A
Mini Project Report
On

Greenhouse Weather Monitoring System

Bachelor of Engineering
Electronics & Telecommunication Engineering

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BADNERA-AMRAVATI

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Certificate

This is to certify that the project entitled

Greenhouse Weather Monitoring System

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Abstract

Weather plays an important role in our farming system. In greenhouse or internal farming system, weather monitoring is important. For better production and maintenance, it is important to monitor. This project is developed for forecasting weather parameters like Temperature, Humidity, Soil Temperature, Soil Moisture, Lux Level and Rain Detection.

Temperature and Humidity are monitored for internal weather of greenhouse. The soil is the most important part of a greenhouse and farming also. In this project, Soil Moisture Level and Temperature is monitored for taking care of soil. We monitoring Lux Level (Light Intensity), Because light is equivalently important for growth of plant. This is an ideal situation for greenhouse production. Plants have an optimal intensity of light. This is the point at which the process of photosynthesis is maximised and plant growth is greatest. If the Lux Level is less, growth is reduced.

No matter the size of your greenhouse, installing a rainwater catch system is logical step. This is an innovative solution to reuse naturally occurring rainfall. These water-efficient systems collect rainwater from the roof of your greenhouse and divert it into a storage tank for later use. For storing rainwater, we used rain sensor by which we detect rain.

We will be displaying data on LCD Display and also on Mobile using Bluetooth. It is a low-cost weather monitoring system for greenhouse. In this project weather forecasting system is designed by using a sensor. It is useful for forecasting and data analysis process.

Introduction

Weather describes the atmospheric condition at a place over a short duration of time. Weather is defining different variables, such as temperature, humidity, air pressure, and the wind. Weather or Climatic change plays an important role in human life.

Weather monitoring is important for our household, farming to the industrial environment. There has been always a huge importance of

climate for human life and to develop agriculture to its observation. Nowadays, there are many automation systems and weather forecasting systems all over the world collecting the environmental parameter continuously for forecasting. Weather plays an important role in agricultural production. It has a profound influence on crop growth, development, and yields, on the incidence of pests and diseases, on water needs, and on fertilizer requirements. For more production, a farming system needs real-time monitoring and update of soil moisture, rain detection, and different data analysis. The monitoring system could be design based on Arduino Nano.

For better production and harvesting rare crops and fruits, farming system needs real time weather update. This weather monitoring system can get update of temperature, humidity, soil moisture rate, Soil temperature, Light intensity and rain detection analysis. Sometime weather climates can change unfortunately or soil needs more water or remove water, so that this device can detect this problem and give update to farmer for quick solution. This proposed system has five sensors which can detect temperature, humidity, soil moisture, soil temperature, light intensity and rain detection measurement from analog to digital. Arduino Nano will receive readings from various sensors and then process the data and then data will be available on LCD display and on mobile application

Monitoring system could be design by using sensor. It is useful for forecasting and data analysis process. Processing, analysis and transfer of data is very important for aspect of measurement. The main aim of this paper is to design and develop a weather monitoring system using Arduino Nano. This device or monitoring system fetches weather condition like temperature humidity, soil moisture, soil temperature, Light intensity and rain detection. Knowing the exact soil moisture conditions on their fields, not only are farmers able to generally use less water to grow a crop, they are also able to increase yields and the quality of the crop by improved management of soil moisture during critical plant growth stages.

Objectives

The objectives of the study are:
- To develop a Greenhouse Weather Monitoring System for greenhouse better farming.
- To make an interface for monitoring the temperature, humidity, soil moisture rate, soil temperature, light intensity and rain detection.
- To get the real time weather condition of a greenhouse.

Literature Review

The development and implementation of cost-efficient and reliable greenhouse weather monitoring system. Here we used Bluetooth module to transmit data to the mobile application. Also, we have use LCD display to show data. The Arduino Nano take analog and digital data from different sensors like DHT11, LDR, DS18B20, etc., process it and convert it into digital values. After that data is shown on LCD display. Also, data is transmitted through Bluetooth connectivity to the mobile application. Here we used I2C Communication to transmit data from Arduino Nano to LCD display. Data Parameters are Temperature, Humidity, Soil Temperature, Soil Moisture, Light Intensity and Rain Detection.

"Real Time Weather Monitoring from Remote Location Using Raspberry pi" proposed a system for Real time weather monitoring using Raspberry pi, it will measure various weather parameters like temperature, light intensity, atmospheric pressure, Gas/smoke level using appropriate sensors interfaced with Raspberry Pi, it uses wireless technology to provide real time data transfer. The project deals with designing a simple, highly efficient, cost effective and easy to operate Real time weather monitoring system. Using a database to raspberry pi this project can access from anywhere (Vijayalakshimi, K & Lakshmi, G.V, C 2016).

"Raspberry Pi Based Weather Monitoring System" proposed a system that visualize the parameters of weather variables. To know the current weather condition at remote location this system is design for. Proposed System will visualize and store various weather parameters as given above with the help of sensors interfaced to Raspberry will get

al l data, SD card on Pi stores the collected data as like memory card (V. Rasal, M & G. Rana, J, C 2016).

"An Intelligent Weather Station" presented an intelligent weather station for forecasting different variables of weather. To predict and analysis weather variables from anywhere. The hardware and software design of the implemented prototype are described the forecasting performance related to the three atmospheric variables, atmospheric pressure, humidity, temperature (Mestre et al. 2015).

"Weather Monitoring Using Raspberry Pi Viva Web Application" proposed an environment monitoring system. This system also capable of monitoring and control of environmental parameters like temperature, pressure and humidity. It also focused on low cost. This system uses Wireless sensor Networks for sensing the environment parameters in the area under supervision (Vasantha, J & Basha, M, 2016).
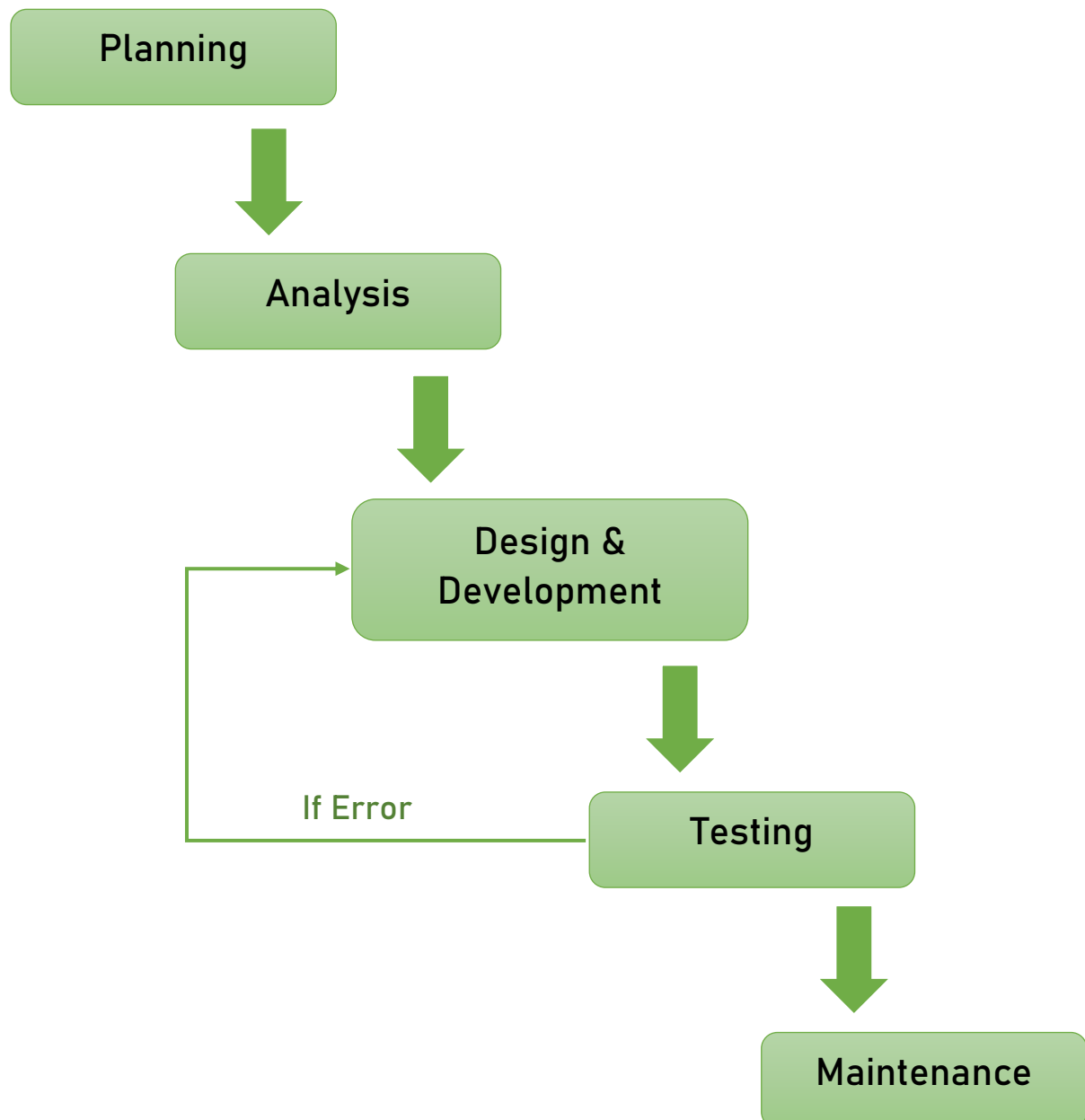
"Soil and water analysis techniques for agricultural production" proposed parameters used for the efficiency analyses in soil moisture levels. It also analysis the soil moisture level. In this paper, it discus about soil moisture, texture and average moisture value (Maral. N, 2010).

"An Effective Method for Soil Moisture Sensing using Arduino Uno and Ins. Tabassum, A. Hossain DOI: 10.4236/ica.2018.93005 68 Intelligent Control and Automation terracing with GSM Sim900" proposed that soil sensors are used to measure the volume fraction of water in soil. A soil moisture sensor detects the water level and provides information to accordingly control the supply of water. Also, different crops require varying amounts of water for cultivation. Here it also measures the moisture value according to the water level (Panigrahy. A et al., 2016).

"Arduino Based Automatic Plant Watering System" proposed that an artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas. A high relative humidity (above 80% – 85%) should be avoided because it can increase the incidence of disease and reduce plant transpiration. In that percentage of moisture water supply must be ignored (Devika. S et al. 2014).

Methodology

Methodology is asset of ides or guidelines about the existing process. It is the process about how to collecting and validating knowledge of subject matter. Following is a diagrammatic representation of different phases of proposed methodology.

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┌─────────────┐
│  Planning   │
└─────────────┘
       │
       ▼
  ┌──────────┐
  │ Analysis │
  └──────────┘
        │
        ▼
   ┌──────────────┐
   │   Design &   │◄──────┐
   │ Development  │       │
   └──────────────┘       │
         │                │
         ▼          If Error
    ┌──────────┐         │
    │ Testing  │─────────┘
    └──────────┘
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    ┌──────────────┐
    │ Maintenance  │
    └──────────────┘
```

Methodology of proposed model

Block Diagram
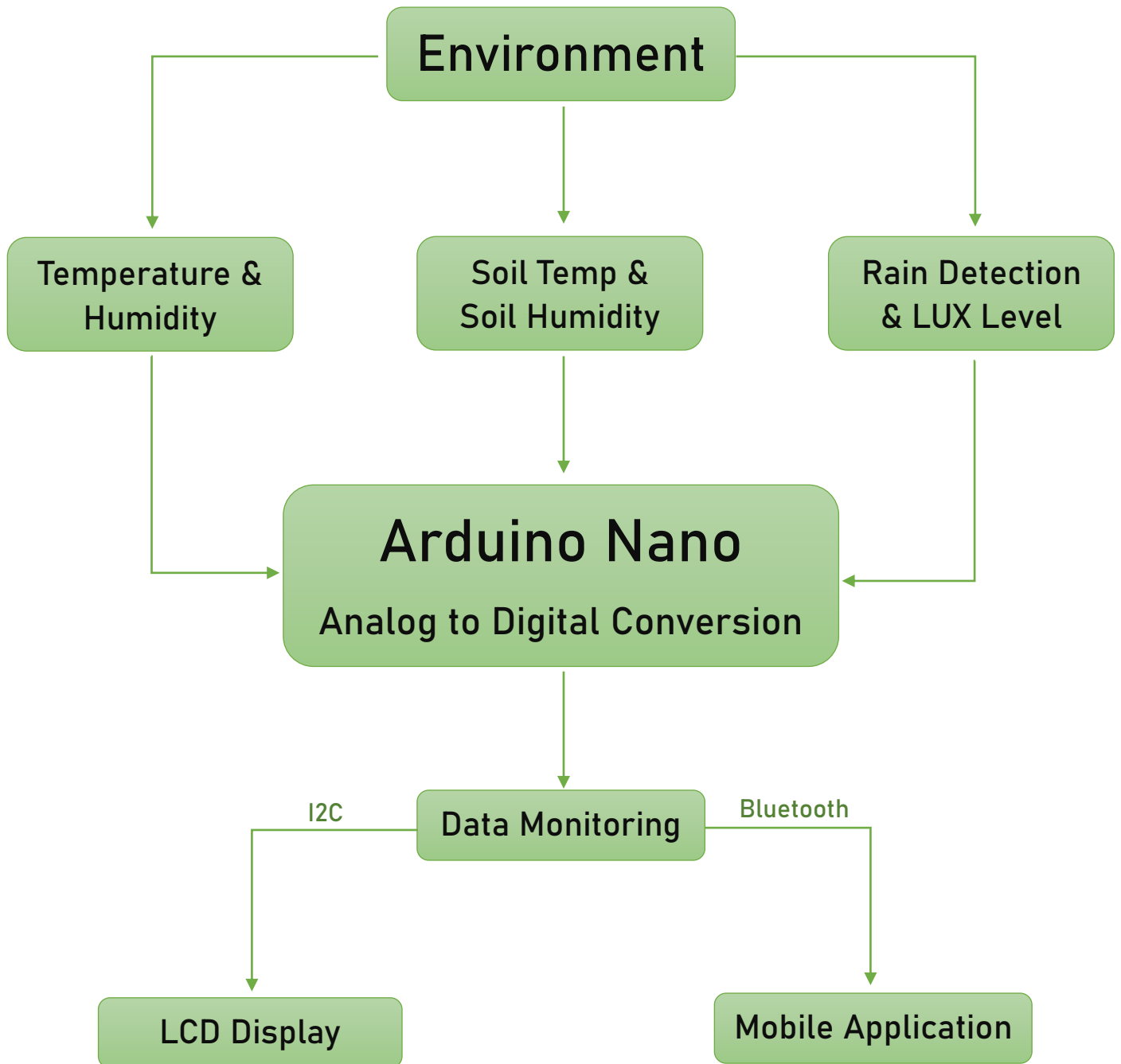
Block diagram of proposed model

Hardware Requirements

1. Arduino Nano Board

2. LCD Display

3. DS18B20 Temperature Sensor

4. DHT 11 Temperature & Humidity Sensor

5. Capacitive Soil Moisture Sensor

6. HC-05 Bluetooth Module

7. LDR Sensor

8. Other components

Software Requirements

1. Arduino IDE 2.0 Software

2. PCB Designing Software

3. Mobile Application

Project Description

In this project, Arduino Nano work like a remote weather monitoring system for a greenhouse farm. Weather parameters like humidity, temperature, soil moisture, soil temperature, light intensity and rain detection is monitor for better performance and production. Arduino receive data from different sensor, manipulate and process it and display it to LCD display using I2C communication and also, send to mobile application using Bluetooth connectivity. Soil moisture is controlled by according their value of moisture level.

We don't get any mobile application readily available on play store or any other platform that's why we develop an application on "MIT App Inventor" using MIT App Inventor tags. This app will receive data from Arduino using Bluetooth connectivity and display in proper manner. In result section we have given image of app.
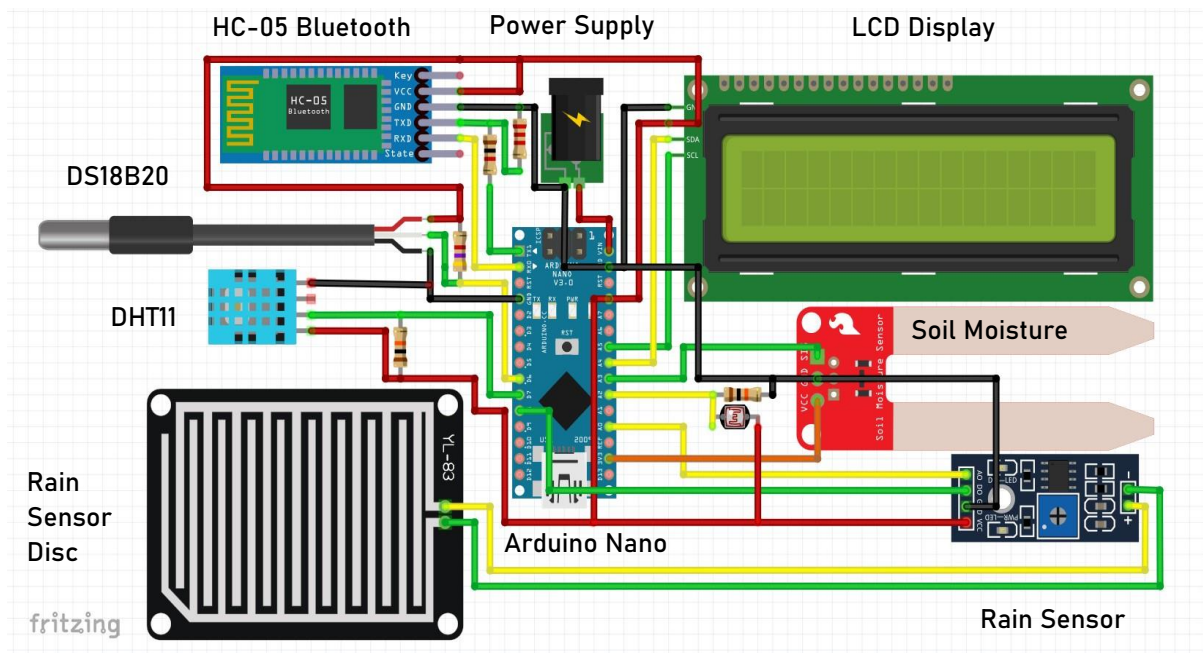
Connectivity of the Project
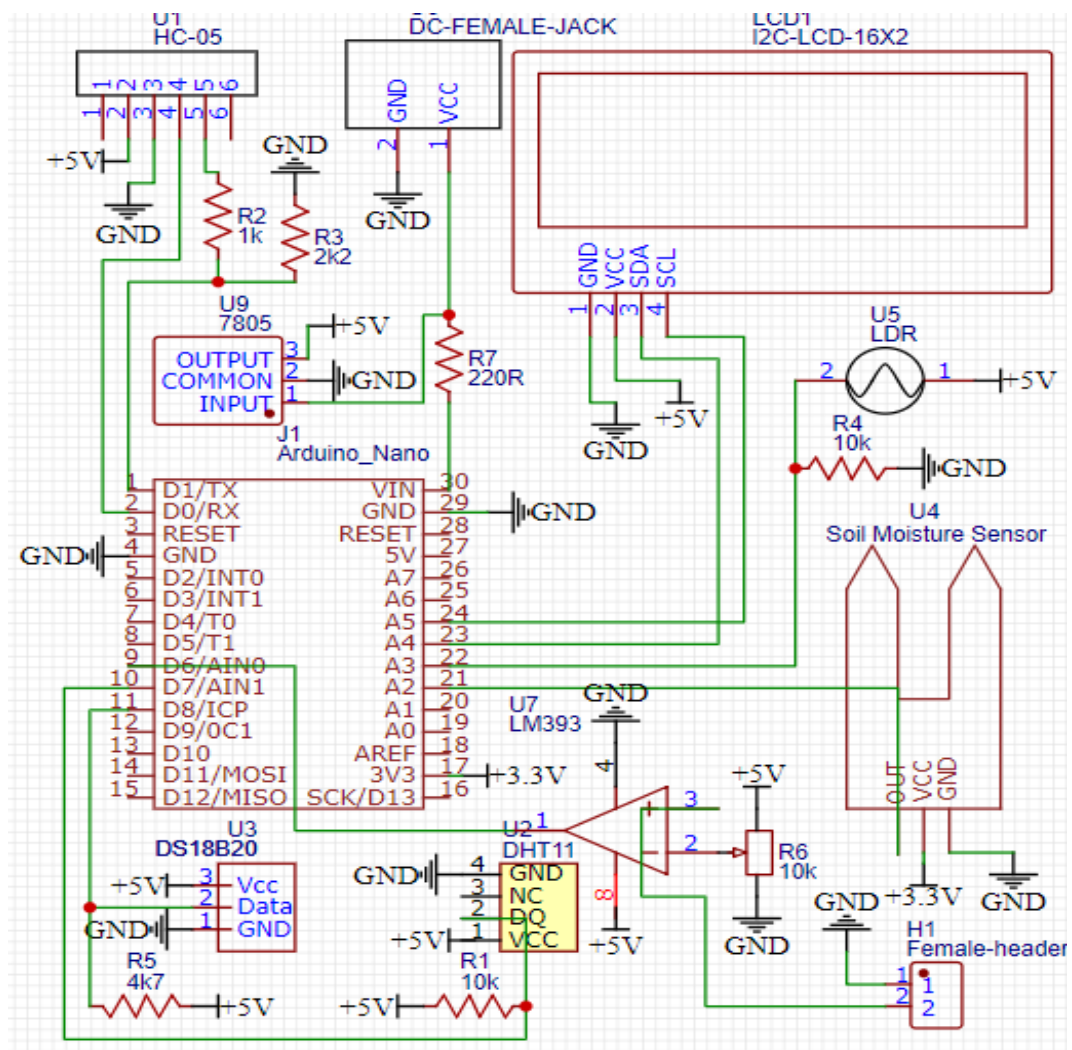
Circuit diagram of the Project
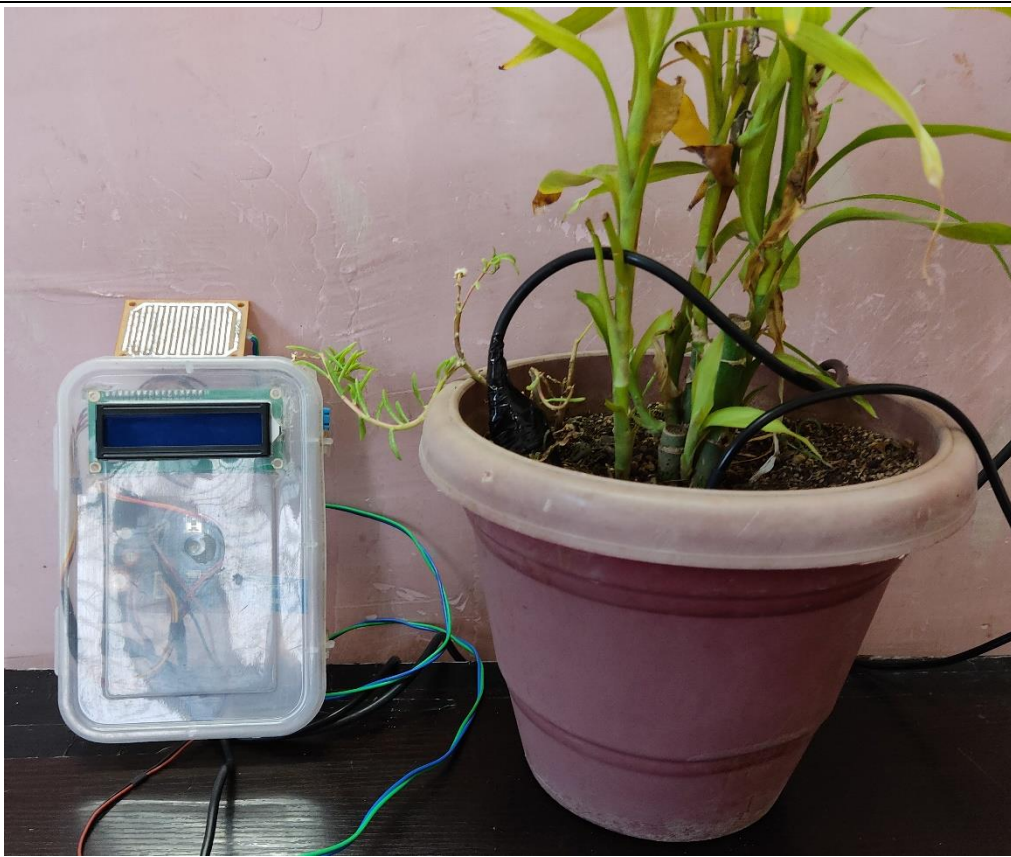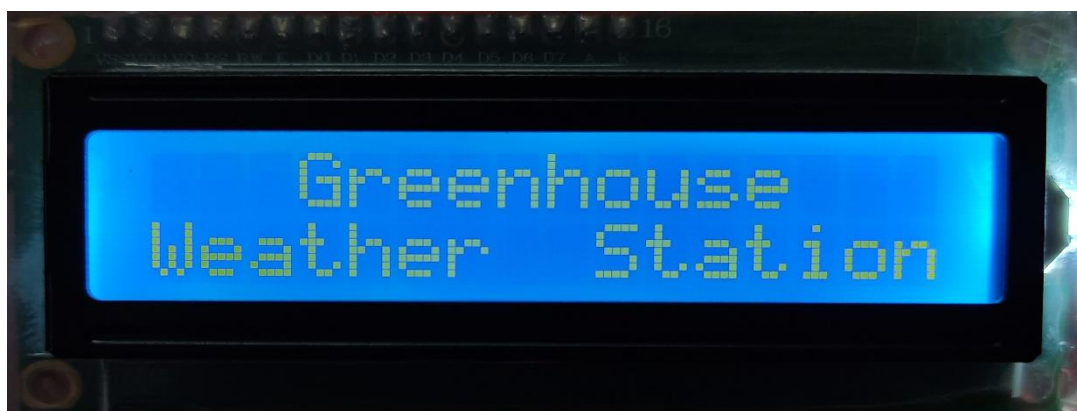
Demo photo of the Project

Demo photo of the Project

Demo photo of the Project

Result

Surrounding Temperature

Surrounding Humidity

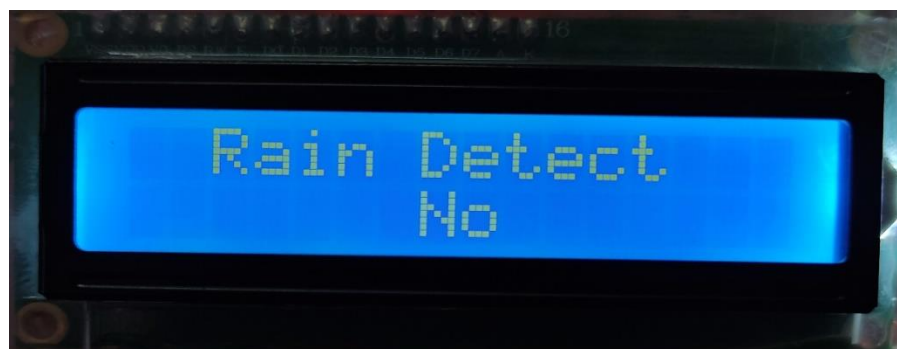Soil Temperature

Soil Moisture before watering
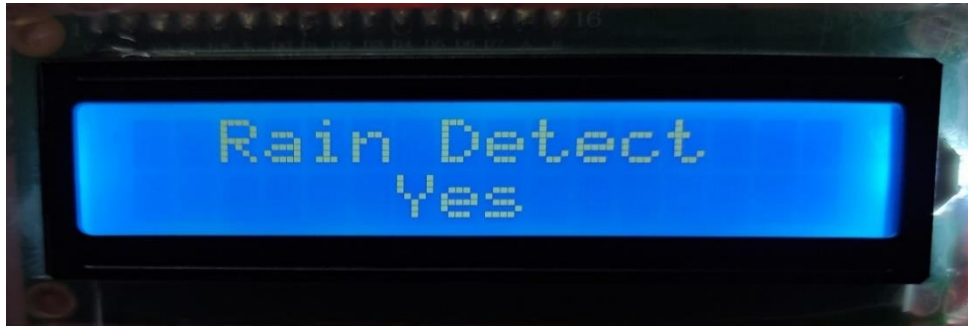
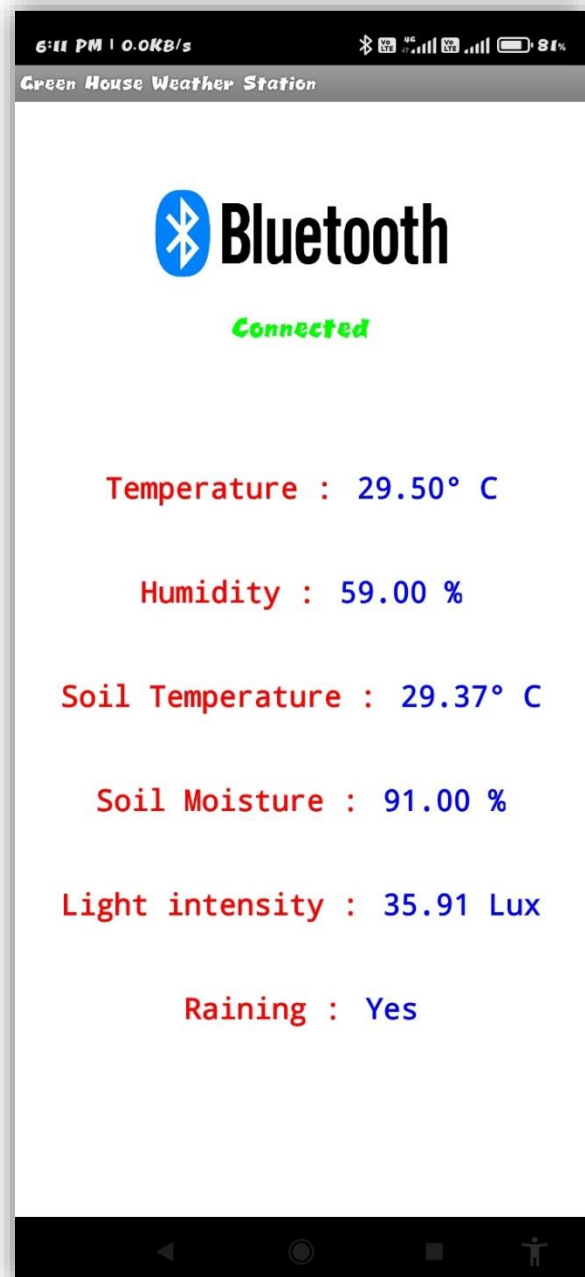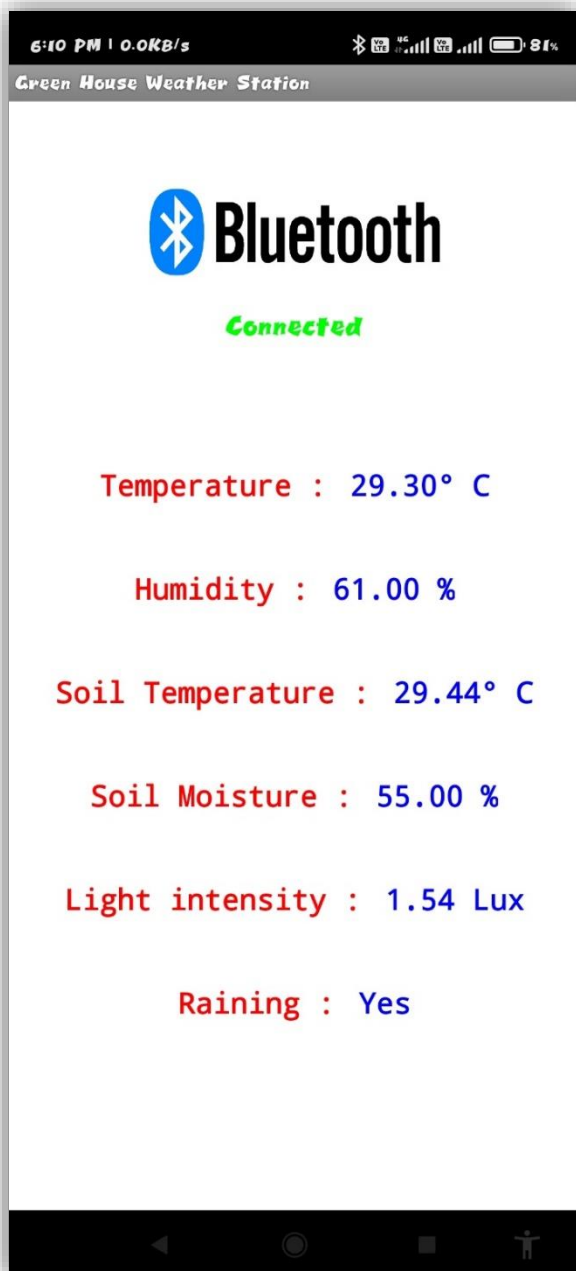Soil Moisture after Watering

Lux Level inside shade

Lux Level outside shade

Rain Detection while not raining

Rain Detection while raining

Receiving Data on Mobile App

Conclusion

The Project is design and developed for weather monitoring system. The Greenhouse monitoring system was able to monitor variation in Temperature, Humidity, Soil Temperature, Soil Moisture, Light Intensity and Rain detection.

The proposed system will enable small scale farmers to plant healthy crops all round with little supervision.

Future work

In future this project can be developed further and it can also give more effective result in real life application.
- From one-week observation, the weather parameters value can be used for weather prediction for upcoming days.
- Increasing sensor for more effective result.
- To develop mobile application for forecasting weather from anywhere in
the world.
- To develop a gateway system for weather forecasting and controlling system.
- To develop a system for controlling multiple nodes from one gateway.

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