = dht.readTemperature();
    humidity = dht.readHumidity();
    lcd.setCursor(0, 0);
    lcd.print("Temp: ");
    lcd.print(temp);
    lcd.print("C");
    lcd.setCursor(0, 1);
    lcd.print("Hum: ");
    lcd.print(humidity);
    lcd.print("%");
    if (temp > 30){
        digitalWrite(fan, HIGH);
        if(replaytemp == true){
            Serial.println("Temperature is greater than 30 degree.");
            Serial.println("Turning Fan on.");
            Serial.println("");
            replaytemp = false;
        }
    }
    else{
        digitalWrite(fan, LOW);
        if(replaytemp == false){

```

```

        Serial.println("Temperature is less than 30 degree.");
        Serial.println("Turning Fan off.");
        Serial.println("");
        replaytemp = true;
    }

}

}

void ldrSensor (){
    int ldrvalue = analogRead(LdrSensor);
    lcd.setCursor(0, 0);
    if(ldrvalue < 60){
        digitalWrite(ledPin, HIGH);
        if(replayldr == true){
            Serial.println("It's night time.");
            Serial.println("Turning LED on.");
            Serial.println("");
            replayldr = false;
        }
    }
    else {
        digitalWrite(ledPin, LOW);
        if(replayldr == false){
            Serial.println("It's day time.");
            Serial.println("Turning LED off.");
            Serial.println("");
            replayldr = true;
        }
    }
}
}

```


Conclusion:

Using the proteus software, this full home automation system was created. The circuit could carry out all of the mentioned logic, after developing and modeling the circuit. Overall, I had fun and learned a lot working on this project, which helped me learn more about circuit design and simulation.