184763_MUDATHIR_DOCUMENTATION

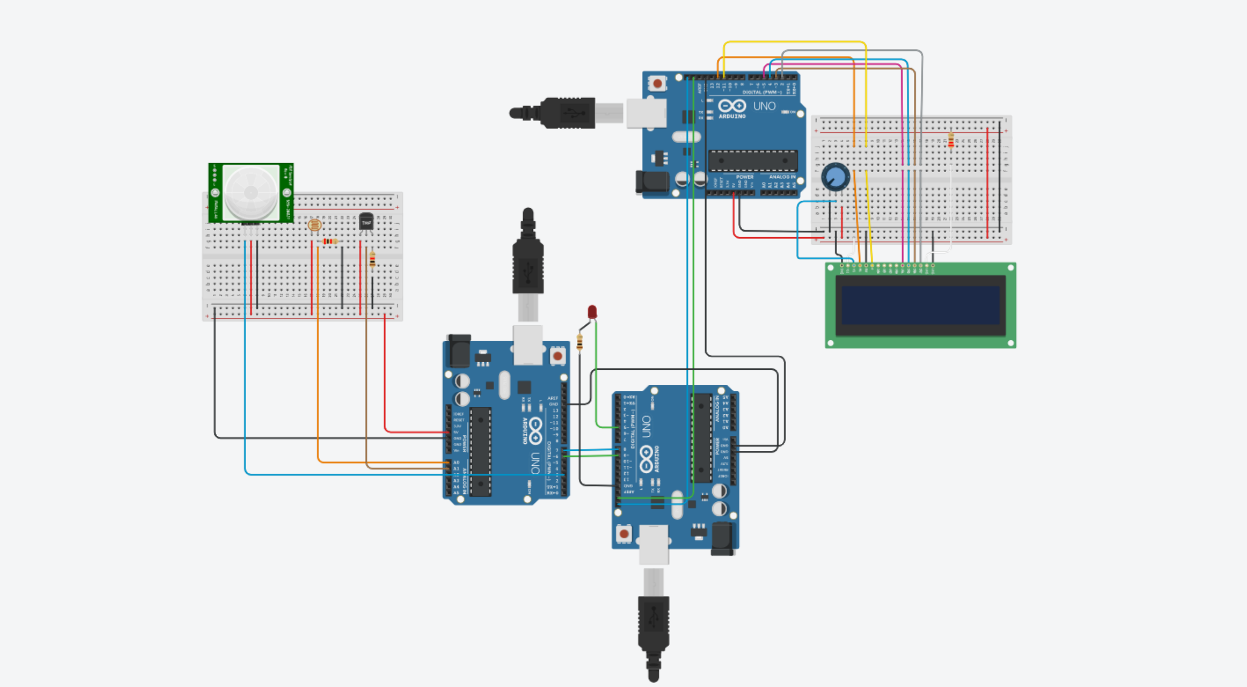
BRIEF EXPLANATION OF THE PRODUCT: this is a product that utilizes in-depth micro-controller communication. It consists of basically three sensors: a motion sensor, light sensor and a temperature sensor. These sensors are connected to microcontroller 1 which is in serial communication with the master microcontroller, the master microcontroller displays output on an LCD (on another microcontroller) using I2C communication protocol. Based on the measured variables, an LED on the master is turned on. This device is find useful application in a greenhouse system. Imagine the entire device is placed near a plant, it helps to measure critical parameters of the plant like the temperature of its surrounding, the intensity of light on the plant, and it also senses motion of pest/ predators that might want to feed on the plant. The main aim of the designed device is basically to ensure safety of a plants without having to constantly monitor the plant. If the led on the master is in a high state, this indicates that that your plant is doing great, however if the state is low it means there is something wrong. Either there is an incoming predator/pest or surrounding temperature is too low or high, or the intensity of light is too low or high for photosynthesis. This device saves time as you do not have to check your plants constantly. The temperature and light intensity have been scaled from 0 to 100. The rip sensor which is a motion sensor can either have a value of 0 or 1. It is zero when no motion is detected and it is 1 when there is a motion detected. Average environmental conditions such as the light intensity range being between 70-90 percent, the temperature range being between 25 and 50 degrees. Combining these two conditions with the fact that the rip sensor must have a value of 0, an LED on the master controller is turned on to signify the plant is okay.

BILLS OF MATERIALS INCLUDING THE PRICES

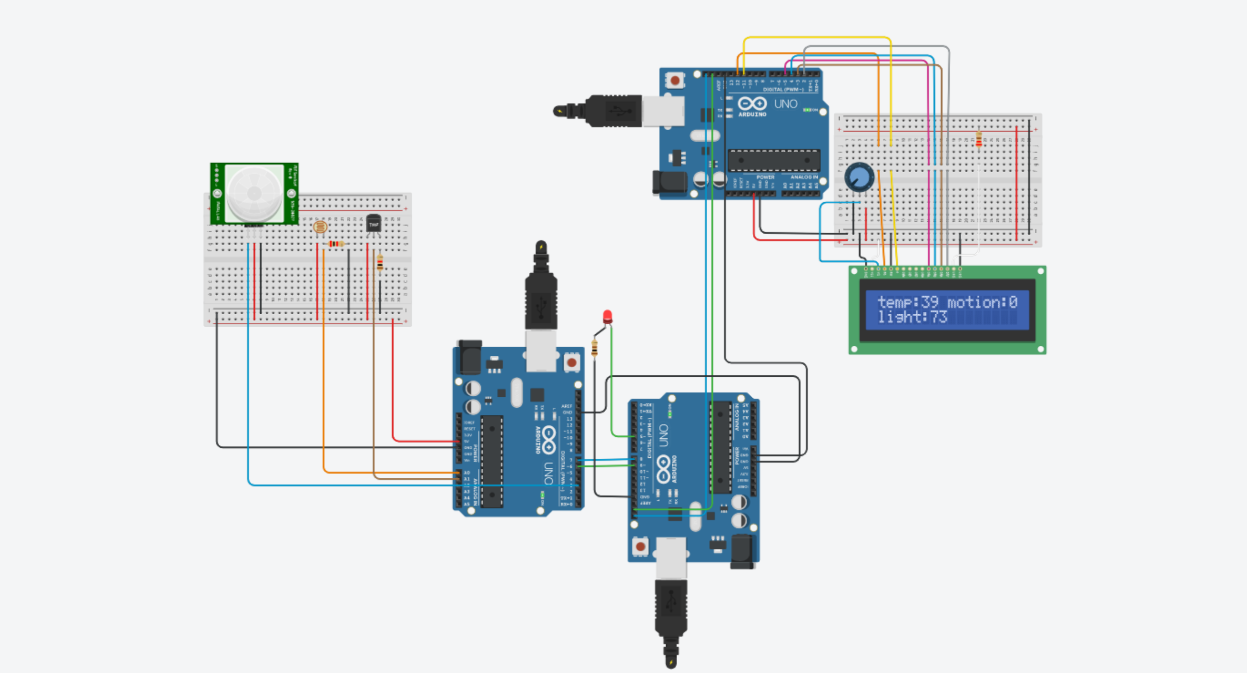
MATERIALS	QUANTITY	PRICES
Arduino board	3	$22.95 per piece
lcd	1	$1.70
PIR sensor	1	$10
Temperature sensor	1	$7.3
Light sensor	1	$6.31
Resistors	4	$2.25
Connecting wires	30	$3.27 for 40 pins
Potentiometer	1	$1.2
Led	1	$1.18 for full pack
Breadboard	2	$2.9

PHYSICAL LAYOUT OF THE CIRCUIT AND SCREENSHOTS

LAYOUT AND CONNECTIONS

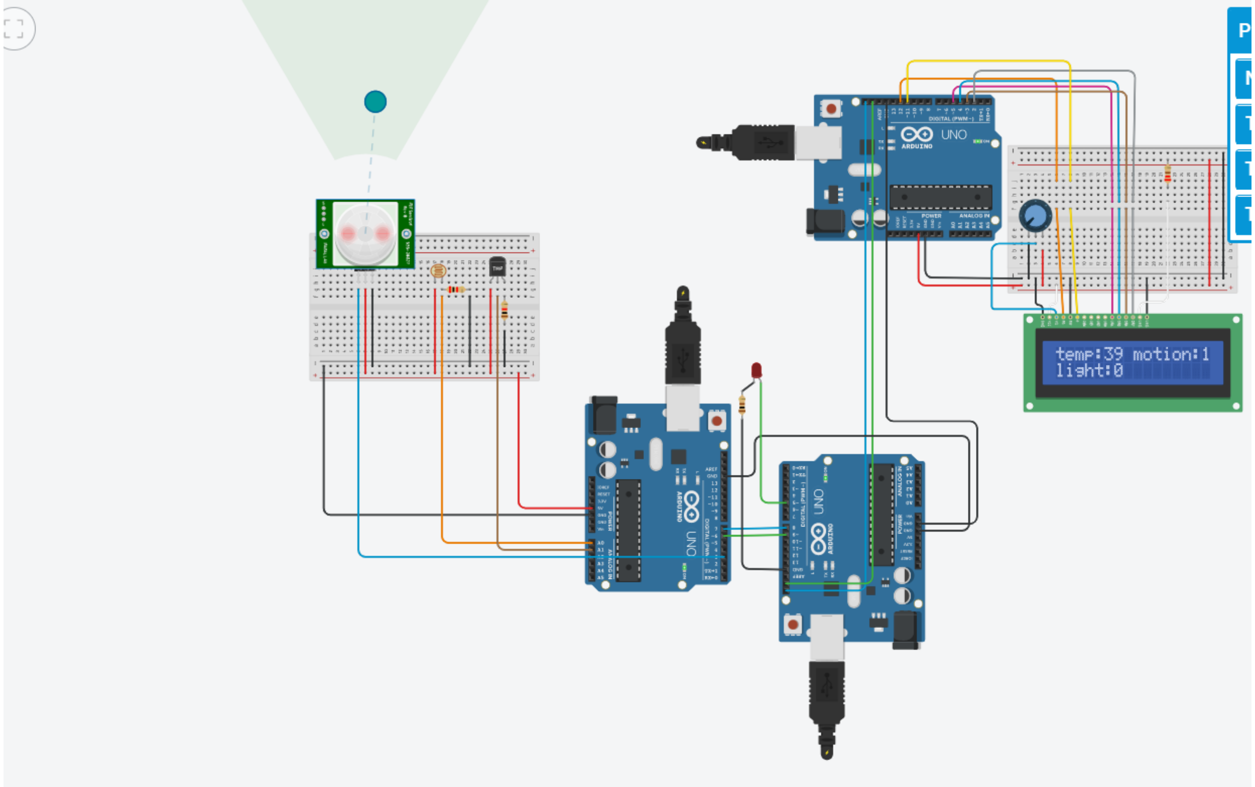


WHEN THE SENSORS MEET THE DESIRED EVIRONMENTAL CONDITIONS; THE LED LIGHTS UP; SCREENSHOT IS PROVIDED BELOW;



```
temp:39 motion:0
light:73
```

WHEN CONDITION IS NOT MET, ZERO LIGHT INTENSITY AND MOTION DETECTED; LED DOESN’T LIGHT



FUNCTIONALITY OF THE PRODUCT:

The product can be used in a green houses just for the sole purpose of monitoring your plants by using certain environmental conditions under which you feel your plant should grow. In this design, a general suitable ranges of temperature and light intensity has been chosen. The device is not costly, total cost of materials as seen from the bill of materials does not exceed sixty dollars. You simply operate it by bringing it close to the plant that you want to be monitored. It take the temperature, the light intensity and senses whether there are incoming predators/pest that wants to feed on your plant. It indicates that the plant is in a good condition when the LED lights up, whenever the led is off, it signifies to the user that there is something wrong. People interested in green house systems are advised to get this because it saves a lot of stress and it is cheap, also it is really easy to know something is wrong with your plant or not (just check the led).

DESIGN METRICS

The following are the design metrics in which my product can be graded on

-user interface design

-safety

-environmental aspects

-estimated device lifespan

-warranty

USER INTERFACE DESIGN: this simply means how the user interfaces/ communicates with the device. In my product the user interface is easy, not very complicated. The user just needs to place the device close to the desired plant to be monitored and observe the lighting of the LED.

SAFETY: this device is pretty much safe, it doesn't pose danger to human beings, to the plants or animals. It doesn't emit any harmful gas or radiation. However caution should be taken during usage. It must be handled with extreme care

ENVIRONMENTAL ASPECTS: it functions wells and works in all type of environmental condition but cannot be used with extremely low temperature region or high temperature region.

ESTIMATED LIFESPAN: the lifespan of the device is expected to last for at least a year when being handled with extreme care.

CONCLUSION: The desire for a device that works well in green house is pretty much important these days. This product designed helps to monitor plant success and prevent attack from predators.

CODES

SLAVE 1

```
uint8_t clk=7;

 uint8_t data=6;

const uint8_t sensor_pins[3]={A0,A1,3};

uint8_t sensor_readings[3]={};


void setup()

{

  for(int i=0;i<3;i++)

    pinMode(sensor_pins[i],INPUT);

  pinMode(clk,INPUT);

  pinMode(data,OUTPUT);

  Serial.begin(9600);

}


void loop()

{

  for(int i=0;i<3;i++){
    for(int j=0;j<8;j++){
    while(!digitalRead(clk));
    switch(i)
    {
      case 0:
      sensor_readings[i]=((analogRead(sensor_pins[i])-11)/805.0 *100);
      break;
      case 1:
      sensor_readings[i]=(analogRead(sensor_pins[i])-31)/337.0 *100;
      break;
      case 2:
      sensor_readings[i]=digitalRead(sensor_pins[i]);
      break;
    }
    uint8_t q=(sensor_readings[i]&(1<<j))!=0;
    digitalWrite(data,q);
    while(digitalRead(clk));
    }
    Serial.println(sensor_readings[1]);
  }
    /*Serial.print(sensor_readings[i]);*/
}
```

MASTER CODE

```
#include<Wire.h>
uint8_t clk=8;
uint8_t data=9;
uint8_t readings[3]={};
uint8_t flag;
void setup()
```

```
{
  pinMode(clk, OUTPUT);
  pinMode(data,INPUT);
  Serial.begin(9600);
  Wire.begin();
  pinMode(5,OUTPUT);

}

void loop()
{
  uint8_t c=0;
  for(int i=0;i<3;i++){
    flag=0;
    for(int j=0;j<8;j++)
    {
      digitalWrite(clk,HIGH);
      delay(10);
      uint8_t v=digitalRead(data)<<j;
      flag=flag|v;
      digitalWrite(clk,LOW);
      delay(10);
    }
   readings[i]=flag;
  }
  Wire.beginTransmission(80);
  Wire.write(readings,3);
  Wire.endTransmission();
  Wire.requestFrom(80,1);
  if(Wire.available())
    c=Wire.read();
  if(c==200)
    digitalWrite(5,HIGH);
  else
    digitalWrite(5,LOW);

}
```

SLAVE 2 CODE

```
#include<Wire.h>
#include<LiquidCrystal.h>
LiquidCrystal lcd(12,11,5,4,3,2);
uint8_t data[3]={};
uint8_t decision_level[3]={};
void receive(int bytes)
{
  int j=0;
  while(bytes)
  {
    data[j]=Wire.read();
    j++;
    bytes--;
  }
  lcd.setCursor(5,0);
  lcd.print(data[1]);
  lcd.setCursor(15,0);
  lcd.print(data[2]);
  lcd.setCursor(6,1);
  lcd.print(data[0]);
}
void send()
{
  if(data[0]>=70&&data[0]<=90&&data[1]>=25&&data[1]<=50&& data[2]==0)
    Wire.write(200);
  else
    Wire.write(0);
}
void setup()
{
  Wire.begin(80);
  lcd.begin(16,2);
  lcd.print("temp:");
  lcd.setCursor(8,0);
  lcd.print("motion:");
  lcd.setCursor(0,1);
  lcd.print("light:");
  Wire.onReceive(&receive);
  Wire.onRequest(&send);
}

void loop()
{


}
```