GREEN HOUSE AUTOMATION

A greenhouse is a structure with walls and roof made chiefly of transparent material, such as glass, in which plants requiring regulated climatic conditions are grown.The interior of a greenhouse exposed to sunlight becomes significantly warmer than the external temperature, protecting its contents in cold weather.

INTRODUCTION

The world climate change has brought about unpredictable weather conditions that have resulted in the global food shortage being experienced. A possible solution to this problem will likely involve households growing a reasonable percentage of the vegetables and crops they need in a greenhouse which does not require too much land space. A greenhouse can produce more crops per square meter when compared to open field cultivation if the microclimatic parameters that determine crop yield are continuously monitored and controlled to ensure that an optimum environment is created

Currently greenhouses are monitored and controlled either manually by going on the field or by monitoring and controlling the sensor network remotely. In this system control decisions are taken by the system itself based on the sensed values without human interference.

The automated greenhouse control system achieves monitoring and control of a greenhouse environment by using sensors and control devices which are under the control of a microcontroller running a program. Only three parameters namely soil moisture, temperature and light are taken into consideration for the design of this project. But more parameters can be added if necessary. Accordingly, a soil moisture sensor and a water pump, a thermistor and a cooling fan and an LDR and few DC bulbs are used to sense and control the soil moisture content, temperature and light intensity respectively. The output of the sensors and the status of the control devices are displayed on an LCD display.

PROBLEM STATEMENT

Currently greenhouses are monitored and controlled either manually by going on field or monitoring and sensing the sensor network remotely.Automated greenhouse is to ease people when they wish to grow plants. It helps to monitor the situation, when they are not at home. The main aim of is to minimize the human care needed for the plant by automating the green house and monitor the in-house environment status.

DESIGN OBJECTIVES

●Build miniature greenhouse which is equipped with automatic monitoring and controlling system.
●To measure the temperature, light intensity ,soil moisture content etc within a greenhouse. thereby constantly monitor and control environmental conditions to remain at present temperature,light,moisture humidity levels etc.
●To display the sensor readings in real time to the user.
●To act upon sensor readings that deviate from the defined range using the pump, cooling fan and DC bulb.
●To display the status of these control devices to the user , thereby user can control the greenhouse from far away places.

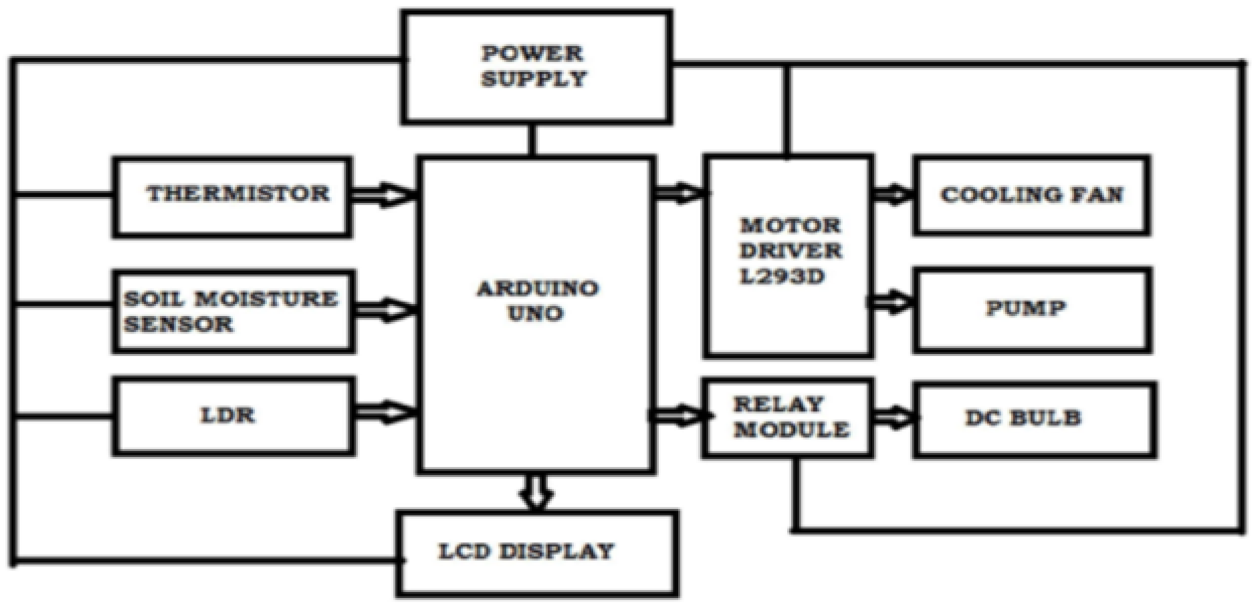
●It focuses on saving water, increasing efficiency and reducing the environmental impacts on plant production.

COMPONENTS

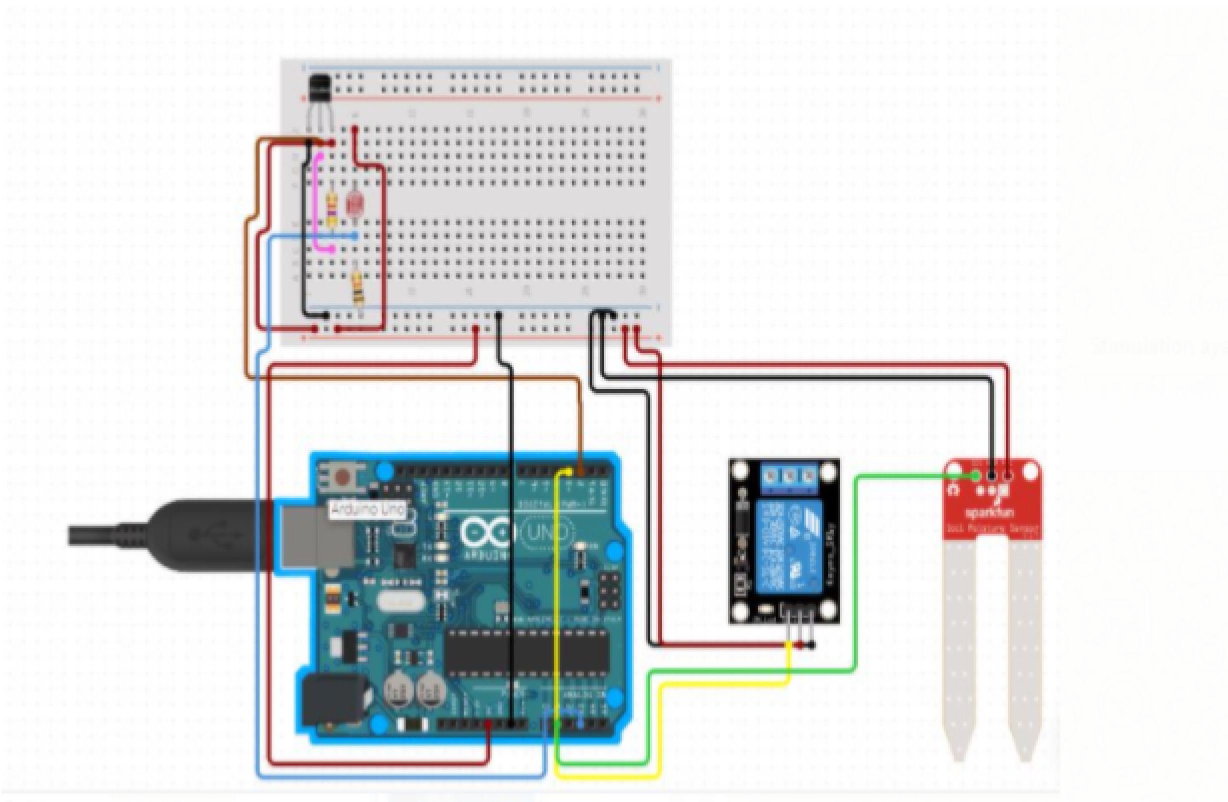
Sl. No.	COMPONENTS	COST (Rs.)
1	ARDUINO UNO	700
2	SOIL MOISTURE SENSOR	200
3	LDR	8
4	THERMISTOR NTC 10K	12
5	RESISTORS 10K, 100K (2 NOS)	6
6	MOTOR DRIVER L293D	200
7	MINIATURE WATER PUMP 12V	200
8	MINI MOTOR 12V	20
9	RELAY MODULE 5V	84
10	DC BULBS 4V (6 NOS)	60
11	LCD DISPLAY 16X2	200
12	12 V DC ADAPTER	200
13	POTENTIOMETER 10K	20
14	OTHER	300
	TOTAL	2210

TABLE OF COMPONENTS

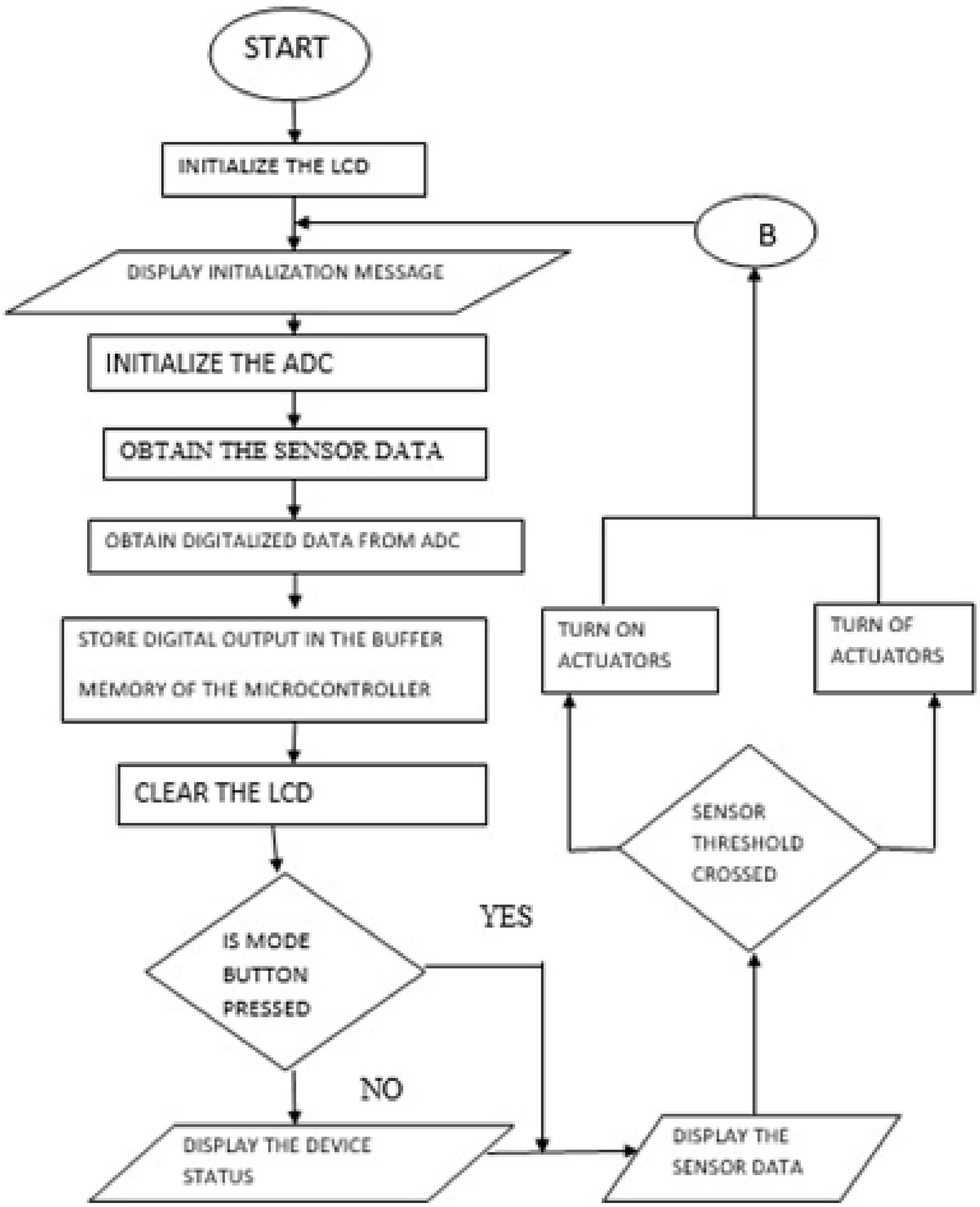
BLOCK DIAGRAM



CIRCUIT DIAGRAM



FLOW CHART


START
INITIALIZE THE LCD
B
DISPLAY INITIALIZATION MESSAGE
INITIALIZE THE ADC
OBTAIN THE SENSOR DATA
OBTAIN DIGITALIZED DATA FROM ADC
STORE DIGITAL OUTPUT IN THE BUFFER MEMORY OF THE MICROCONTROLLER
CLEAR THE LCD
IS MODE BUTTON PRESSED
YES
NO
DISPLAY THE DEVICE STATUS
DISPLAY THE SENSOR DATA
SENSOR THRESHOLD CROSSED
TURN ON ACTUATORS
TURN OF ACTUATORS

DESIGN METHODOLOGY

The system comprises of sensors(LDR, LM35, Moisture sensor), microcontroller and actuators.
Working parameters- climate changes that are temperature ,moisture ,light conditions
Microcontrollers performs the required activities by instigating the relays, fan & bulb until it reaches the suitable conditions required for the plants. All these events will be displayed in LCD display for the user, which is user friendly.

Sl.No	Variable to be measured	Its importance
1	Temperature	Affects all plants metabolic functions
2	Humidity	Affects transpiration rate and plant's thermal control mechanisms
3	Soil moisture	Affect salinity and pH of irrigation
4	Solar radiation	Affects photosynthetic rate, responsible for most thermal load during warm periods.

WORKING

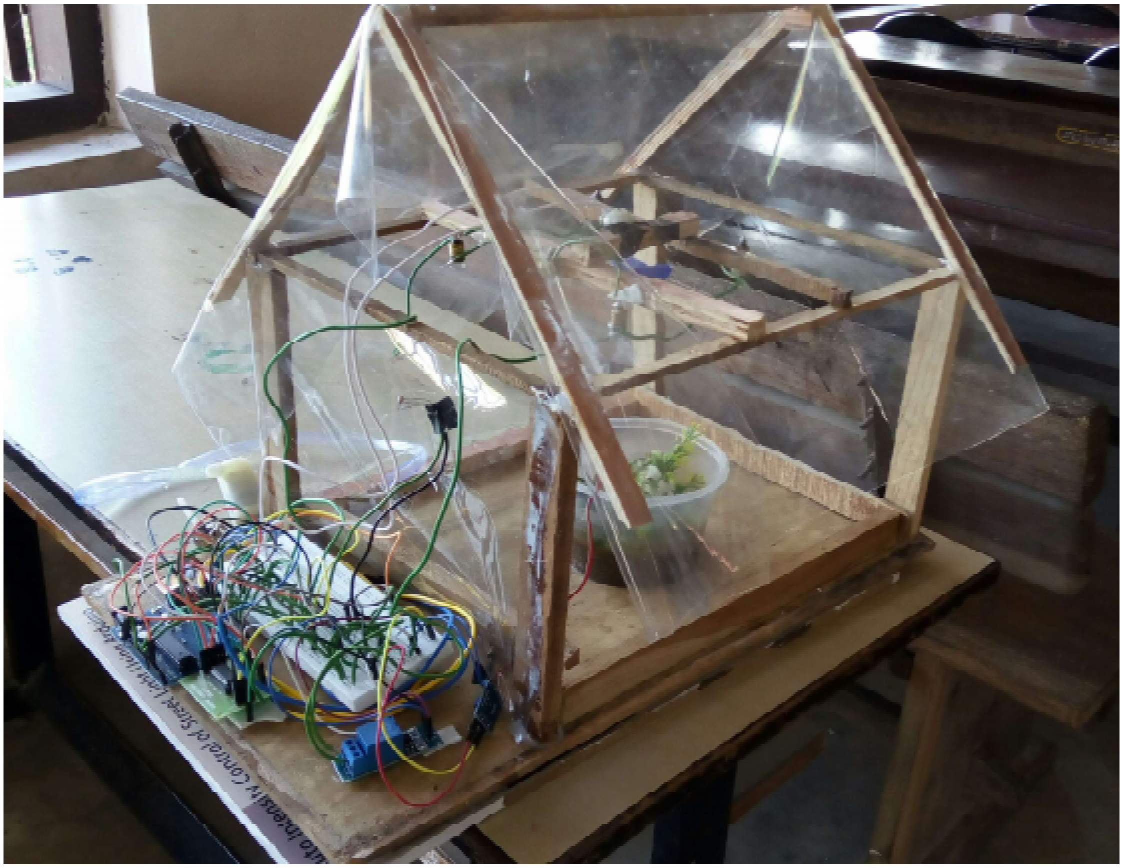
Arduino monitors the sensor outputs continuously. The output of the soil moisture sensor increases as the soil becomes dry. Arduino reads the outputs of the soil moisture sensor, compares it with an upper and lower threshold values and determines whether the soil moisture is high (H), medium (M) or low (L). The output of light sensing circuit increases with increase in light intensity. Arduino reads this output, compares it with an upper and lower threshold values and determines whether it is high (H), medium (M) or low (L). The output of the temperature sensing circuit decreases with increase in temperature. Arduino reads and using Steinhard equation, converts it into the corresponding temperature. Then the status of soil moisture content, light intensity and value of temperature are displayed in the LCD display.

If the soil moisture is low i.e., if the output of the sensor is above an upper threshold value, a pump is turned on so that it irrigates the soil. Thus the soil moisture content increases, the output of the sensor decreases and when it falls below a lower threshold value, the pump is turned off. If the temperature goes above a threshold value, a fan is turned on so as to cool the interior of the greenhouse. When the temperature falls below this value, the fan is turned off.

If the light intensity goes below a threshold value, DC bulbs are turned on and when the light intensity becomes normal, the bulbs are turned off.

The status of the pump, cooling fan and the bulbs are then displayed on an LCD display

PROTOTYPE



CHALLENGES

- Greenhouses in India are being deployed in the high-altitude regions where the sub-zero temperature up to 4O0 *C* where conditions for plant growth are hostile. The existing set-ups primarily are ;
- MANUAL SET-UP ; Time consuming, vulnerable to human error and hence less accurate and unreliable.,system consistency, outside influences
- PARTIALLY AUTOMATED SET-UP; It reduces the labor involved in terms of irrigating the set-up. keeping good rate of transpiration, condensation is a bitter task
- FULLY- AUTOMATED; sophisticated set-up, not completely automated and expensive.

SOLUTION

- The proposed system is an embedded system which will closely monitor and control the microclimatic parameters of a greenhouse. The system comprises of sensors, Analog to Digital Converter, microcontroller and actuators.
- Sensors sense the change in any of the above mentioned climatic parameters. The microcontroller then performs the needed actions.
- Thus, this system eliminates the drawbacks of the existing set-ups mentioned in the previous section and is designed as an easy to maintain, flexible and low cost solution.

FUTURE SCOPE

Automated greenhouse monitoring system can be improved in many ways and can be used in wide applications. Non-conventional energy source such as solar panels, wind mills, etc. can be used to supply power to the automated greenhouse monitoring system equipments. It can also be improved in such a way that the status of the sensors and control devices gets stored in a database can be viewed by the user using a website. Additionally, sensors to measure the nutrient levels in the soil can be used to sense and control same in the same way soil moisture is controlled. It has a bright future in agriculture field and it will create a revolution on it.

ARDUINO PROGRAMMING CODE

```
#include <OneWire.h>

#include <DallasTemperature.h>

#define ONE_WIRE_BUS 8 //temp sensor

float sensorValue=0;

int LDRValue = 0 ;// result of reading the analog pin

int RelayPin =9 ;//relay pin

int sensorPin=A0;//moisture sensor

float temp = 0.0;                    // variable to store the measured temperaturevariabele (float = floating
point number)

int oneWireBus = 12;

OneWire oneWire(oneWireBus);           // 1-wire instance on the oneWireBus pin

DallasTemperature sensors(&oneWire);    // give the OneWire instance as parameter to the
DallasTemperature library

const int ledPin = 12;//LED light


const int ldrPin = A1;//LDR value read from this pin




void setup() {




  pinMode(RelayPin, OUTPUT);

  pinMode(ledPin, OUTPUT);
```

```
  pinMode(ldrPin, INPUT);


  Serial.begin(9600);
  sensors.begin();
}



void loop() {



  sensors.requestTemperatures ( ) ;  // Sending the commands to get the temperature values from sensor



Serial.print("Temperature: ");
  Serial.print(sensors.getTempCByIndex(0));
  Serial.print((char)176);//shows degrees character
  Serial.print("C  |  ");

  //print the temperature in Fahrenheit
  Serial.print((sensors.getTempCByIndex(0) * 9.0) / 5.0 + 32.0);
  Serial.print((char)176);//shows degrees character
  Serial.println("F");
 sensorValue=analogRead(sensorPin);//moisture sensor
```

```
  if (sensorValue>550){

    digitalWrite(RelayPin, HIGH);
    delay(3000);
    digitalWrite(RelayPin,LOW);
    delay(3000);
   }
int ldrStatus = analogRead(ldrPin);

if (ldrStatus <=300) {

digitalWrite(ledPin, HIGH);

Serial.println("LDR is DARK, LED is ON");

}

else {

digitalWrite(ledPin, LOW);

Serial.println("LDR is Not DARK, LED is OFF");

}
```

```
delay(5000);

}
```