A SMART ENVIRONMENTAL MONITORING SYSTEM FOR MAXIMIZING THE PRODUCTION OF VERMICOMPOST ORGANIC FERTILIZER

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled "**A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer**", submitted by All Mehedi Hasan Sagor, ID No: 181-15-11219 and Syeda Suria Fatema, ID No: 181-15-11319 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 04/01/2022.

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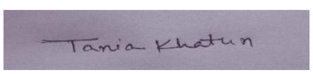

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We hereby declare that, this project has been done by us under the supervision of Dr**. Fizar Ahmed, Assistant Professor, and Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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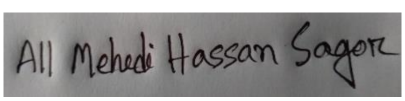

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ABSTRACT

With the increase in the fields of embedded, the people interruption has become less and embedded fields of a project are being broadly used for a security plan. Crop production in our country is a major field because most family depends on it. Many people don't know when they have to provide water and fertilizer to their fields. We can boost the production of crops. In such a case, we've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors. A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer system will be the next future of agriculture sector. This system will be installed in crops field and it detects the moisture level and help us to provide water at the right time, as a solution to monitor moisture level, cost-effective remote sensing of soil moisture for supporting crop production system is developed. We use a moisture Sensor which is a generic moister sensor used to detect the moisture level of the field. The Module has Digital Out and Analog Out. It Detects moisture levels for crops field. Once the moister sensor detected low moisture then it interconnects the motor driver and the mini water pump turns on. Also, OLED will show the Humidity, Moisture, pH, Temperature level which can be monitored by the users. By continuing this process this device will help us by informing the whole natural situation of a crop field and providing informative information so that we can grow more crops.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

By using Arduino Uno, Motor driver, NodeMCU, etc. We can make an embedded system that controls a situation. The motivation of the thesis is to generally to overwhelmed the shortfall of this occurs condition.

1.2 Inspiration

Our modern time is a time of technology. Humans are becoming more dependent on embedded systems. Days passed, this dependency is increasing exponentially. Many farmers of our country don't know when they have to give water to their crops field for this the crop production decreasing day by day. So we decided to make a design that can boost it. For these circumstances, we’ve done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors? A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer system will be the next future of agriculture sector. This system will be installed in crops field and it detects the moisture level and help us to provide water at the right time. We developed cost-effective remote sensing of soil moisture for supporting crop production systems. We call it in the remote sensing of soil moisture for supporting crop production systems.

1.3 Objective

A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer using moisture sensors and a mini water pump to provide water to the crop field. A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer using moisture sensor, Arduino Uno Motor driver module. This project is used for the moisture level detection, once the moisture level decrease then the mini water pump will turn on to full fill the moisture level, or if the moisture level is ok then the mini water pump will remain shut down. The NodeMCU and moisture sensor interfacing with Arduino Uno or Mega are simple. At last, the OLED will display the Humidity, Moisture, pH, Temperature level [1].

1.4 Estimated Outcome

Crop production in our country is a major field because most family depends on it. Our developed product's primary outcome will be to make the user grow more crops by providing water at the right time on the field. Mainly this product demands a large advance development and a big range of agriculture field system. For this matter, it might be wealth observing that how the outcome of the project is exactly verifying embedded system arrangement to refine the production's combination to make this involuntary factor.

1.5 Draft of the Report

Mainly discussing motivation, objectives, and goals briefly is the purpose of this chapter. Besides that, the user can monitor the moisture level, and then the motor will turn on to full fill the moisture of the crop field. It has summarized the "A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer system" [3].

CHAPTER 2
BACKGROUND

2.1 Introduction

In this section, we discuss numerous investigation work complete by manipulative and construction machines, soil identification. An Embedded system makes or designs a module or a machine that can perform a task by programming. The Embedded system is a program update day by day. Qualification is one of the most noticeable challenges. Making the embedded system visually attention-grabbing will always remain a core feature. Stipulation clenches the embedded system's topic, and a large scale of opportunities are available for the qualification of the embedded system.

2.2 Interrelated Work

Implement remote sensing of soil moisture [2]. There have some embedded systems based on other objectives. But, our system is only based on realistic automated many effective features to facilitate the system. This system is a fixed device and it will be installed in the agriculture field. From the foundation, we were concerned in embedded systems and desired to improve some embedded system. So, we chose this Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer system to develop, related lessons to the use of the embedded system in crop productions so that farmers can produce more crops and we can full fill our basic requirement of the food sector. A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer is a device to monitor the environment level of surrounding agricultural field, and its given instruction to control that device with given command, functions that are involved in the embedded system may concern to show a discrepancy for sustaining tasks like identifying, monitoring, conditions, controlling [4]. This portion offers a summary of the embedded system which is developed to show moisture level along with certain strategy aspects for this embedded system. The embedded system has been developed for moisture level detection, fixed system, etc.

2.3 Comparative Studies

Using this system, people can install A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer systems in the crop field. On this device, OLED will show the Humidity, Moisture, pH, Temperature level which can be monitored by the users. If the moisture level decrease then the mini water pump will turn on to full fill the moisture level, or if the moisture level is ok then the mini water pump will remain shut down [5]. People also use the NodeMCU which will control the Humidity sensor, Moisture sensor, pH sensor, Temperature sensor accordingly.

2.4 Opportunity of the Problem

Moisture level detection and proper guidelines for the crops field perilous task. We can take some measures by this embedded system to make sure that people can measure the temperature, moisture, humidity, and grow specific crops to their field. Certain related departments have already tried to develop and deploy A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer in a less complex way [8]. Still, the performance of the product is not an adequate amount of satisfaction. Mainly this project is examined from two points of opinion: “price and performance” and “weight and size”. To conclude, the system should make it possible to grow more crops and detect the moisture level.

2.4.1 Estimated Time Preparation

Table 2.1 Time preparation

Preparation	27 days
Project & Study	70 days
Code	15 days
Trying & Implementation	35 days
Complete	147 days

2.5 Contests

No matter what we are saying, the demand for advanced technology is swelling day by day. There is no stopping to it. Individuals are improving the overall product rates with a high amount of productivity. This might be a better solution to a difficult problem, but it is not enough without its efficiency to meet the challenges. We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors? A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer will be the next automation system in the agriculture sector. In this project, we detect the moisture level and turn on or off the mini water pump which attaches with Arduino We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors?

2.6 Experience and skill

We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors? A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer will be the next automation system in the agriculture sector. In this project here the system interacts with the Humidity sensor, Moisture sensor, pH sensor, Temperature sensor and turn on or off the mini water pump which attaches with Arduino.

2.7 Free of Technology

Paying for an embedded system consummate can be a lavish endeavor for the big agriculture field. Sometimes small things can't withstand the cost. For the warfare of this, various corporations are proposing embedded systems as a provision. Embedded system can be used to the agricultural field. We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors? Which will be the next future of embedded systems? This Smart environmental monitoring system for maximizing the production of vermicomposting organic fertilizer will be the next automation system in the agriculture sector.

CHAPTER 3
REQUIREMENT ANALYSIS

3.1 Flowchart model

It is graphical flowchart representations of our project work.

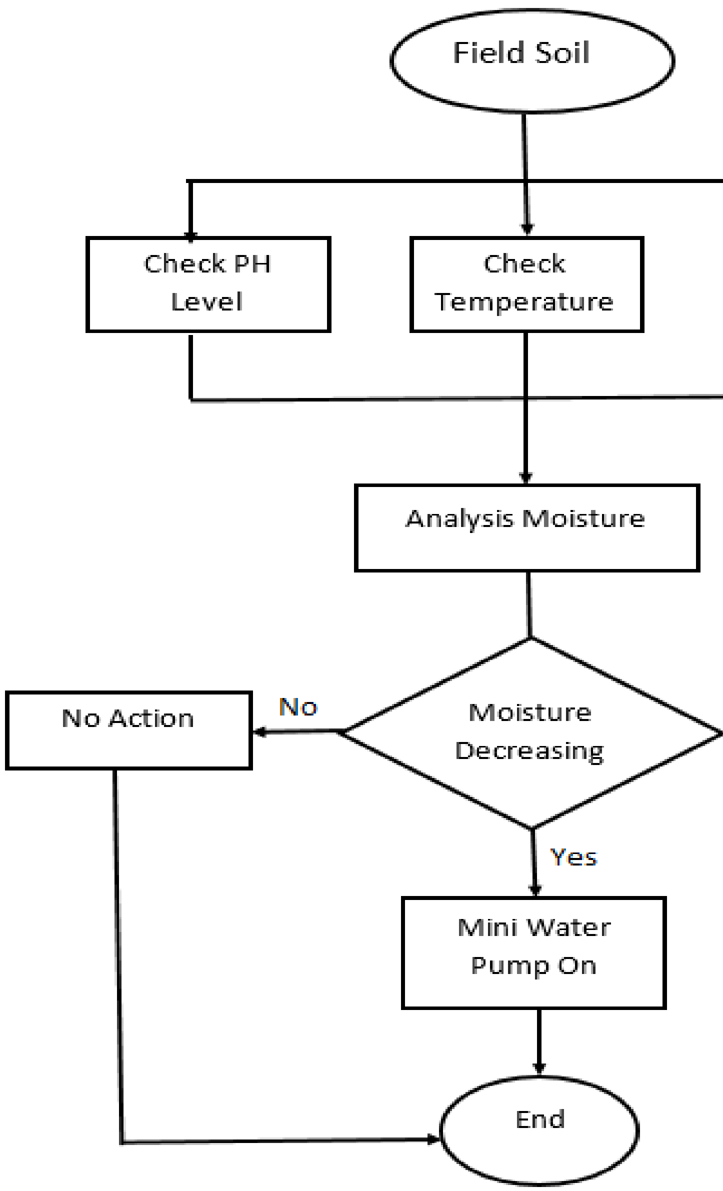

Figure 3.1 Flowchart Model

3.2 Requirement collection: Requirement Collection basically define as that kinds of equipment we implement to fulfill our project. Here are the list of project devices which we use to complete our project.

3.2.1 User requirements:

Table 3.1 User Requirements

OLED	Jumper Wire	Mini water pump	pH sensor
A2B Cables	Laptop	Adapter	NodeMCU
Arduino Uno	Chases	Pin	Humidity sensor
		Hard Board	Moisture sensor
		Motor driver	Register
			Temperature sensor

3.2.2 Arduino Uno

Figure 3.2 Arduino Uno

This Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer will be the next future of automation system on industry and agriculture. In this project we have interacts the system with Humidity sensor, Moisture sensor, pH sensor, Temperature sensor and activate the mini water pump which attach with Arduino. The Arduino has an electronic prototyping platform based on Atmega AVR Microcontroller. It Operates on +5 Volts. It have 14 Digital pins in total. Its have 6 Analog Input Pin. It has Flash Memory of 32KB and 1KB EEPROM. This is Serial Communication enabled.

3.2.3 LED Light

Figure 3.3 LED Light

LED is a kind of semiconductor. When electrons pass through the semiconductor then the LED will light up. LED lights are more efficient compared to incandescent and CFL bulbs.

3.2.4 Adapter

Figure 3.4 Adapter

We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors. We will have a system that will use an adapter. This is a basic tool used to interconnect the whole system. An adapter converts attributes of one electrical device or system to those of an otherwise incompatible device or system.

3.2.5 Mini Water Pump

Figure 3.5 Mini water pump

We’ve done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors. A mini submersible water pump is used to supply the water depending to crop filed moisture. This mini water pump is design to rotate the push water outwards to turn on water pump [6].

3.2.6 Jumper ware

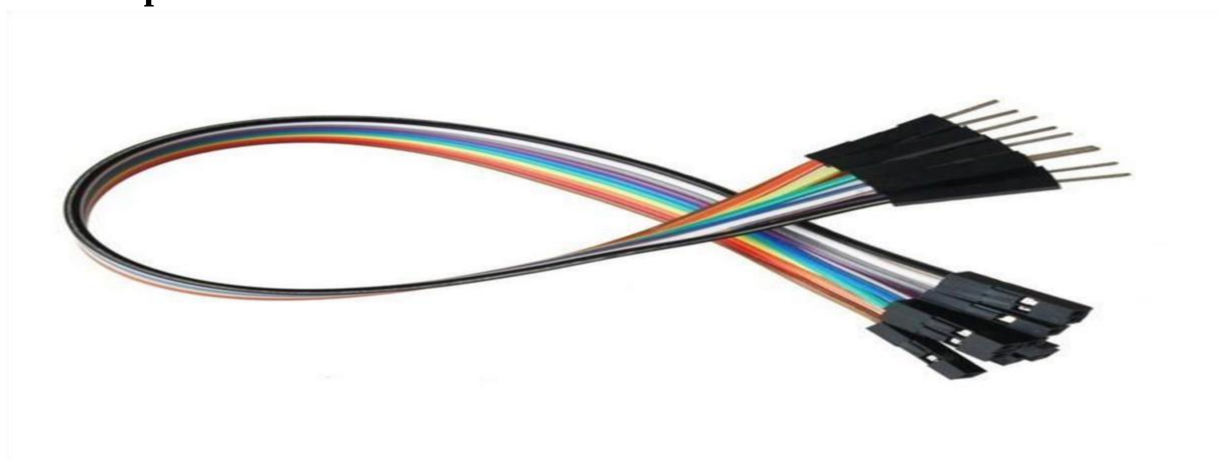

Figure 3.6 Jumper Wire

A jumper wire is a type of electronic wire, which also can be joint with group of cables. Jumper wire have connectors at both point of the wire which connect components and device to PCB board and breadboard. Where the other equipment or components will be attach with jumper wire.

3.2.7 NodeMCU

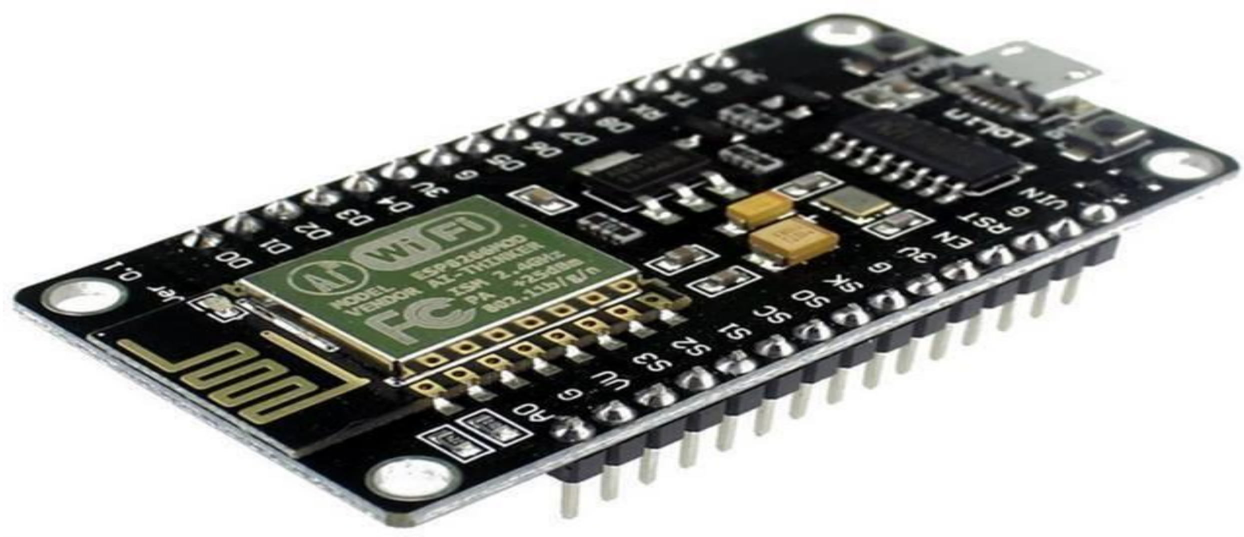

Figure 3.7 NodeMCU

We use a NodeMCU in product to make sure that it will interconnect. In our A Smart environmental monitoring system for maximizing the production of vermicompost organic fertilizer project we are using this NodeMCU. Here in our project for internet control over Humidity sensor, Moisture sensor, pH sensor, Temperature sensor. The pH sensor detect the moisture of the crops filed by the helping of the NodeMCU.So we can say that this is an automation process by which when moisture detected then it turn on the mini water pump. When the moisture is back to shape then the mini water pump turn off and the whole activity is done by the NodeMCU. Here for controlling and connection of Humidity sensor, Moisture sensor, pH sensor, Temperature sensor valve we use 4 channel 5v relay module which is connected to the NodeMCU then we detect the moisture.

3.2.8A2B Cables

Figure 3.8A2B Cables

A2b Cables are used to connect the Arduino uno and to the computer port or battery port. This is used to correlation to the hardware to software. By using A2B cables we can set command through software and it work through hardware.

3.2.9 Humidity sensor

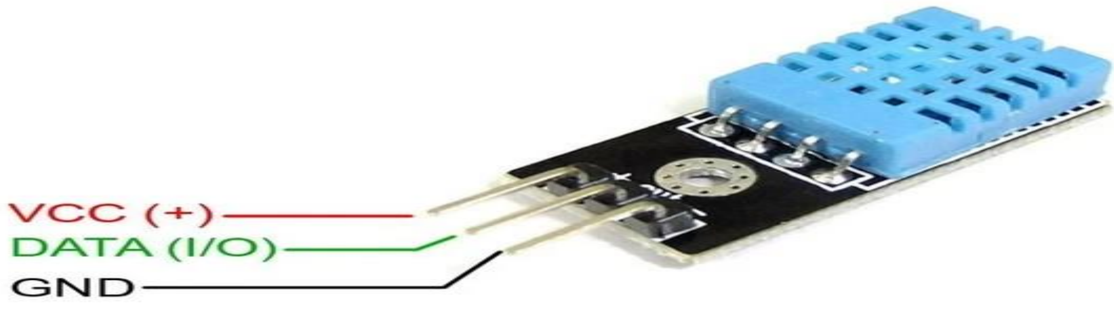

Figure 3.9 Humidity Sensor

We’ve done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors. Humidity sensor used to measure the humidity in its environment. It have two pins, one of them are positive and other is negative. Basically environmental humidity measure by the humidity sensor. Then the value level of the electrical signal convert to integer value to show integer value of the humidity levels.

3.2.10 Moisture sensor

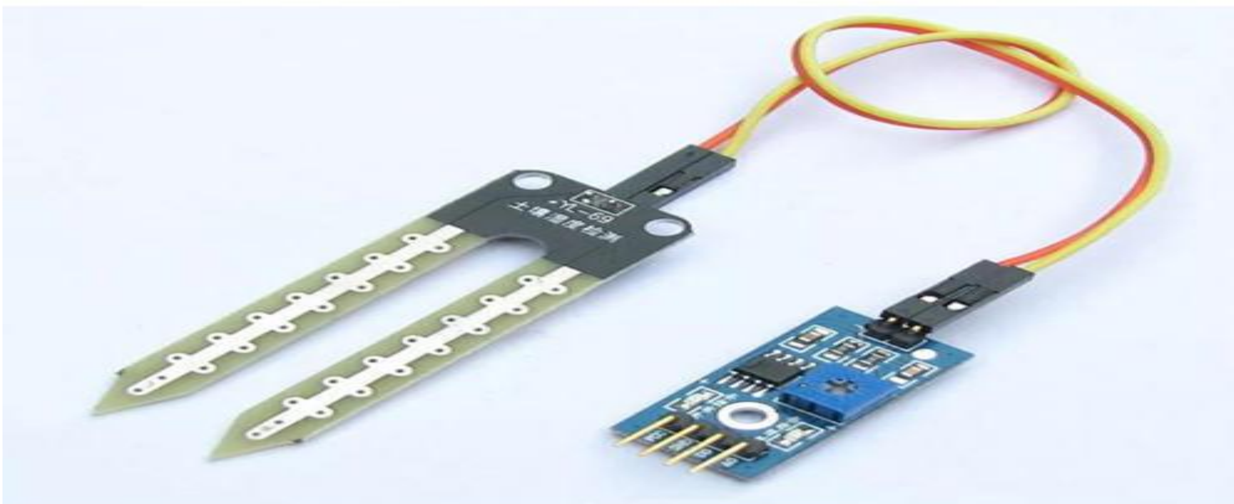

Figure 3.10 Moisture sensor

We’ve done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors. Moisture sensor to measure the water level of the field soil. The electrodes and electrical resistance measure the moisture level of the field. If the level of the moisture increase then the resistance decreases, other possibility happened for the reverse conditions. When the moisture level of the field decrease then the mini water pump will turn on, or if the moisture is ok then the mini water pump will remain off [7].

3.2.11 Motor driver

Figure 3.11 Motor driver

We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors. This Motor driver inter connect control circuits and the water pump motors. This motor driver convert low current to high current to run the motor [9].

3.2.12 OLED

Figure 3.12 OLED

Usually we use OLED to represent the level of Humidity, Moisture, pH, Temperature. In our device the OLED will view to the user. By using the OLED one can monitoring the Moisture level. If the level is high then nothing to worry but when the level low then one can use NodeMCU to connect mini water pump to take action.

3.2.13 pH sensor

Figure 3.13 pH sensor

We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors. Actually pH sensor works between the valuve to 0-14. If the value is less than 7 then it will represent acidity, if the value is more than 7 then it will represent base, or if the value stick to 7 then wil be consider as neutral value of pH. It's have hydrogen gas to detect the Mv (millivolts) as the hydrogen ions.

3.2.14 Temperature Sensor

Figure 3.14 Temperature sensor

We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors? Temperature sensor detect the temperature of its environment. Temperature sensor actually measure temperature on the environment and it transform to electronic data from input value. Among the contact temperature sensors are thermocouples and thermistors.

3.3 Description and Modelling:

We've done the embedded system design where we apply some significant and noteworthy design, which will be a big upcoming step to agriculture sectors. Basically we use NodeMCU which interconnect the Humidity sensor, Moisture sensor, pH sensor, Temperature sensor. In them when the moisture decries then the mini water pump will turn on and will full fill the need of water of the crop filed. On the other hand if the moisture level is fine for the crop filed then the mini water pump will remain shut down.

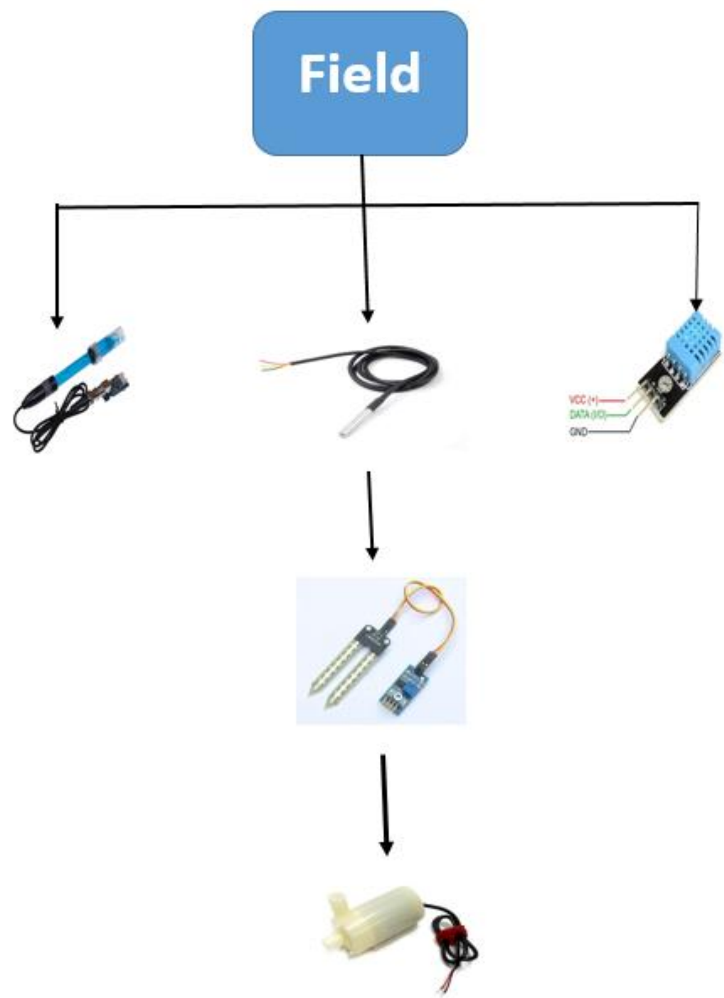

Figure 3.15 Modeling and Description

CHAPTER 4

Design Requirement

4.1 Front end Design

In frontend design we use virtual Arduino Uno and many other hardware devices which help us to build up the hardware design specification. Here we use virtual Arduino Uno, PH sensor, and Motor driver L298 MODULE, Jumper wires, Moisture sensor, Dht11 and NodeMCU.

4.1.1 Building Hardware Design

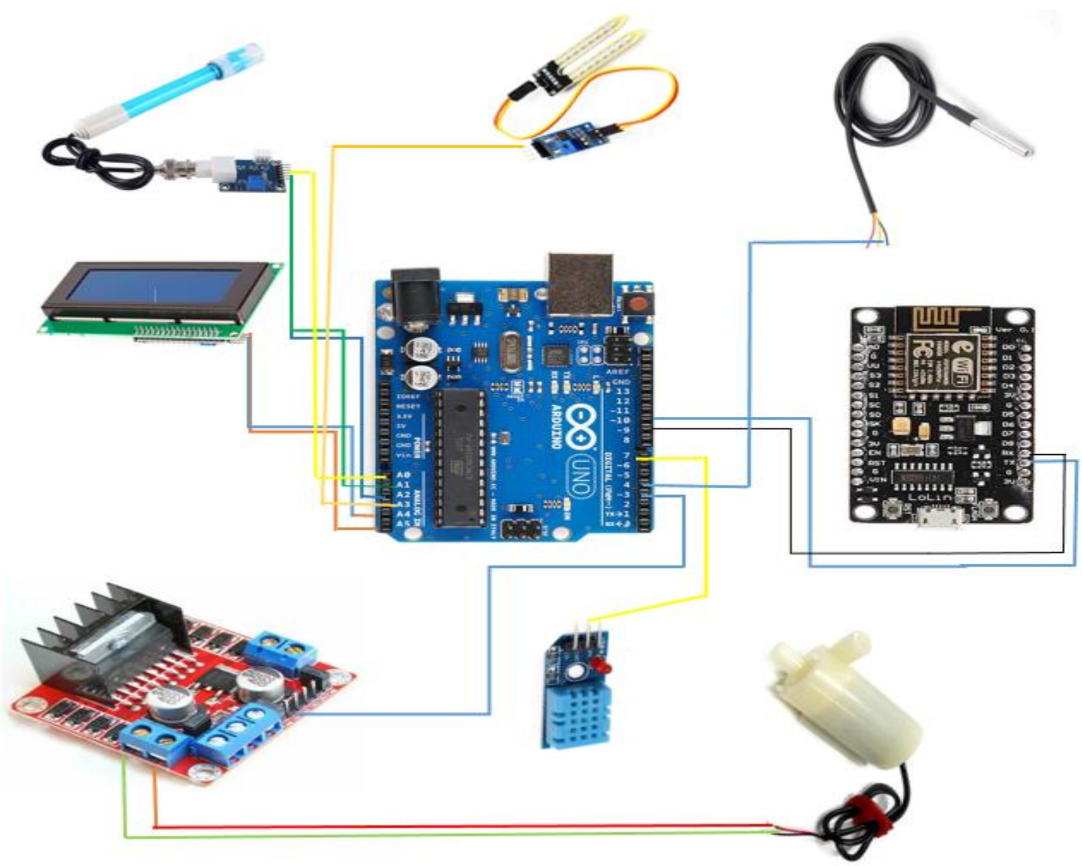

Figure 4.1 Frontend Design

4.2 Backend Design

In the backend design describe how the project will works in exception way, how the change will happen, how new function and logic will work. The programmer can create logical code and modify the program, and they can doing this whole things with the help programming languages C.

4.3 Required Implementation:

Here are all required implementation are given below.

Table 4.1 User Requirements

A2B Cables	Laptop	Adapter	NodeMCU
Arduino Uno	Chases	Hard Board	Register
OLED	Jumper Wire	Pin	Humidity sensor
		Mini water pump	Moisture sensor
		Motor driver	pH sensor
			Temperature sensor

CHAPTER 5
Implementation and Testing

5.1 Implementation of Apex end Design

We used Arduino Uno, PH sensor, Moisture sensor, DS18b20, jumper wire, male to male connector, male to female connector, bread board, Dht11. For the Implementation of Apex end Design we use Arduino Uno, Motor driver L298 MODULE etc. Here are the implementation of system design, for instance:

5.1.1 Arduino Uno to pH Sensor Connection

We did some important implement for the project. We have this system to detect moisture for the soil and grow specific crops on the field. This system are mainly used for the agriculture fields. At first we have connect the Arduino mega A0, A1, A2 pin to pH sensor. There will be needed a bread board to connect the pH sensors vcc pin and the GND will connect with the negative point.

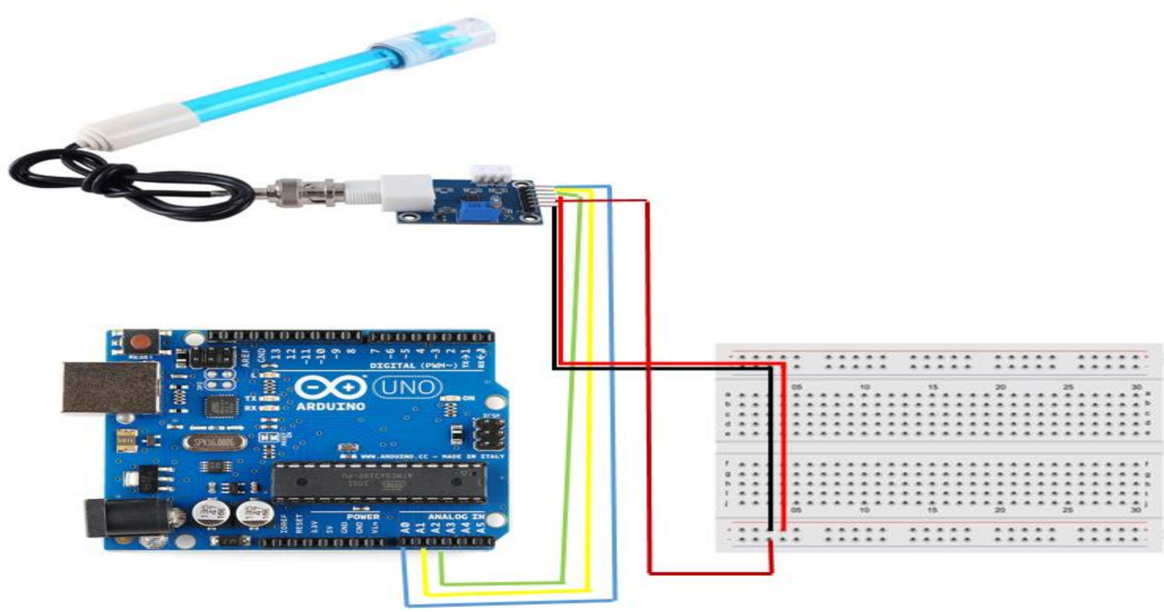

Figure 5.1 Arduino Uno to pH sensor connection with a breadboard

5.1.2 Arduino Uno to Humidity sensor connection

Using a Humidity sensor in product to make sure that it will detect the humidity level on the air. We connect our Humidity sensors digital output pin with Arduino's digital pin 7 and connecting Humidity sensors GND with Arduino's GND pin.

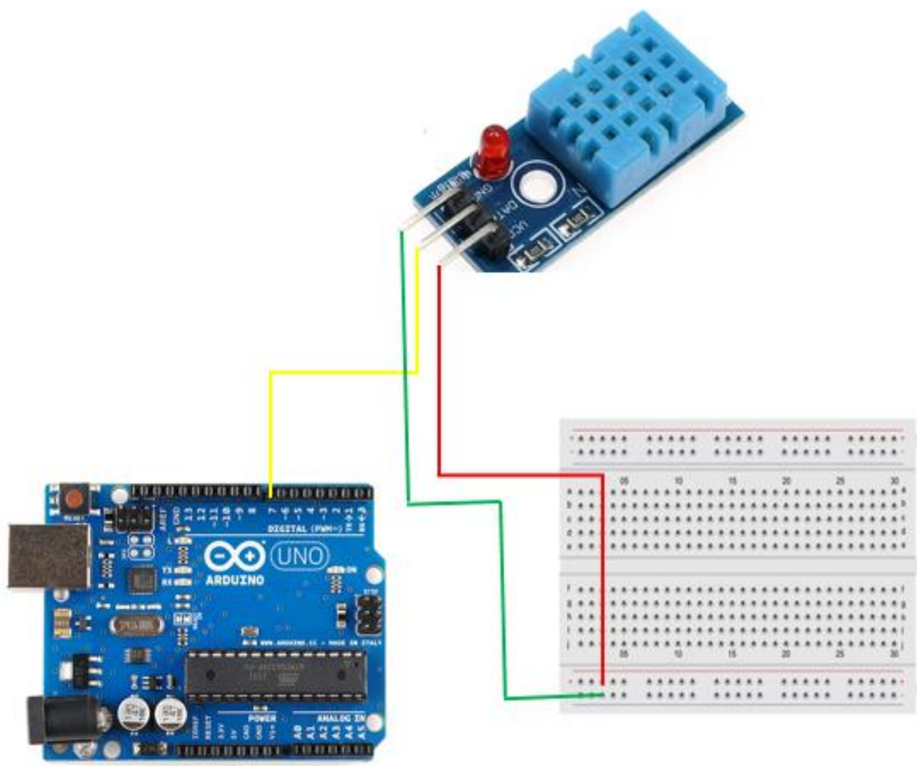

Figure 5.2 Arduino Uno to Humidity sensor connection

5.1.3 Arduino Uno to Soil Moisture connection:

Here we are using a Soil Moisture for measure instant. Soil Moistures digital pin is connected with A3 and other pin goes to GND. When it connect to the pin number A3 and the GND pin then the Soil Moistures will turn on and measure soil moisture level.

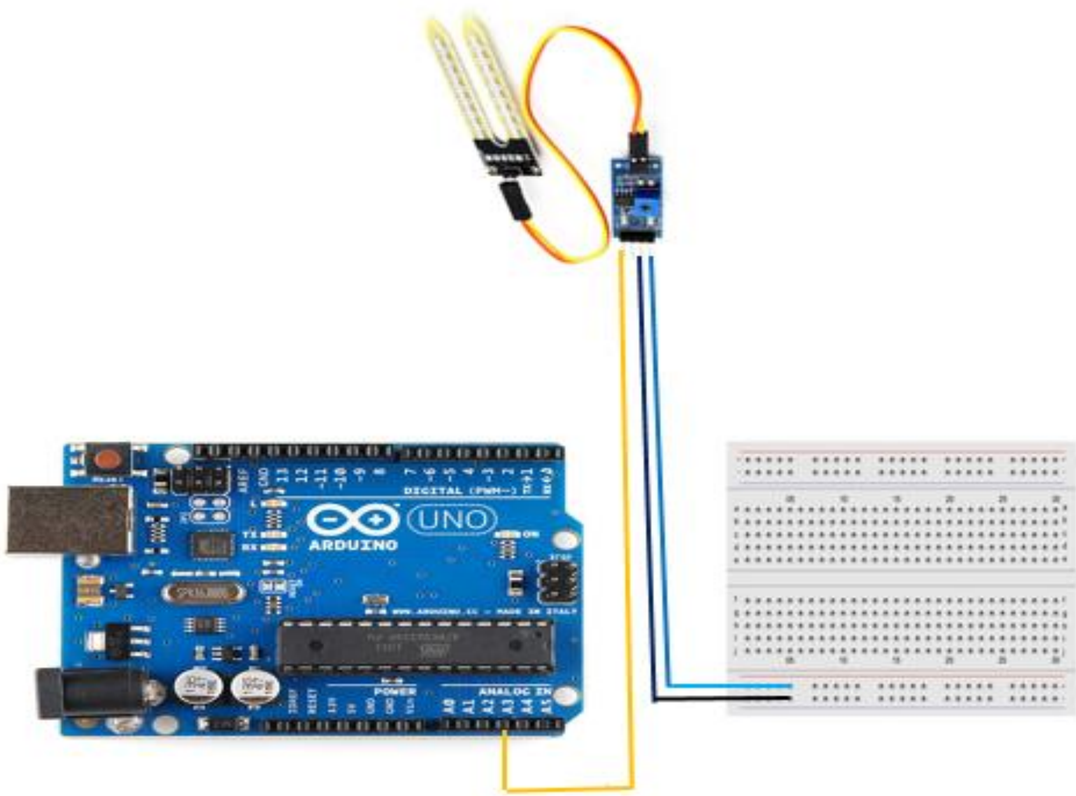

Figure 5.3 Arduino Uno to Soil Moisture connection

5.1.4 Arduino Uno to Motor Driver module connection:

Here we are using a Motor Driver module. We connect our Motor Driver module digital output pin with Arduino's digital pin 3 and connecting Motor Driver module. Motor drivers interconnect the mini water pump and provide control signal.

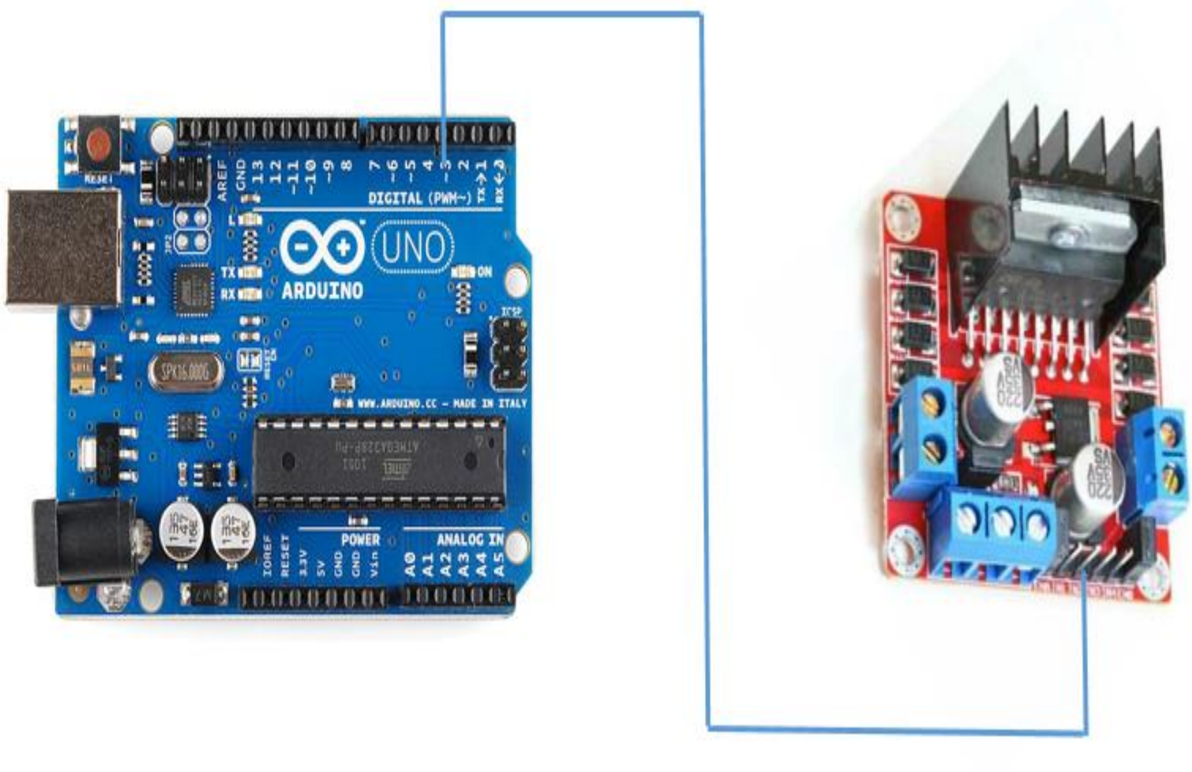

Figure 5.4 Arduino Uno to Motor Driver module connection

5.1.5 Arduino Uno to Temperature sensor connection:

Using a Temperature sensor in product to make sure that it will detect the Temperature level on the environment. We connect our Temperature sensors digital output pin with Arduino's digital pin 4 and connecting Temperature sensors to detect the Temperature.

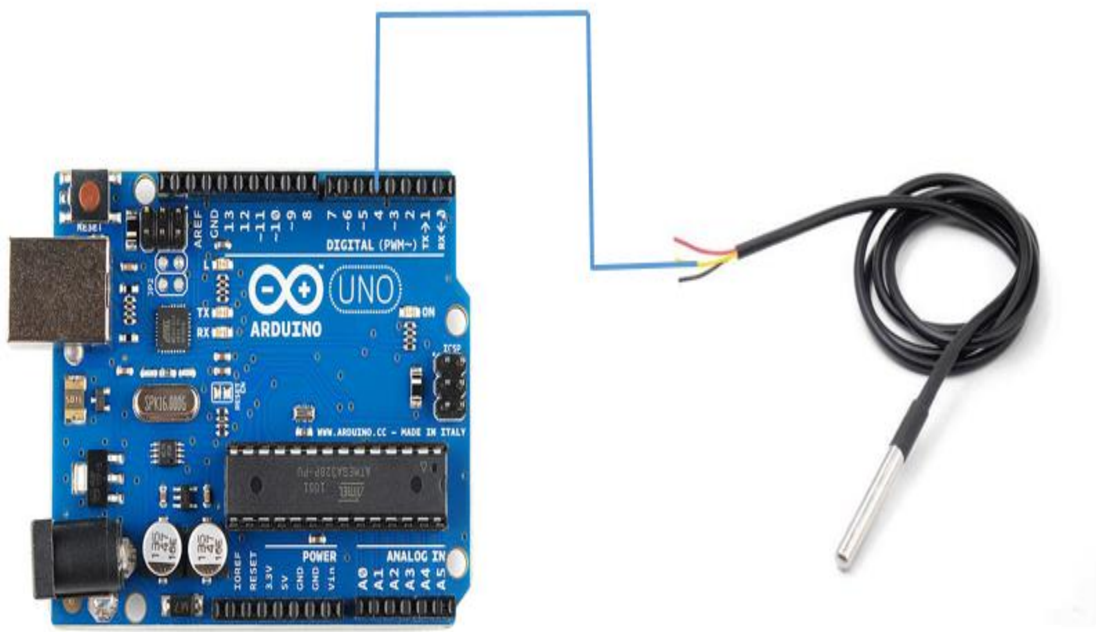

Figure 5.5 Arduino Uno to Temperature sensor connection

5.1.6 Arduino Uno to NodeMCU connection:

We use a NodeMCU in product to make sure that it will interconnect pH sensor, Humidity sensor, Moisture sensor, and Temperature sensor, actually connect the system in one place. We connect our NodeMCU digital output pin RX, TX with Arduino's digital pin D8, D9 respectively. NodeMCU combined with Wi-Fi and the Wi-Fi connect to PC or other smart device to monitor all environmental measurement.

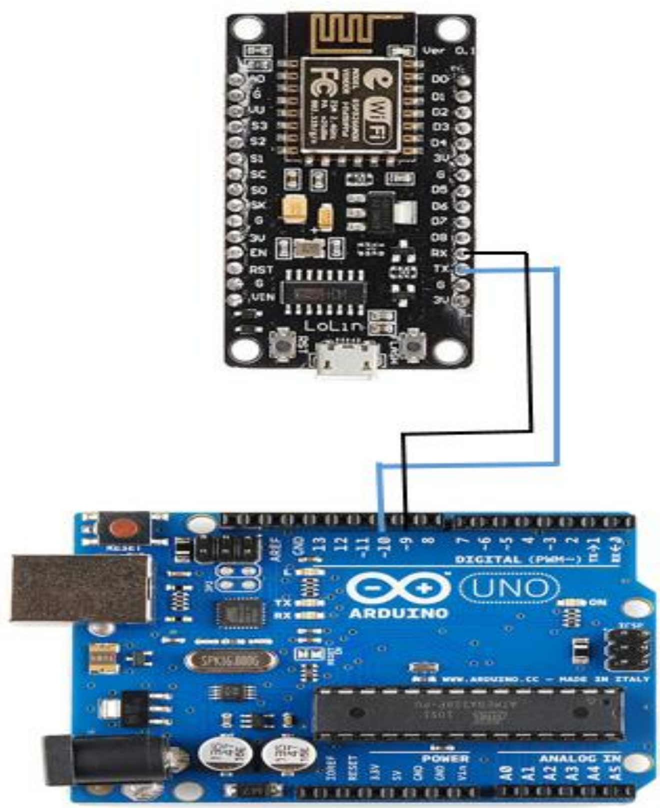

Figure 5.6 Arduino Uno to NodeMCU connection

5.2 Test Results and Reports

We have done our project with every possible test and every aspect of purposes. When we first set our system in an agriculture filed to measure the moisture level, temperature level, humidity level, pH level, then if moisture level decrease (less than 50%) the water pump will be turn on and if the moisture level stay stable then the water pump will be off, but the all environment level will be shown on the OLED and on the respective device.

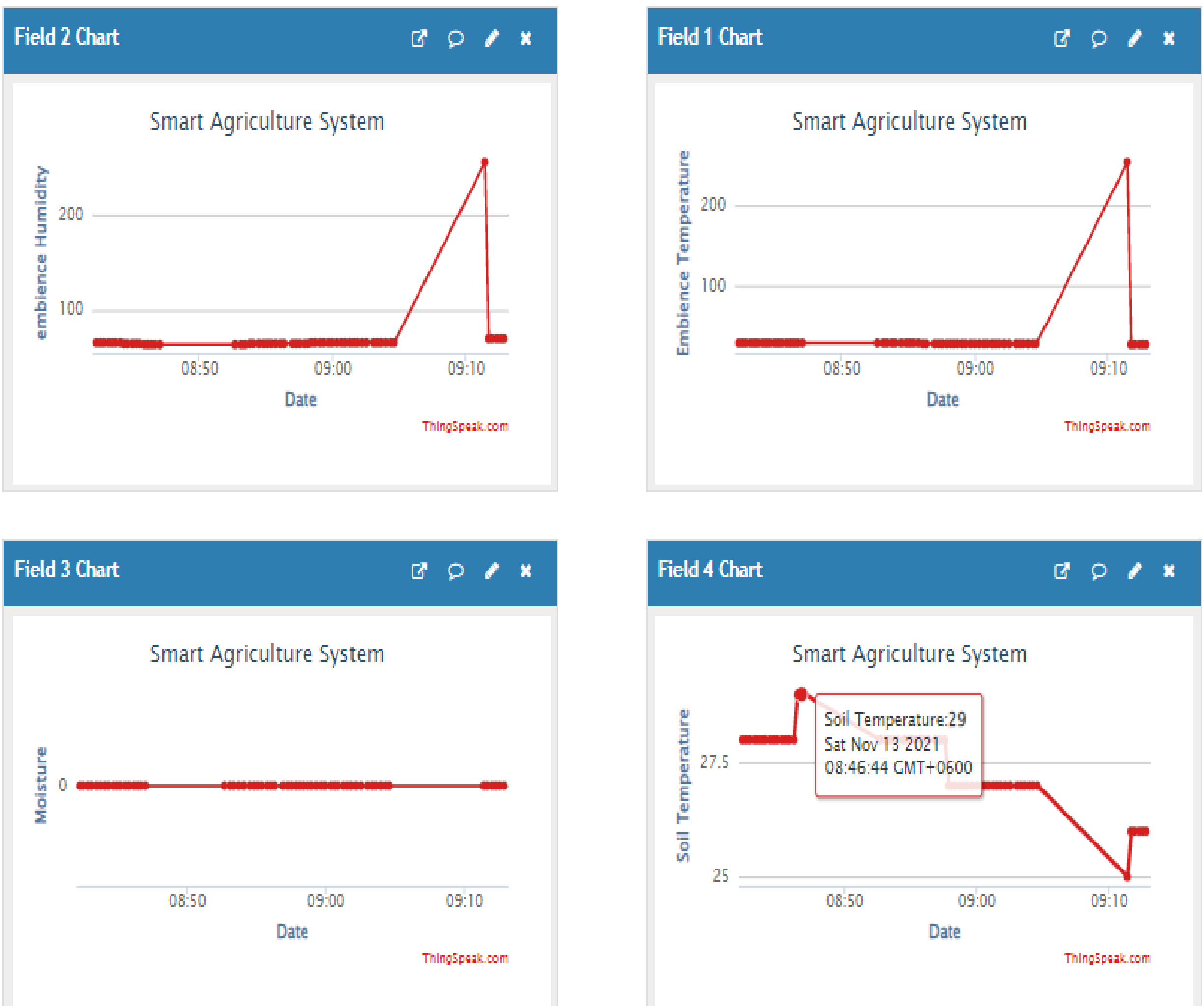

Figure 5.7 Monitor sensors level

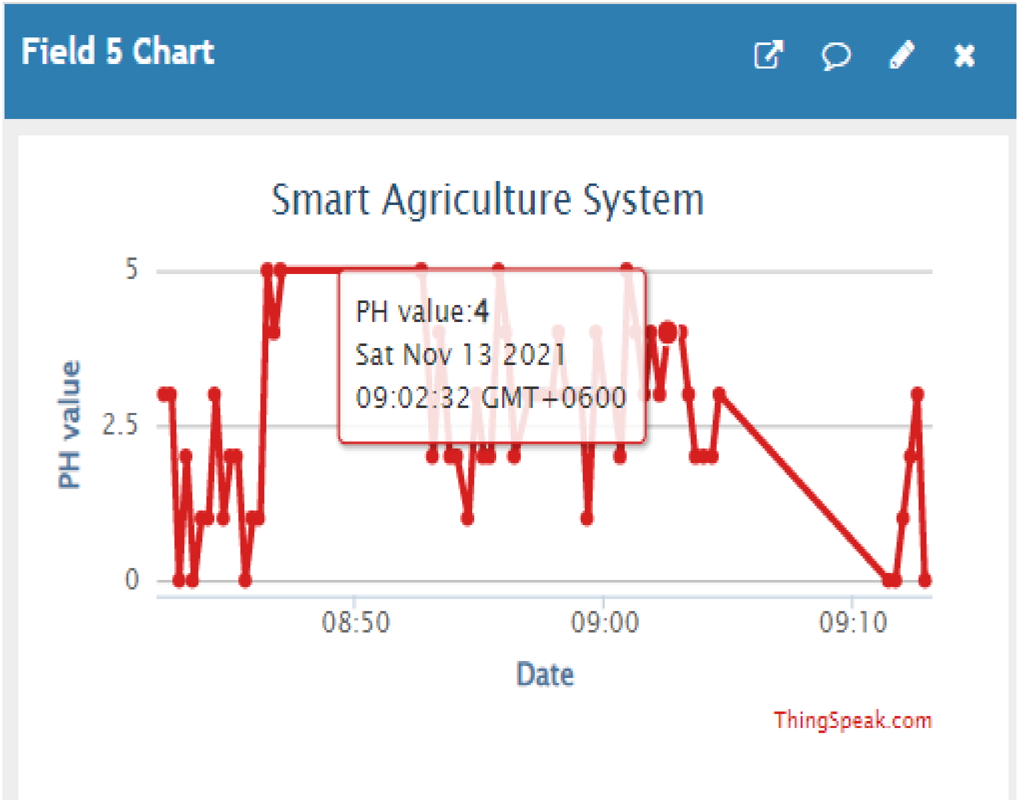

Figure 5.8 Monitor pH level

Figure 5.9 monitoring display

CHAPTER 6

Conclusion and Future Work

6.1 Conclusion

Today's life is covered with the science and it a most important part of our life. This embedded system is one of the significant field for the modern agriculture side. Our smart environmental monitoring system for maximizing the production of vermicomposting organic fertilizer is a part of embedded system. It will help us to monitor moisture, temperature for those field where we can grow various crops. By implementing this project we can detect the field whether its type is productive or not. It will help to grow more crops for human being. We want to implement more features related to this project to make it more productive and cost effective for simple people.

6.2 Future Work

We have a hug chance to implement many extra ordinary features on this project. We want to implement some below mentioned future work,

1. Making it more reliable as it can work within large space of range.
2. Design a waterproof protection cover for its internal safety.
3. We want to make product base on this project.
4. Increasing the accuracy of device performance.

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