NAME : SAURABH SALVI

ROLL NO : ME22B1033

BRANCH : MECHANICAL

TASK #1

ELECTRONICS

Project 2 :

Setup to get optimal temperature of water for bathing purpose.

Short Description :

In this project, we have mainly used :

- Temperature Sensor
- Gas Sensor

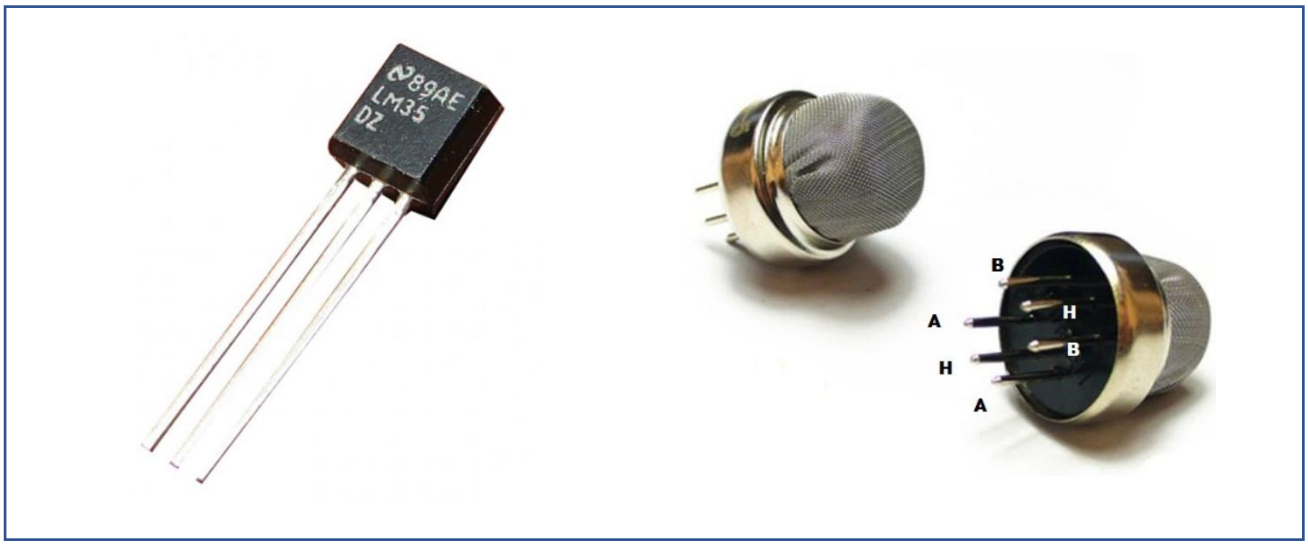


Fig. Components used in project L :Temperature Sensor ; R : Gas Sensor

In this project, we have used the temperature sensor in order to keep the temperature of the water (which is to be taken for bath) between a specific range. The process is fully automated. Gas Sensor is used basically as an alarming call if water becomes too hot at time.

Flow chart :

The 2 motors actually represent 2 taps of water : hot and cold

→

The temperature sensor is kept in touch with water to read it's temperature

↓

We control the motors based on the data whether the temperature is going out of the range or not

←

That's how the temperature is balanced by having a perfect mix of hot and cold water.

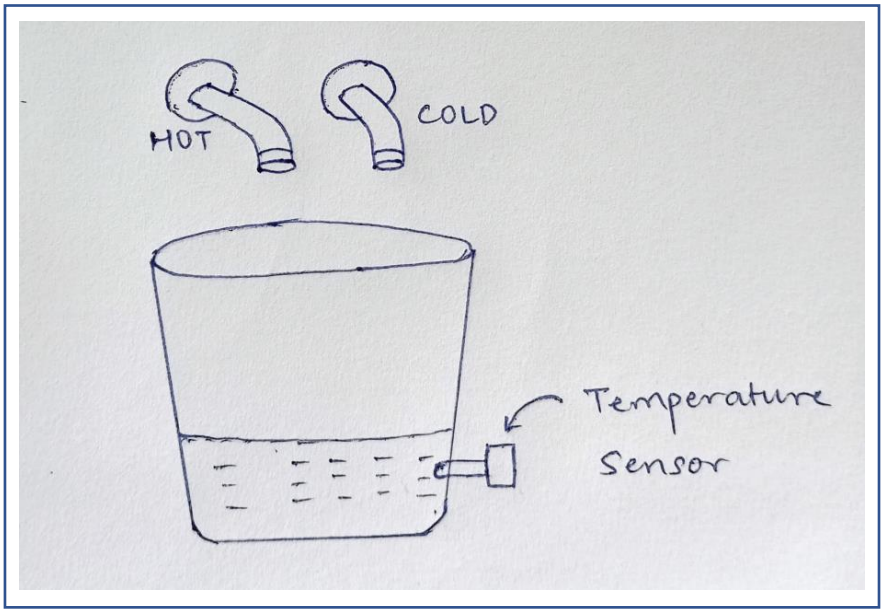


Fig. Project Setup

The circuit schematic (using Tinkercad) :

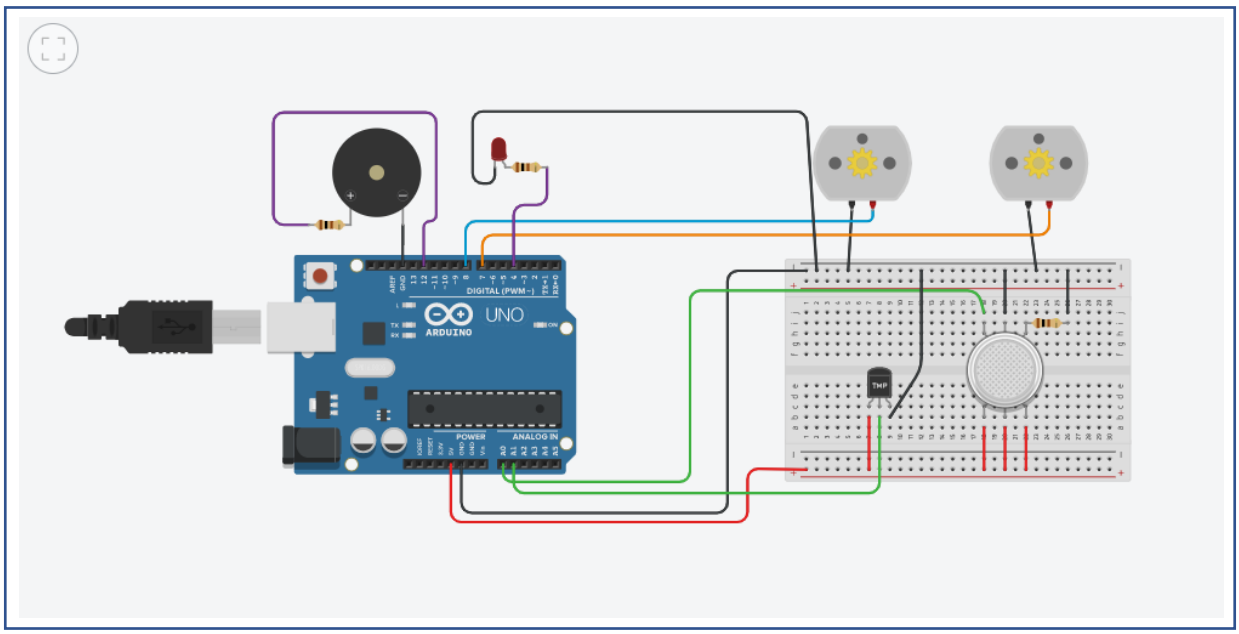


Fig. Circuit schematic using Tinkercad

I have decided to use the breadboard instead of just direct connections in order to give ground and +5V supply to the rail because of the limited pins for ground on Arduino as well as +5V.

Code for the project :

For presentation purpose, I have decided to break the code into 3 parts :

- Initialization
- Void setup
- Void loop

Initialization :

```
int buzzer = 12;
int hot = 7;
int cold = 8;
int gasSensor;
float vread;
float vfinal;
float temp;
int led = 4;
```

1. The temperature sensor has 3 pins, one goes to +5V, one to gnd and the third one is for temperature reading purpose (goes to analog pin).

2. Also buzzer is connected to pin 12 while an led is connected to pin 4.

3. The two motors showing two taps of hot and cold water are also attached to pin 7 and 8 respectively.

4. The values obtained from gas sensor are integers. Hence, we define a int datatype variable ‘gasSensor’ which will keep values from the sensor in it.

5. Based on working of temperature sensor, we first read the value obtained by float datatype variable ‘vread’.

6. After this, that ‘vread’ value is converted to the voltage value by some formula (discussed later) and this value is stored in float datatype variable ‘vfinal’.

7. And for final temperature value, we have a float ‘temp’ variable.

Void setup :

```
void setup()
{
  pinMode(A0, INPUT);
  pinMode(A1, INPUT);
  pinMode(buzzer, OUTPUT);
  pinMode(hot, OUTPUT);
  pinMode(cold, OUTPUT);
  Serial.begin(9600);
  pinMode(led, OUTPUT);
}
```

1. The analog pin A1 is given for the temperature sensor and it is acting as INPUT since it is collecting data from surroundings. And similarly A0 is given for gas sensor.

2. Buzzer and led are kept as OUTPUT to pin 12 and pin 4 respectively.

3. The two motors named (hot and cold) are kept as OUTPUT and attached to pin 7 and 8 respectively

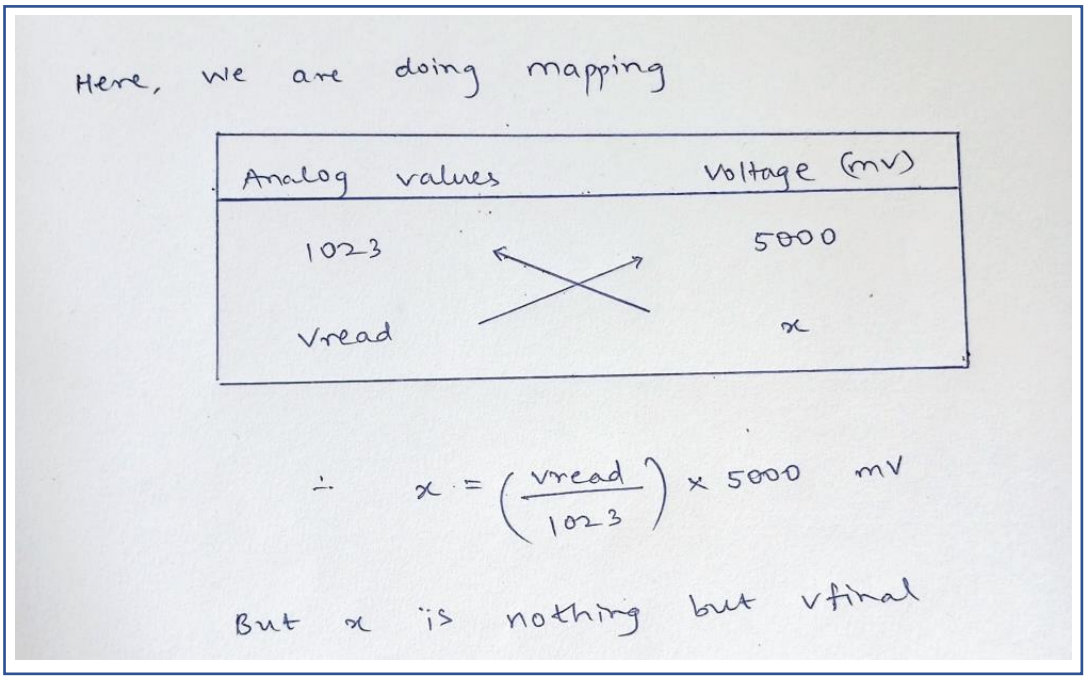
4. I had to establish the communication between the Serial monitor and Arduino so that I can see the desired values.

Void loop :

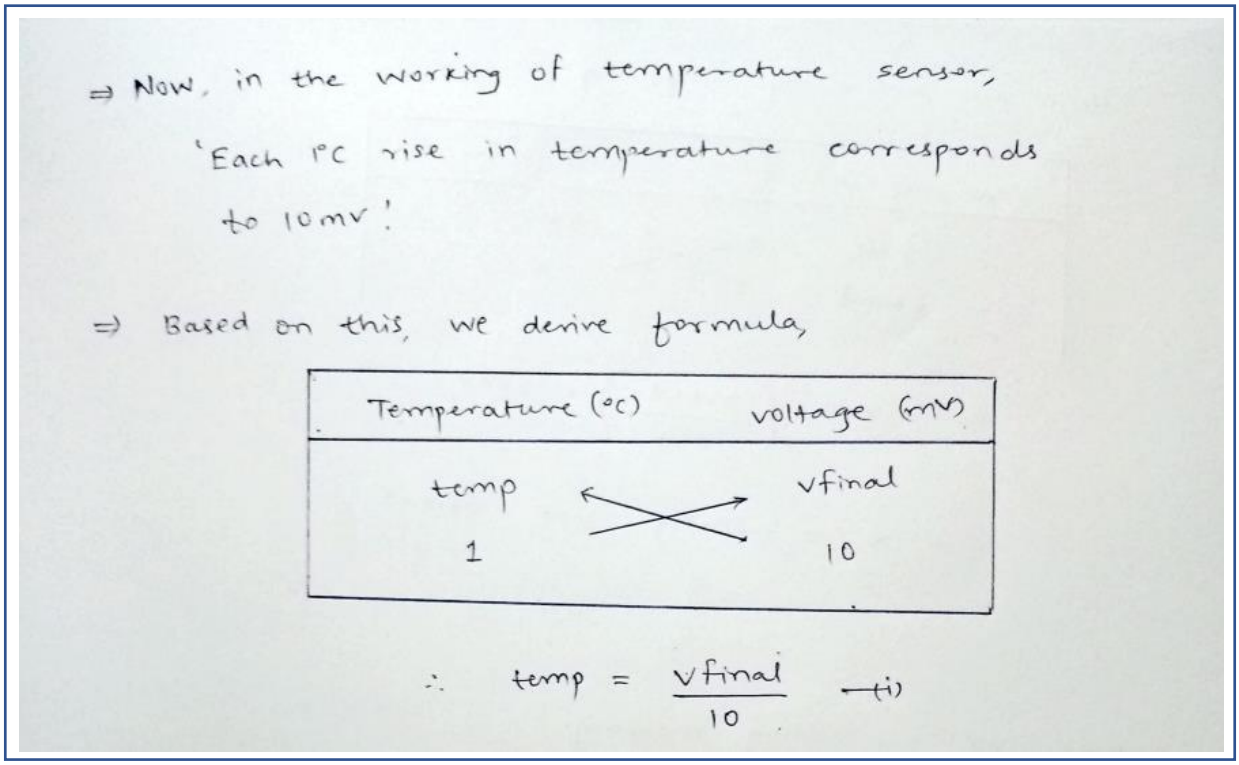
```
void loop()
{
  vread = analogRead(A1);
  vfinal = (vread/1023)*5000;
  temp = (vfinal-500)/10 ;

  Serial.print("Temperature : ");
  Serial.print(temp);
  Serial.print(" ; ");

  if(temp <= 32){
        digitalWrite(hot, HIGH);
        digitalWrite(cold, LOW);
  }
  else if(temp >= 40){
        digitalWrite(hot, LOW);
        digitalWrite(cold, HIGH);
  }
  else{
        digitalWrite(hot, HIGH);
        digitalWrite(cold, HIGH);
  }

  //emergency system
  gasSensor = analogRead(A0);
  Serial.print("Gas Sensor value : ");
  Serial.println(gasSensor);

  if(gasSensor >= 42){
        digitalWrite(buzzer, HIGH);
        digitalWrite(led, HIGH);
  }
  else{
        digitalWrite(buzzer, LOW);
        digitalWrite(led, LOW);
  }
}
```

1. We first read the value that the sensor is giving to us at analog pin A1 by the function analogRead(A1) and keep it in vread;

2. Now, we need a voltage value(in mV) corresponding to the vread.
   For that,



3. Now, we need the temperature value. The derivation of the formula in the code is shown below.



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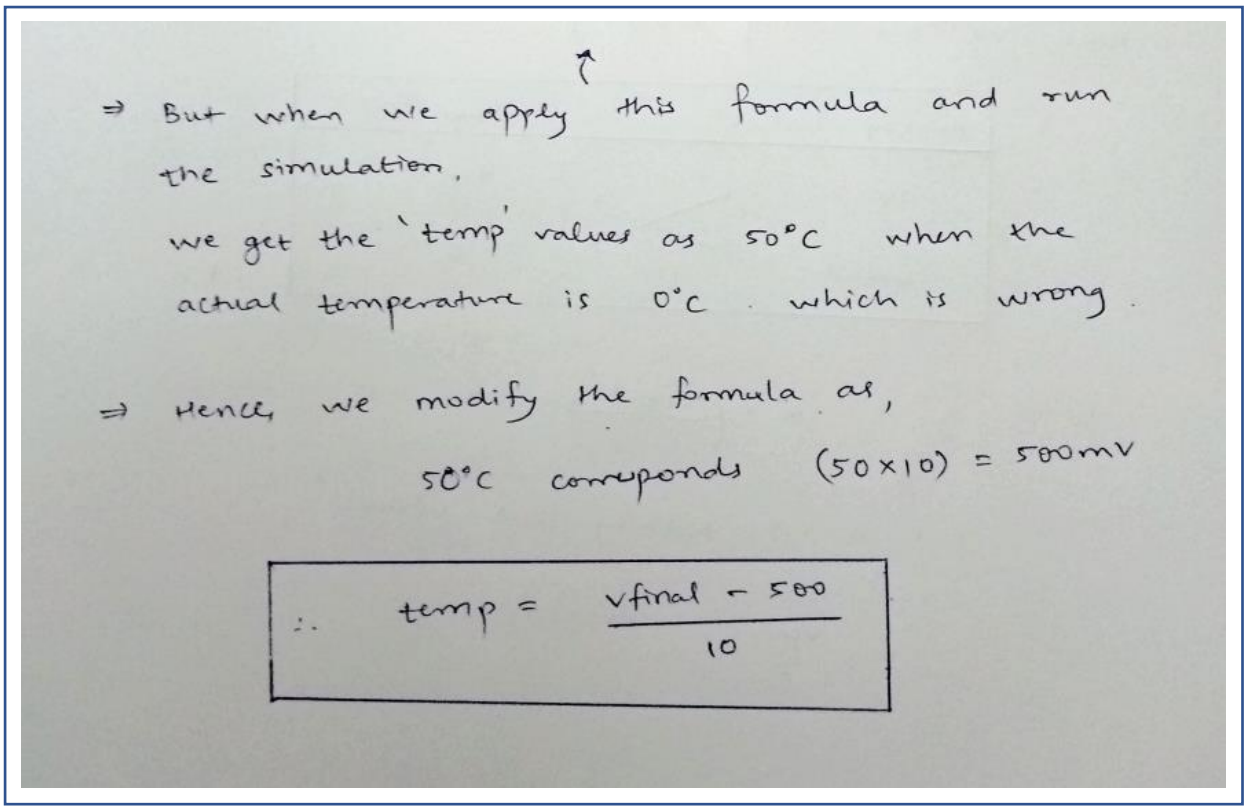

4. Now comes the conditions part.

If temp < 32 :

The water is cooler than what we need hence turn ON the hot water tap and close the cold one

If 32< temp < 40 :

The water temperature is in our desired range, hence keep mixing normal water (hot + cold)

If temp > 40 :

The water is warmer than what we need hence turn ON the cold water tap and close the hot one

5. Now, we deal with the alarming system part, that if the amount of smoke exceeds a certain value (here 42) that would make the buzzer and LED glow so that the operator could take the necessary action.

Addition to the project :

- Even though we have controlled the temperature of water by water sensor but still we can even control the overflow case of water from the bucket by a combination of glowing LED and photoresistor. (**Alternative can be IR sensor or ultrasonic sensor**)

- The photoresistor is to be connected at the top and to the diametrically opposite side, we will attach a glowing LED.

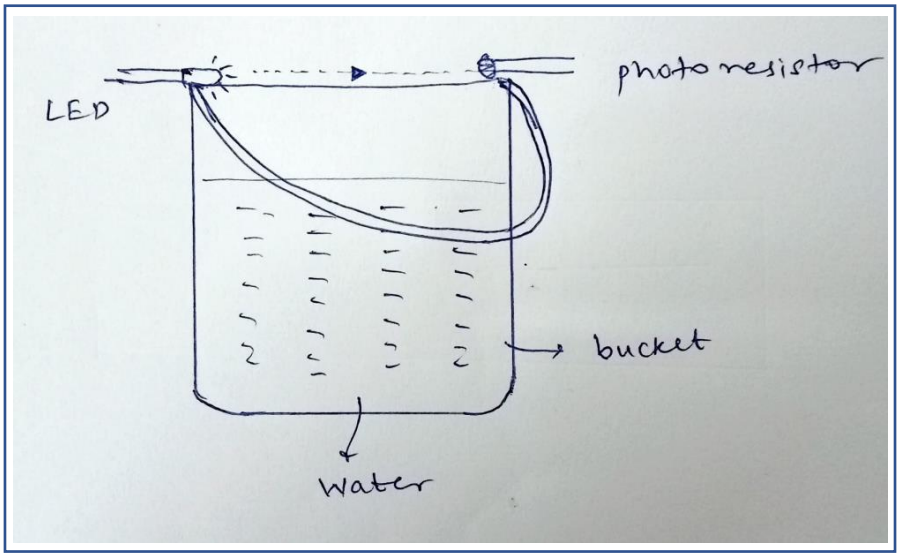

Fig. Setup

Working:

The LED is at its full brightness and the photoresistor is receiving it. But when the water level fills the bucket, it disturbs the intensity of light falling on photoresistor. This signal, we take as alarming situation.
