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:

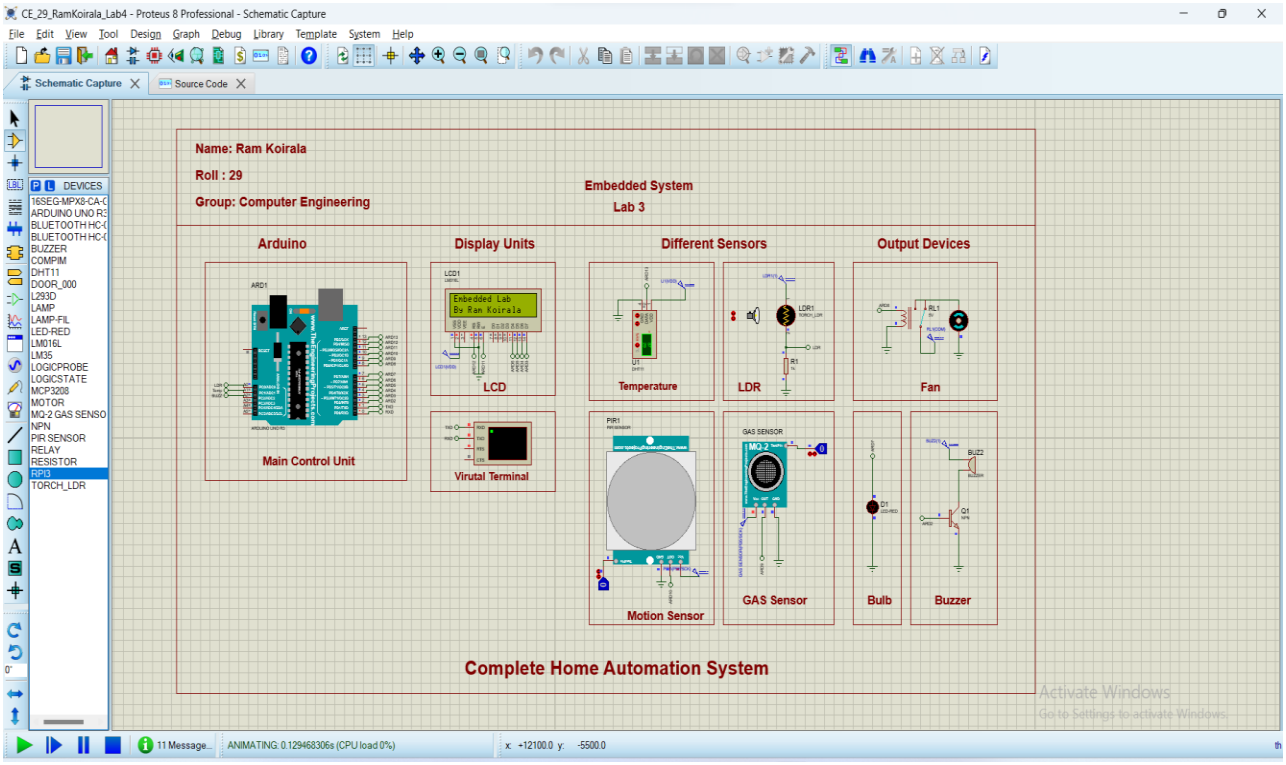

Fig: Overall Circuit diagram

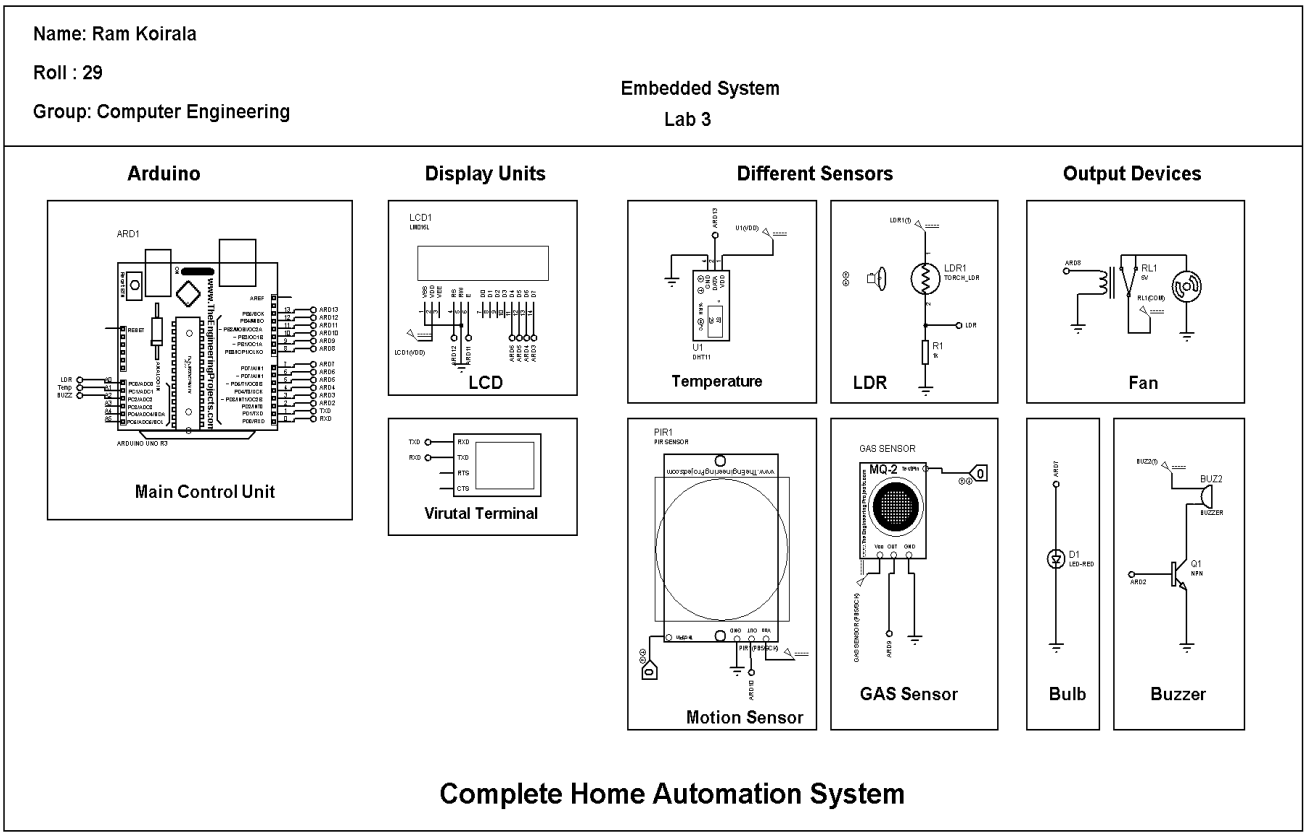

Fig 2: Complete circuit(Exported)

Source code for Arduino

```
#include <LiquidCrystal.h>// Import LCD library
#include <DHT.h>
DHT dht(13,DHT11);
//Initialize Arduino pin for LCD
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; // connect ir sensor to arduino pin 2
int ledPin = 7; // choose the pin for the LED
int fan = 8;
int buzzer = 2;
int LdrSensor = A0;
int TempSensor = 13;
int PIRSensor = 10;// choose the input pin (for PIR sensor)
int pirState = LOW; // we start, assuming no motion detected.
int gasState = LOW;// we start, assuming no motion detected
```

```
int val = 0;// variable for reading the pin status
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 Ram Koirala.");
  Serial.println("  ");
  lcd.begin(16, 2); //Start LCD
  lcd.clear();
  pinMode (GasSensor, INPUT);
  pinMode (TempSensor, INPUT);// sensor pin INPUT
  pinMode(ledPin, OUTPUT);
  pinMode(fan, OUTPUT);
  pinMode(buzzer, OUTPUT);
  pinMode(PIRSensor, INPUT);     // declare sensor as input
  lcd.setCursor(0, 0);
  lcd.print("Embedded Lab");
  lcd.setCursor(0, 1);
  lcd.print("By Ram Koirala");
  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()
{
  // delay(100);
  tempSensor();
  ldrSensor();
  pirSensor();
  gasSensor();// Function to Read PIR sensor Data
```

```
  // delay(100);

}
void pirSensor() {
  val = digitalRead(PIRSensor);// read input value
  if (val == HIGH ) {            // check if the input is 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;
    }
    // lcd.clear();
    // We only want to print on the output change, not state
  }
}
void gasSensor() {
  val1 = digitalRead(GasSensor);// read input value
  if (val1 == HIGH ) {            // check if the input is 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;
    }
    // lcd.clear();
    // We only want to print on the output change, not state
  }
}

void tempSensor(){
  temp = dht.readTemperature();
  humidity = dht.readHumidity();
  // val2 = analogRead(TempSensor);
  // val2 = (val2*500)/1023;
  // temp = val2;
  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;
    }

  }
  // delay(100);

}

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;
    }
  }
  }
```

OUTPUT:

The complete simulation can be viewed by clicking on the following Link:

View Demo

Conclusion:

This complete home automation system was built with the proteus software. After designing and simulating the circuit, it was found that the circuit was able to perform all the logic defined above. Overall, working on this project was enjoyable and informative and it helped me to increase my knowledge in the field of circuit design and simulation.