GARDUINO

The Arduino-based Automated Garden Controller

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Introduction

"Science is the great antidote to the poison of enthusiasm and superstition."

Adam Smith, The Wealth of Nations

Our Garduino garden controller uses an Arduino microcontroller to run our indoor garden, watering the plants only when they're thirsty, turning on supplemental lights based on how much natural sunlight is received, and alerting us if the temperature drops below a plant-healthy level. For sensors, the Garduino uses an inexpensive photocell (light), thermistor (temperature), and a pair of normal hook-up wires (moisture).

The project has a great significance in agricultural countries such as India, because the undesired combination of Light, Heat and Moisture lead to unproductive utilization of land. If these values are automated, such that the plants virtually come to life, it will not only increase productivity but will also conserve our scarce resources like water.

The greatest benefit of this project is that no external expensive sensors are required, as all the sensors are made from inexpensive components and directly embedded into the Arduino Uno R3 Microcontroller

Problem Statement

"The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them."

William Lawrence Bragg

The real-life problem that we face in Agriculture and Horticulture is that the moisture (irrigation), heat and light that are provided to plants have no check at all. Therefore, the farmers and agriculturists have no way to determine if the plants are getting the perfect and favourable mix of water, light energy and heat for its growth.

Now, since each plant has different moisture, heat and light requirements, this makes the situation more difficult, complex and tough to monitor. The task is to come up with an automated setup which electronically monitors the moisture, light and heat required for the favourable growth of the plant (which will be unique for each plant and will have to be tested before use) and provide warnings if they are not within the desired levels.

This would prove to be a boon not only in large tracts of agricultural land, but in controlled indoor environment such as greenhouses and nurseries, where the exact and optimum conditions for plant growth must be known.

Hardware and Software Requirements

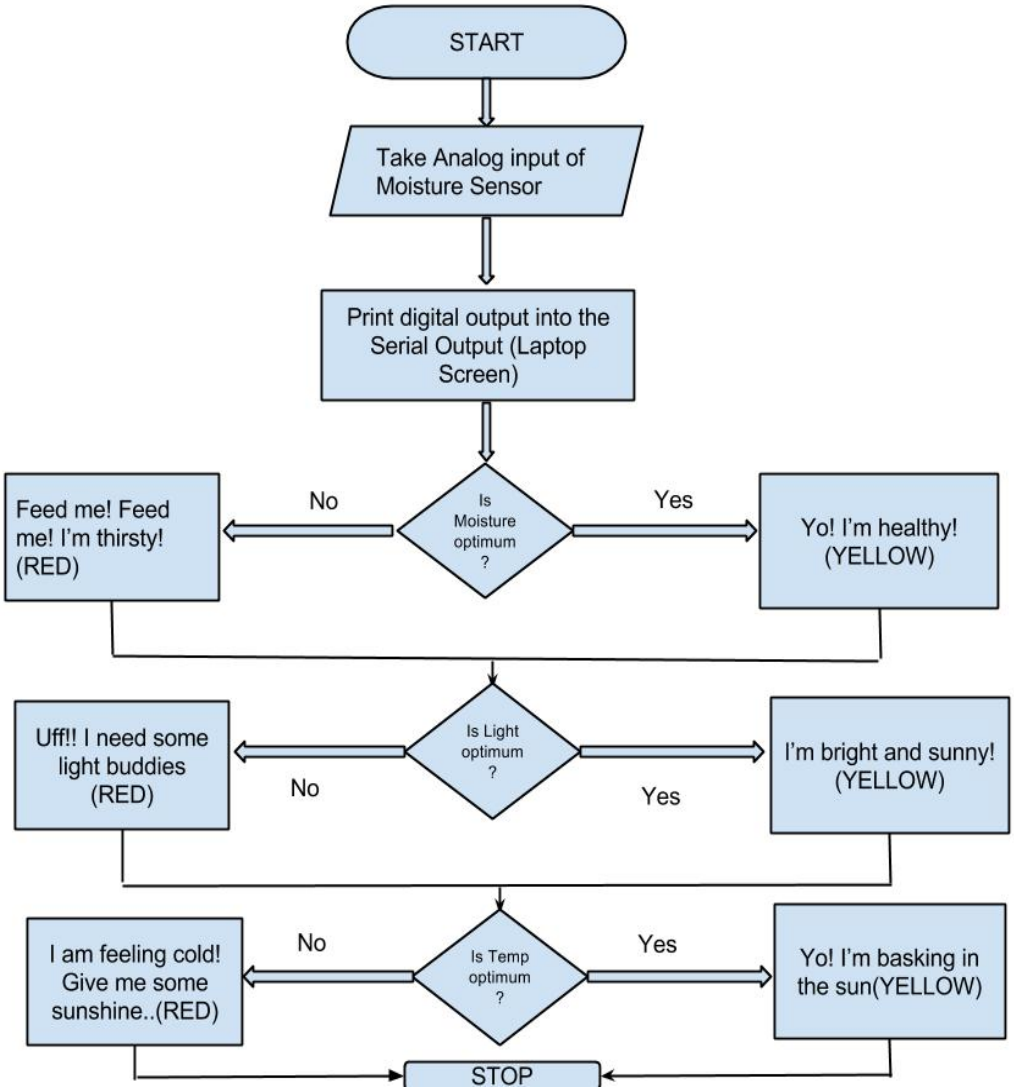
1. Arduino Uno R3 single board microcontroller
2. Arduino Integrated Development Environment on Ubuntu
3. Computer (We used HP Probook 4445s on Ubuntu OS)
4. AC Power Source for Computer
5. Solderless Breadboard
6. 1.2 Ohm Resistors
7. Photoresistor
8. Thermistor
9. Hook-up Wires
10. Green, Yellow, Red Light Emitting Diodes
11. USB to Arduino Cable (also acts as Power Source)

SOLUTION

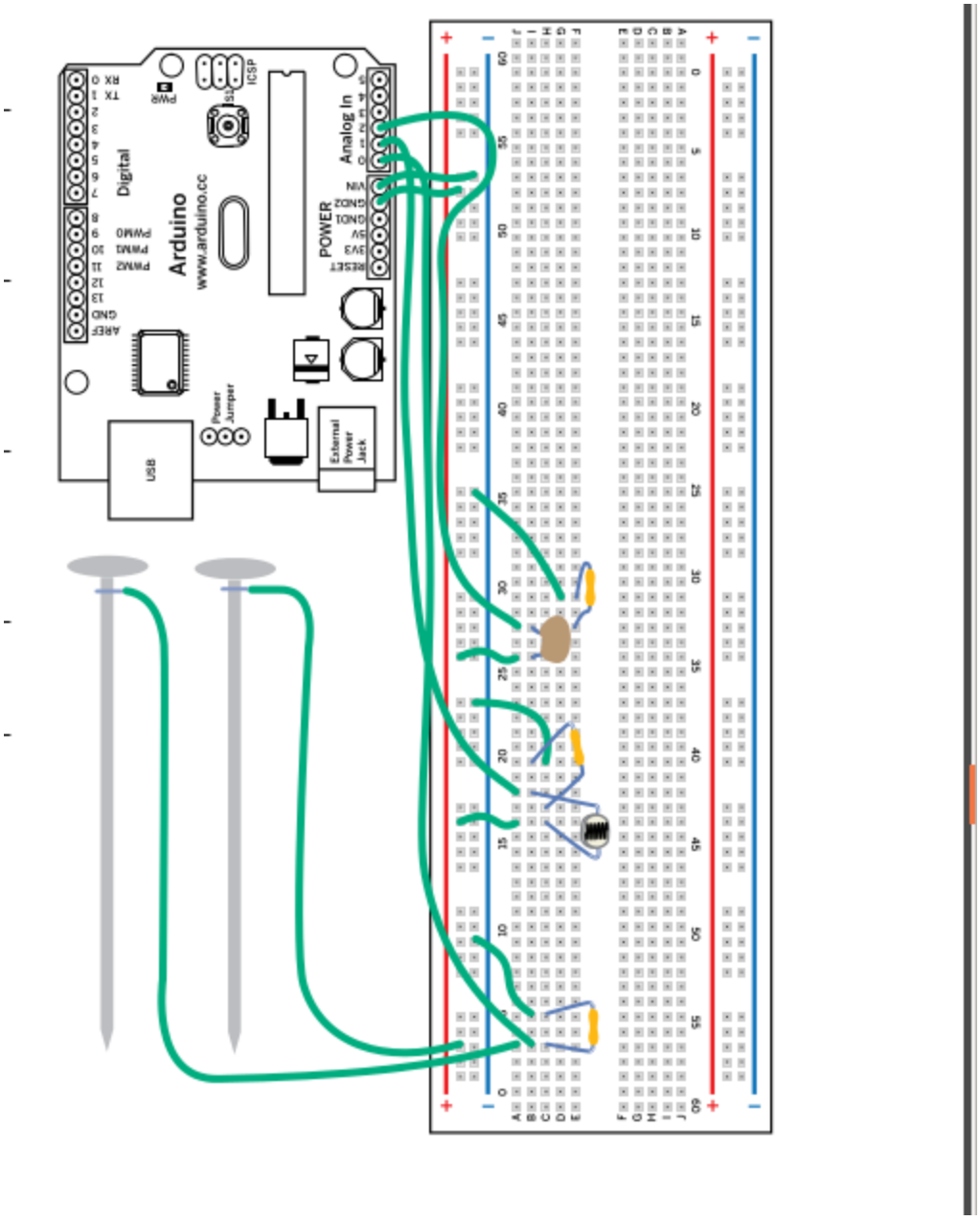
"To the wise, life is a problem. To the fool, it is a solution."

Marcus Aurelius

FLOWCHART / BLOCK DIAGRAM



CIRCUIT DIAGRAM



ARDUINO CODE

```
//define analog input to our Sensors
int moistureSensor = 0;
int lightSensor = 1;
int tempSensor = 2;

//define variable to store moisture, light and temp values
int moisture_val;
int light_val;
int temp_val

void setup() {
  //open serial port
  Serial.begin(9600);
  pinMode(13,OUTPUT);
  pinMode(12,OUTPUT);
  pinMode(11,OUTPUT);
  pinMode(10,OUTPUT);
  pinMode(9,OUTPUT);
  pinMode(8,OUTPUT);
}

void loop() {


  /**************MOISTURE SENSOR***************/
```

```
moisture_val = analogRead(moistureSensor);
Serial.print("The value read by Moisture Sensor is ");
Serial.println(moisture_val);
//turn water on when soil is dry, and delay until soil is wet
if (moisture_val < optimum)
{
  Serial.println("Feed me! Feed me! I'm Thirsty\n\n");
  digitalWrite(13,HIGH);//blink RED LED
  delay(2000);
  digitalWrite(13,LOW);
  delay(2000);
}
else
{
  Serial.println(" Yo! I'm healthy!\n\n ");
  digitalWrite(12,HIGH);//blink YELLLOW LED
  delay(2000);
  digitalWrite(12,LOW);
  delay(2000);

}



/************LIGHT SENSOR****************/

light_val = analogRead(lightSensor);
Serial.print("The value read by Light Sensor is ");
Serial.println(light_val);
```

```
  if (light_val < optimum)
  {
    Serial.println("Ufff! I need some light buddies!\n\n");
    digitalWrite(11,HIGH);//blink RED LED
    delay(2000);
    digitalWrite(11,LOW);
    delay(2000);
  }
  else
  {
    Serial.println(" I'm bright and Sunny!\n\n ");
    digitalWrite(10,HIGH);//blink YELLLOW LED
    delay(2000);
    digitalWrite(10,LOW);
    delay(2000);
 }



/************TEMPERATURE SENSOR***************/

  temp_val = analogRead(tempSensor);
  Serial.print("The value read by Temperature Sensor is ");
  Serial.println(temp_val);



  if (temp_val < optimum)
  {
                      Serial.println("I am feeling cold! Give me some sunshine..(RED)
                       \n\n");
    digitalWrite(9,HIGH);//blink RED LED
    delay(2000);
```

```
    digitalWrite(9,LOW);
    delay(2000);
  }
  else
  {
    Serial.println(" YO! I am basking in the sun\n\n ");
    digitalWrite(8,HIGH);//blink YELLOW LED
    delay(2000);
    digitalWrite(8,LOW);
    delay(2000);

  }
}
```

RESULT AND CONCLUSION

"Success is a Science ; If you have the conditions, you get the result.

Oscar Wilde

We were successful in creating an Electronic Microcontroller Circuit with the help of Arduino Uno R3™ that monitors, checks and controls the moisture, light and temperature levels. For ease of use, we placed Red and Yellow LEDs. Whenever the obtained values are beyond the optimum scale, RED LED glows and message is flashed on the screen,

whereas when the values are within the optimum limit, the Yellow LED glows for the sensors.

This product can also be commercialized, especially for use in large farms, and in horticulture, Eg. Nurseries. For any given Plant, say Plant X, we shall test the optimum Digital Output Values from the Arduino for 2-3 days, and then with the obtained Optimum values, we shall create the Microcontroller circuit specific to the plant.

As an extension, we can also add Water Motor, Fluorescent Bulb and Heater as Digital Outputs, such that the Motor, bulb and heater can be switched on and off as per the need of the plant. That would, truly be full garden automation. However, our project is still in the experimental stage, and we do not have these included.

GARDUINO | BIBLIOGRAPHY

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