AUTOMATIC PLANT IRRIGATION SYSTEM

A Project Report

Submitted in partial fulfilment of the Requirements for the award of the Degree of

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

By

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IT-2136

Under the esteemed guidance of

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DEPARTMENT OF INFORMATION TECHNOLOGY

D. G. RUPAREL COLLEGE OF ARTS, SCIENCE & COMMERCE

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MAHARASHTRA

2022-23

PROFORMA FOR THE APPROVAL PROJECT PROPOSAL

(Note: All entries of the proforma of approval should be filled up with appropriate and complete information. Incomplete proforma of approval in any respect will be summarily rejected.)

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DEPARTMENT OF INFORMATION TECHNOLOGY

CERTIFICATE

This is to certify that the project entitled, "**Automatic Plant Irrigation System**", is bonafied work of **Ms. Devarshi Ravindra Nichite** bearing Seat.No: **IT-2136** submitted in partial fulfillment of the requirements for the award of degree of BACHELOR OF SCIENCE in INFORMATION TECHNOLOGY from University of Mumbai.

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ABSTRACT

This project on "Automatic Plant Irrigation System" is intended to create an automated irrigation mechanism which turns the pumping motor ON and OFF by detecting the dampness/moisture content of the earth. In the domain of farming, utilization of appropriate means of irrigation is significant. The benefit of employing these techniques is to decrease human interference and still make certain appropriate irrigation.

The proposed model consists of three stages: Firstly, sensing the land's moisture levels. Second stage is the determination of its status: dry or wet. The last and third stage is Motor control.

This project proposes the development of Automatic Plant Irrigation System (APIS) capable of detecting loss of moisture in soil using the soil moisture sensor. Specifically, APIS utilizes the Soil Moisture Sensor to detect water content level in soil and give appropriate responses to the system based on detected condition. Using this response, APIS determines whether or not the land needs to be irrigated. In the current version, APIS is capable of detecting and irrigating a small area that can be considered to be under a single pump's coverage. Implemented using ESP8266 nodemcu APIS uses live input data to determine the conditions. APIS represents our most basic step towards automated farming to improve turnover and reduce the impact of draught or loss due to irrigation issues.

ACKNOWLEDGEMENT

The success and final outcome of any project require a lot of guidance from many people and I am extremely privileged to have this all along with the completion of my project. I owe my deep gratitude to my project guide Ms. Nayana Vaidya , who took a keen interest in my project work and guided me all along till the completion of my project work by providing all the necessary information for developing a good system.

DECLARATION

I hereby declare that the project entitled, "**Automatic Plant Irrigation System**" done at **D.G. Ruparel College of Arts, Science & Commerce**, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university. The project is done in partial fulfilment of the requirements for the award of degree of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)** to be submitted as final semester project as part of our curriculum.

Devarshi Ravindra Nichite

Signature:

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Chapter 1

Introduction

1.1 Background:

The greatest crisis in modern day and age is a great disparity in the agricultural sector turnover. The great losses incurred in agriculture: material losses or financial losses – most of them are attributed to crop health and quality. If the crops are determined to be not up to par, this may result in a loss. In order to prevent this, we need to maintain the quality of crops and keep them at maximum health. On a practical basis, this is nearly impossible for a farmer who has large lands to observe and maintain. However, this is currently being managed manually. There is a danger in this; many of the labourers are preferring to work at white collar jobs, and as a result, there is a large deficiency in manpower. This makes automated farming a necessary part of the future. The greatest cause for the crops being not on par is improper irrigation (other than natural calamities). If the irrigation issues are resolved, most of the problem is solved. Hence this is the pinnacle point that needs to be renovated with technology. Automating this part of the process will be extremely beneficial to farmers. The automated plant irrigation system will help to reduce the work load on farmers, and help to keep the farmlands well irrigated at all times. Most of the farmers all over the world suffer to maintain their crops with proper watering methods, but find themselves helpless. This system will help farmers irrigate their lands even single-handedly, without the need of additional manpower. Its user friendly simple circuitry will make the user feel comfortable in using this system. The user only needs to install the circuit and sensors and connect the pump to the circuit and its complete. The system will start functioning upon power-up, and will need no trigger to keep it running.

1.1.1 WHAT IS DROUGHT?

A drought is a period of below-average precipitation in a given region, resulting in prolonged shortages in its water supply, whether atmospheric, surface water or ground water. A drought can last for months or years, or may be declared after as few as 15 days. It can have a substantial impact on the ecosystem and agriculture of the affected region and harm to the local economy. Annual dry seasons in the tropics significantly increase the chances of a drought developing and subsequent bush fires. Periods of heat can significantly worsen drought conditions by hastening evaporation of water vapour.

Researchers for the study, published in the journal Nature, found that drought and extreme heat reduced crop yields by as much as 10% between 1964 and 2007. Extreme cold and floods did not result in a significant reduction in crop production, according to the study.

The research provides key insight on the effects of climate on agriculture as policymakers prepare for the number of extreme weather events to spike in the coming decades due to global warming. The study, which evaluated the effect of 2,800 weather disasters on cereal crops like corn, rice and wheat, suggests that the effects of drought worsened after 1985 and are expected to continue to deteriorate in the coming decades. The study speculates that's because of more intense droughts driven by climate change, increased vulnerability to drought and changed reporting methods, but couldn't confirm any individual factor with certainty.

Developed countries experienced some of the most severe crop loss due to drought and heat, according to the research. Crop production in North America, Europe and Australia faced nearly a 20% decline thanks to drought and extreme heat, compared to less than 10% in Africa and Latin America. Researchers attributed the disparity to a difference between the agricultural methods employed in the different areas. Farmers in developed countries tend to grow crops uniformly across large areas. Water shortage affects those crops uniformly. Growing a wide variety of crops in a given region in the developing world mitigates the risk that all crops will be wiped out thanks to a given weather event.

The impact of water shortage and extreme heat on food production has been a hot button topic in development circles as the scientific understanding of climate change has grown. One recent study found that climate change could drive an 11% decrease in crop yields and a 20% increase in price by 2050 if countries do not stem their greenhouse gas emissions.

And while developed countries have the resources to adapt, their poor counterparts are often left hard hit when they cannot produce adequate food during extreme weather events. This year's El Niño, for instance, has left millions in need of food assistance in places like Ethiopia where the majority of the population depends on agriculture to make ends meet. Funding for efforts to adapt to climate change, including by preparing farmers, has been a key focus of groups focused on the issue.

Table 1: Winter Wheat Planted and Harvested in Montana's Golden Triangle, 1998-2001

	Planted Acres			Harvested Acres			Acres Harvested ÷ Acres Planted, %		
Year	Following Fallow	Recrop	Total	Following Fallow	Recrop	Total	Following Fallow	Recrop	Total
2001	554,000	72,500	626,500	363,400	32,900	396,300	65.6	45.4	63.3
2000	644,200	91,000	735,200	619,300	61,500	680,800	96.1	67.6	92.6
1999	361,400	21,000	382,400	320,200	18,400	338,600	88.6	87.6	88.5
1998	562,600	49,000	611,600	496,600	40,300	536,900	88.3	82.2	87.8

Table 2: Spring Wheat Planted and Harvested in Montana's Golden Triangle, 1998-2001

	Planted Acres			Harvested Acres			Acres Harvested ÷ Acres Planted, %		
Year	Following Fallow	Recrop	Total	Following Fallow	Recrop	Total	Following Fallow	Recrop	Total
2001	1,245,000	246,000	1,491,000	858,300	138,000	996,300	68.9	56.1	66.8
2000	1,051,700	270,000	1,321,700	1,003,600	233,000	1,236,600	95.4	86.2	93.6
1999	1,522,300	325,500	1,847,300	1,489,000	310,200	1,790,200	97.2	95.3	96.9
1998	1,398,000	270,000	1,668,000	1,335,500	245,000	1,580,500	95.5	90.7	94.7

It can be observed that the turnover is only half the amount planted. This loss was due to inefficient irrigation.

1.2 Objective

The main aim of this project is to create plant communicator device based on Arduino which help us to monitor moisture and irrigate if the moisture level is below.

- Create a plant communicator device based on ESP8266, Soil Moisture
- Use Arduino IDE for coding for ESP8266 device and various dependencies.
- Proper research for Arduino IDE device and its circuit.
- Proper testing and debugging of the device configuration.
- Create proper prototype of Plant Communicator.

1.3 Purpose and Scope

Nowadays, despite being an agricultural country, the number of people who die of hunger is still quite high. Access to food seems to be difficult, as price and quantity of food is still beyond the capability of the lower middle class and lower class. Irrigation induced Crop failure is a major cause of crop loss every year, and in the age of water crises, this has been elevated to great levels. In order to keep up with increasing demand, farmers are required to increase crop efficiency, by rapidly advancing technologies. In order to handle Irrigation issues, this system has been devised and implemented. Usually, farmers need large scale manpower to irrigate large lands simultaneously. However Automatic Plant Irrigation System (APIS) is an automatic system that facilitates automated irrigation of lands simultaneously, upon need.

1.4 Achievement

During the completion of the project I was working, I have achieved knowledge in ‘C’ language, ESP microcontroller, Ardiuno IDE(Sketch Program) and other languages used in project. This project can help the farmers and others to do their work efficiently.

Chapter 2

Survey of Technology

2.1 Existing System

The continuous increasing demand of food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources.

The main reason is the lack of rains & scarcity of land reservoir water. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes to waste.

The existing system of manual irrigation is very inefficient in regard to solving these issues. In modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants drip by drip due to which a large quantity of water is saved. At the present era, the farmers have been using irrigation techniques in India through manual control in which farmers irrigate the land at the regular intervals.

This process sometimes consumes more water or sometimes the water reaches late due to which crops get dried. Water deficiency can be detrimental to plants before visible wilting occurs. Slowed growth rate, lighter weight fruit follows slight water deficiency. This problem can be perfectly rectified if we use automatic irrigation system in which the irrigation will take place only when there will be acute requirement of water.

2.2 Proposed System

All the lands to be irrigated manually are automatically irrigated by this system. When compared to the previous system where farmers need to frequently and constantly keep monitoring the field for signs of dryness, this system will reduce the time needed to be spent on monitoring the field. It greatly diminishes the need for manpower by a great value. This system will be able to function even when the owner is unavailable for a small period of time, hence ensuring proper irrigation even in the absence of people. Also water will not be wasted during traversal.

In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump on/off when required. This process sometimes consumes more water and sometimes the water supply to the land is delayed due to which the crops dry out. Water deficiency deteriorates plants growth before visible wilting occurs. In addition to this slowed growth rate, lighter weight fruit follows water deficiency.

This problem can be perfectly rectified if we use Automated Irrigation System in which the irrigation will take place only when there will be intense requirement of water, as suggested by the moisture in the soil.

2.3 Requirement Analysis

In this project, Automatic Plant Irrigation System with ESP8266 Nodemcu, Agriculture plays a vital role in the development of agricultural countries. Some issues concerning agriculture have been always hindering the development of the country. Consequently, the only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture.

Hence the method is making agriculture smart using automation and IoT technologies. Internet of Things (IoT) enables various applications of crop growth monitoring and selection, automatic irrigation decision support, etc. We proposed ESP8266 Nodemcu for Automatic Plant irrigation system (APIS) to modernize and improve the productivity of the crop.

This explains how the Automatic Plant Irrigation System will work. We will use Soil Moisture Sensor to measure moisture content present in the soil. Using a 5V Power relay we will control the Water Pump. Whenever the sensor detects a low quantity of moisture in the soil, the motor turns on automatically. Hence, will automatically irrigate the field. Once the soil becomes wet, the motor turns off. You can monitor all this happening remotely via Blynk Server online from any part of the world.

2.3 Hardware Requirement

Following is The hardware components required for the project are listed as follows:

Sr. No	Component Types	Component
1.	IC / Microcontroller	ESP 8266
2.	Sensors	Soil Moisture Sensor
3.	Switches	Relay Boards
4.	Motor	Mini DC Motor pump (5v)
5.	Other Components	Jumper Wires, Bread Board

Table 2.3 list of Hardware

2.4 Software Requirement

Following are the Software requirement to program ESP8266:

- Arduino IDE(Sketch Program) – which is similar to C or C++.

2.5 Justification of Platform

In This Automatic Plant Irrigation System (APIS), Soil Moisture Sensor checks the moisture level in the soil and if moisture level is lower, then ESP8266 switches On a waterpump to provide water to the plant. Water pump gets automatically off when system finds enough moisture in the soil. Whenever system switched On or off the pump, a message is sent to the user over the Internet, updating the status of water pump and soil moisture. This system is very useful in Farms, gardens, home etc. This system is completely automated and there is no need for any human intervention.

The Aim of our project is to minimize this manual intervention by the farmer. Automated Plant Irrigation system will serve the following purposes:

1. As there is no un-planned usage of water, a lot of water is saved from being wasted.
2. The irrigation is done only when there is not enough moisture in the soil and the sensors decide when the pump should be turned on/off. This saves a lot time for the farmers. This also gives much needed rest to the farmers, as they don’t have to go and turn the pump on/off manually

Chapter 3

Requirements and Analysis

3.1 Problem Definition:

Nowadays, despite being an agricultural country, the number of people who die of hunger is still quite high. Access to food seems to be difficult, as price and quantity of food is still beyond the capability of the lower middle class and lower class. Irrigation induced Crop failure is a major cause of crop loss every year, and in the age of water crises, this has been elevated to great levels. In order to keep up with increasing demand, farmers are required to increase crop efficiency, by rapidly advancing technologies. In order to handle Irrigation issues, this system has been devised and implemented. Usually, farmers need large scale manpower to irrigate large lands simultaneously. However Automatic Plant Irrigation System (APIS) is an automatic system that facilitates automated irrigation of lands simultaneously, upon need.

3.2 Requirement Specification

3.2.1 Arduino UNO:

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world.

3.2.2 ESP8266 NodeMCU:

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name “NodeMCU” combines “ node “ and “MCU” (micro-controller unit). The term “NodeMCU” strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source.

3.2.3 Jumper wires:

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

3.2.4 Relay Module:

The 2(dual) or 4(quad) Channel Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, PIC and etc. The relays terminal (COM, NO and NC) is being brought out with screw terminal. It also comes with a LED to indicate the status of relay.

3.2.5 Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Soil moisture sensors are used in numerous research applications, e.g. in agricultural science and horticulture including irrigation planning, climate research, or environmental science including solute transport studies and as auxiliary sensors for soil respiration measurements.

3.3 Planning And Scheduling

First let's define what is project plan, or project management plan as named by the Project Management Institute (PMI), really is. It is not a Gantt chart. Even though the Gantt chart is what many people, among them many project managers, mostly associate with the project plan, it is only a part of the entire project plan and is better called the project schedule. The project schedule shows when the project manager has planned for a project activity to happen. Additionally, the project plan should describe how you will make them happen, in order, with what results, which challenges might be faced, etc.

A project plan may consist of:

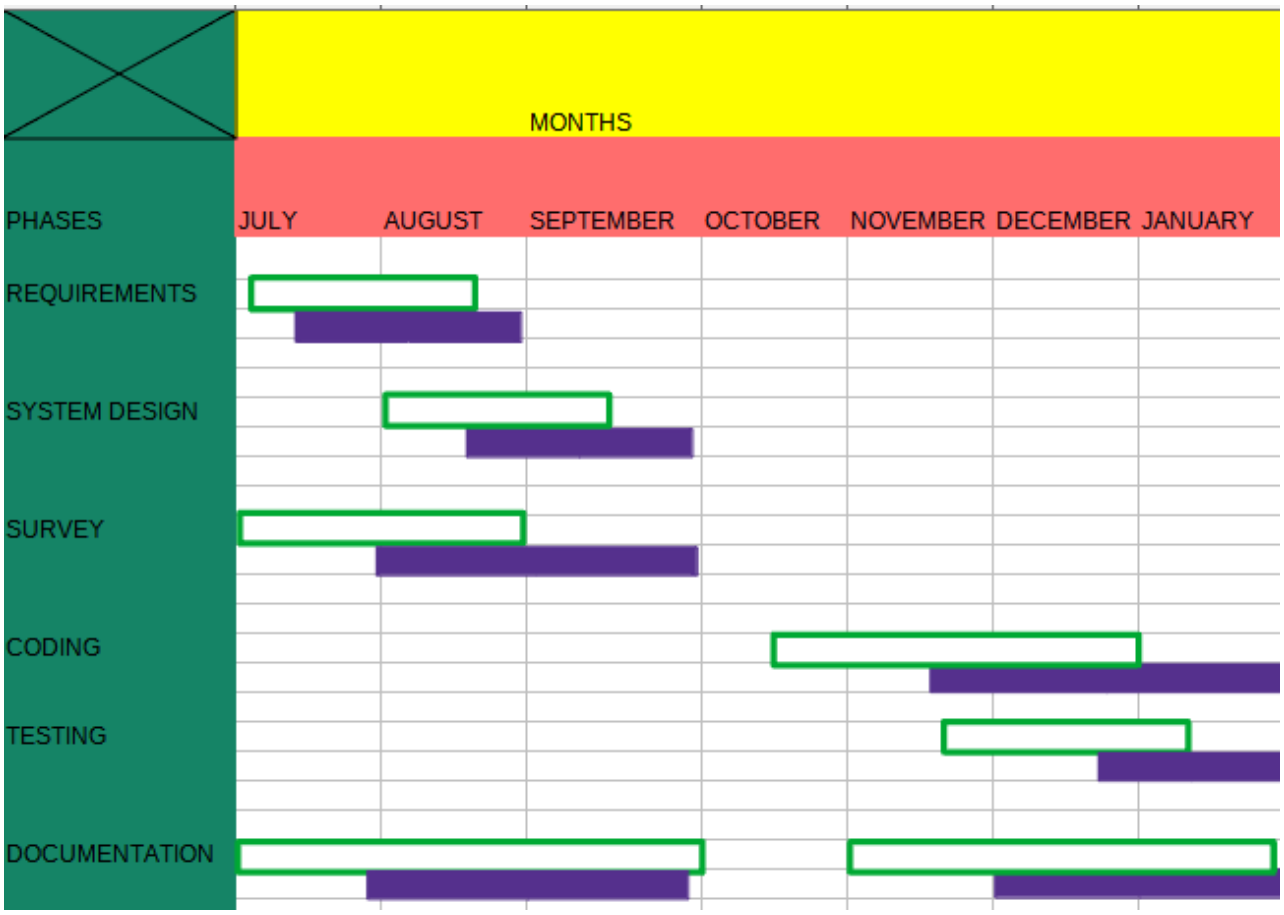
- Aim of Project
- Output
- Risks
- Communication
- Management Structure
- Schedule
- Constraints

Project Schedule

A project schedule is a timetable that organizes tasks, resources and due dates in an ideal sequence so that a project can be completed on time. A project schedule is created during the planning phase and includes the following:

- A project timeline with start dates, end dates and milestones.
- The work necessary to complete the project deliverables.
- The costs, resources and dependencies associated with each task.
- The team members that are responsible for each task.

3.3.1 GANTT CHART



Estimated time

3.4 Software and Hardware Requirement

Hardware Requirement

3.4.1 ESP8266

The ESP8266 is a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability.

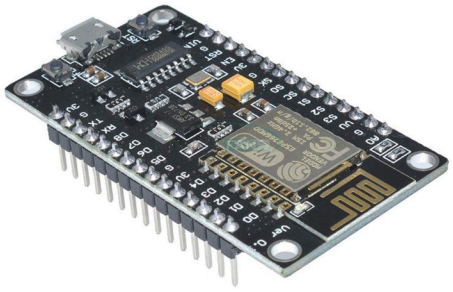
This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.

The ESP8285 is a similar chip with a built-in 1 MiB flash memory, allowing the design of single-chip devices capable of connecting via Wi-Fi.

These microcontroller chips have been succeeded by the ESP32 family of devices.

Features:

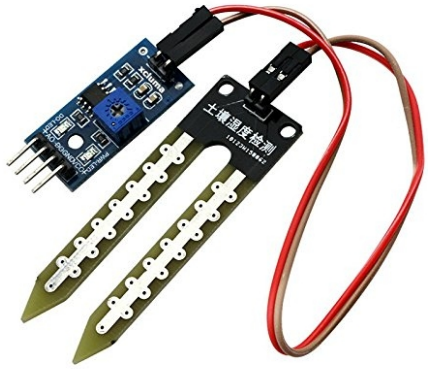
- 32 KiB instruction RAM
- 32 KiB instruction cache RAM
- 80 KiB user-data RAM
- 16 KiB ETS system-data RAM
- 17 GPIO pins



3.4.1 ESP8266

3.4.2 Soil Moisture Sensor

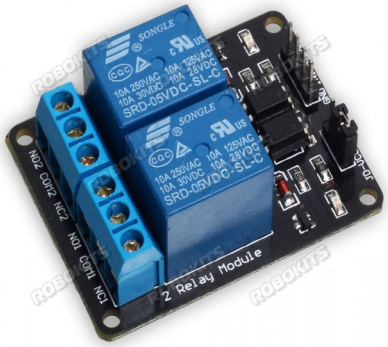
Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.



3.4.2 Soil Moisture Sensor

3.4.3 Relay Board

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. Electromagnetic relays are those relays which are operated by electromagnetic action. Modern electrical protection relays are mainly micro-processor based, but still electromagnetic relay holds its place. It will take much longer time to be replaced the all electromagnetic relays by micro-processor based static relays.



3.4.3 Relay Board

3.4.4 Jumper wires

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

Jumper wires typically come in three versions: male-to-male, male-to-female and female-tofemale. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. For example – When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

3.4.4 Jumper Wires

Software Requirement

3.4.5 Arduino IDE

The Arduino Integrated Development Environment – or Arduino Software (IDE) – contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

3.4.6 Blynk

Blynk is an IoT platform for iOS or Android smartphones that is used to control Arduino, Raspberry Pi and NodeMCU via the Internet. This application is used to create a graphical interface or human machine interface (HMI) by compiling and providing the appropriate address on the available widgets. It is designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, vizualize it.

There are three major components in the platform:

- ➔ Blynk App – allows to you create amazing interfaces for your projects using various widgets we provide.
- ➔ Blynk Server – responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
- ➔ Blynk Libraries – for all the popular hardware platforms – enable communication with the server and process all the incoming and outcoming commands.
- ➔ Blynk works over the Internet. This means that the hardware you choose should be able to connect to the internet. Some of the boards, like Arduino Uno will need an Ethernet or Wi-Fi Shield to communicate, others are already Internet-enabled: like the ESP8266, Raspberri Pi with WiFi dongle, Particle Photon or SparkFun Blynk Board.

But even if you don't have a shield, you can connect it over USB to your laptop or desktop.

3.5 Prototyping Defined:

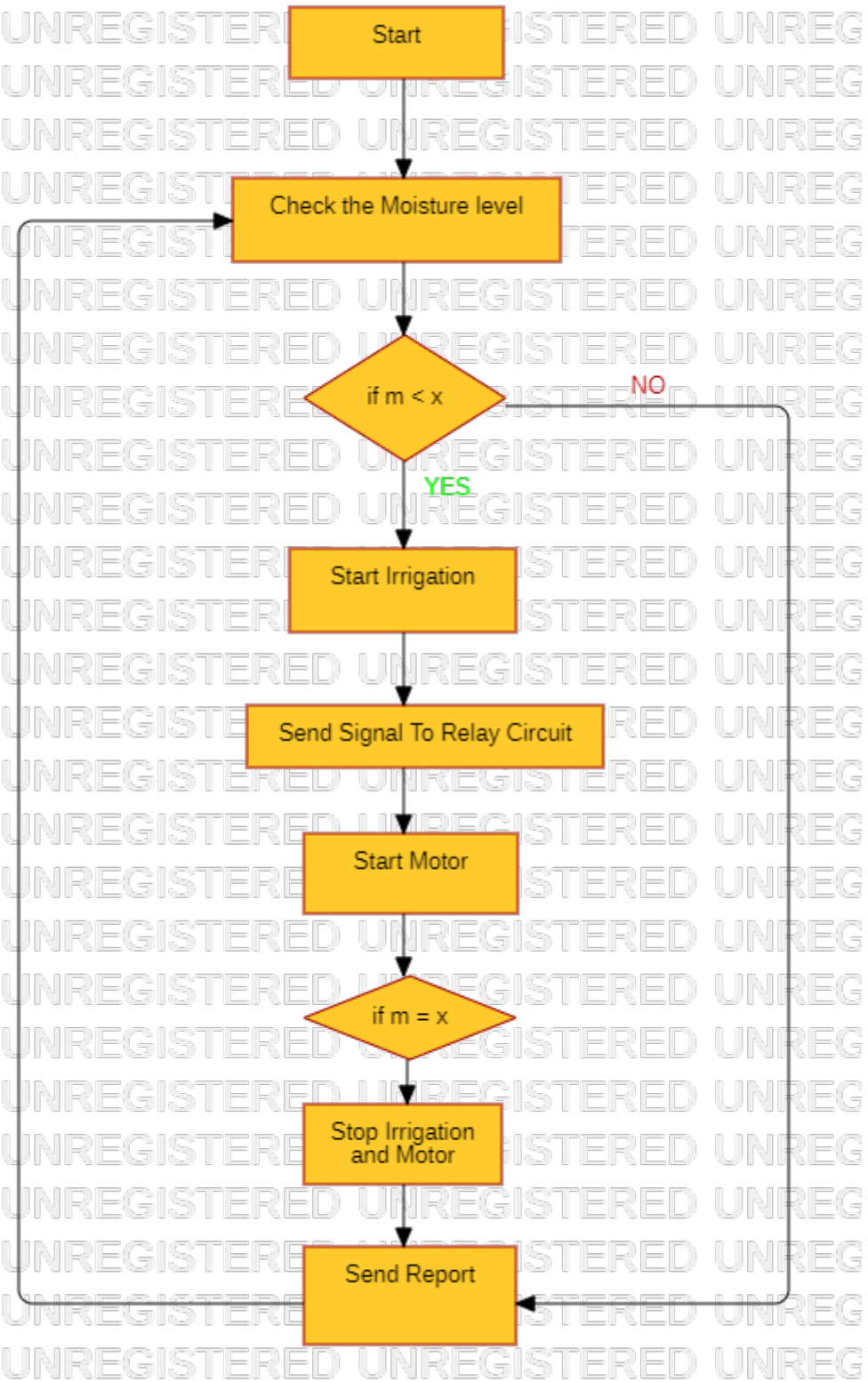
Prototyping is the process of quickly putting together a working model (a prototype) in order to test various aspects of a design, illustrate ideas or features And gather early user feedback. IEEE defines prototyping as “A type of development in which emphasis is placed on developing prototypes early in the development process to permit early feedback and analysis in support of the development process”.

Need for Prototype:

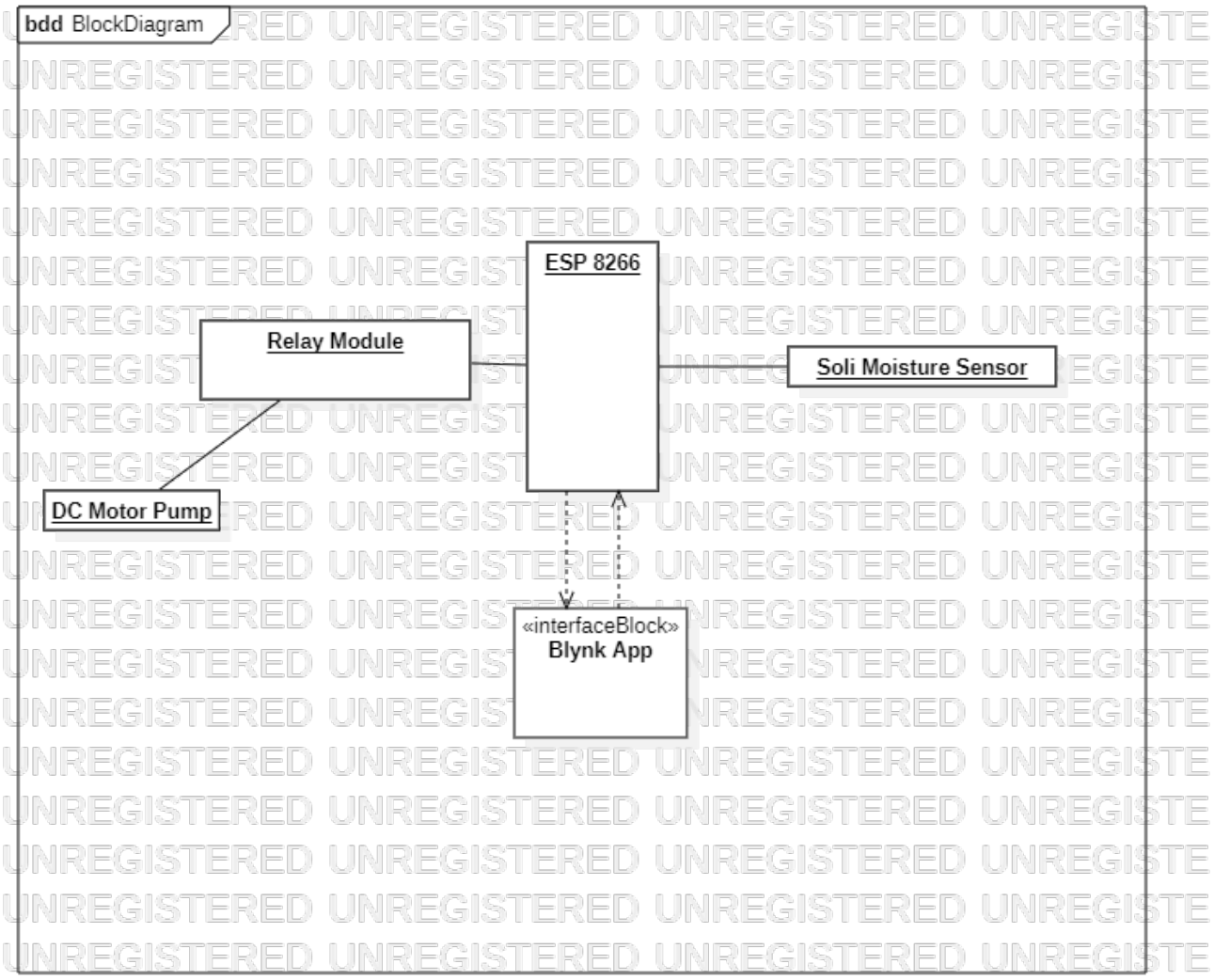
1. Evaluating and Testing the Design: Creating a prototype will allow the design team to not only evaluate, but also test the product before going into full production.
2. Clarifying Production Costs and Issues: If there are any difficulties in production or perhaps processes that can create problems for the final product, it is much better to see these before production starts.
3. Patents: If a product is new enough or unique enough, patents need to be considered. It’s no use to design and manufacture a great product only to have another company start producing a remarkably similar product because the original company failed to patent key aspects of the design.

3.6 Conceptual Model

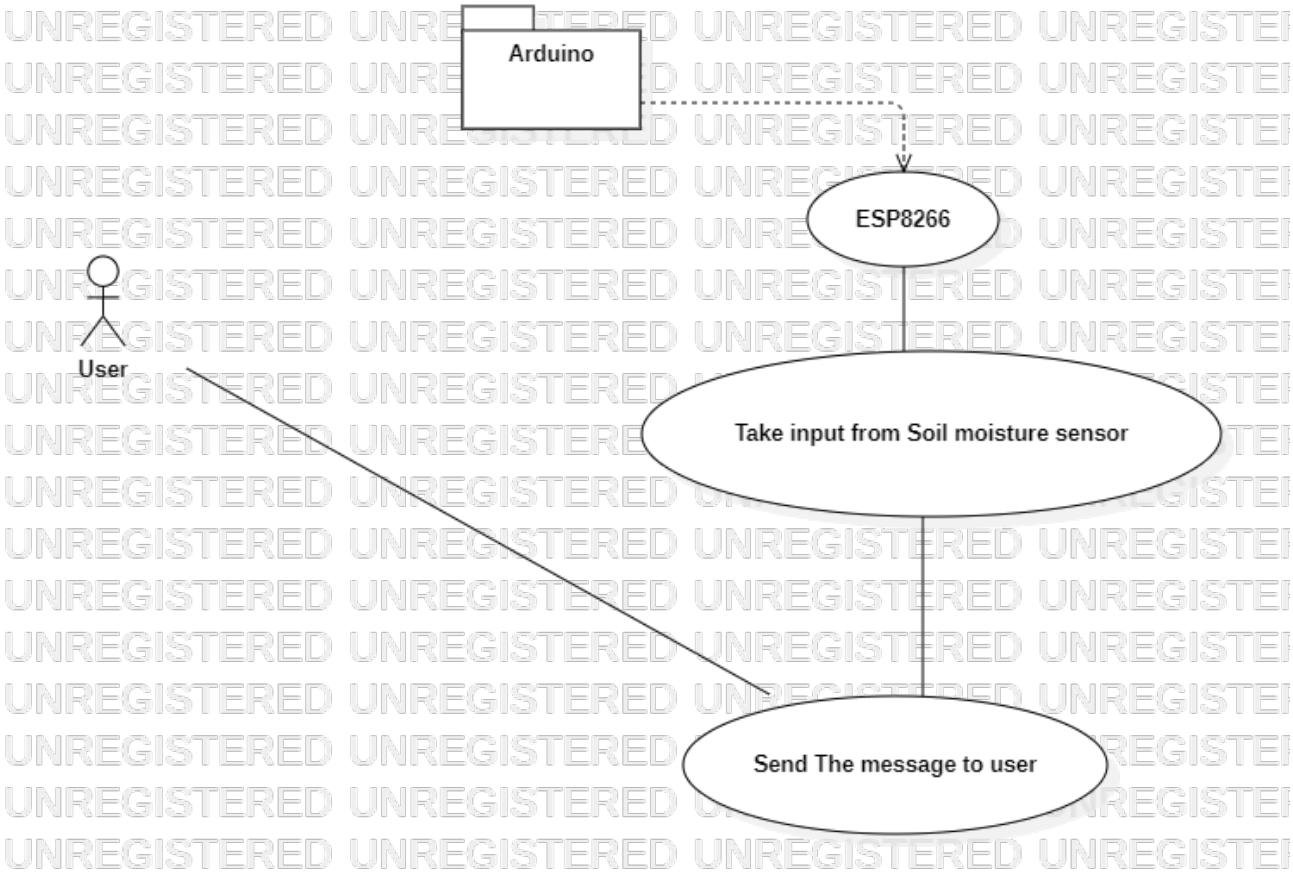
3.6.1 Flow Chart Diagram



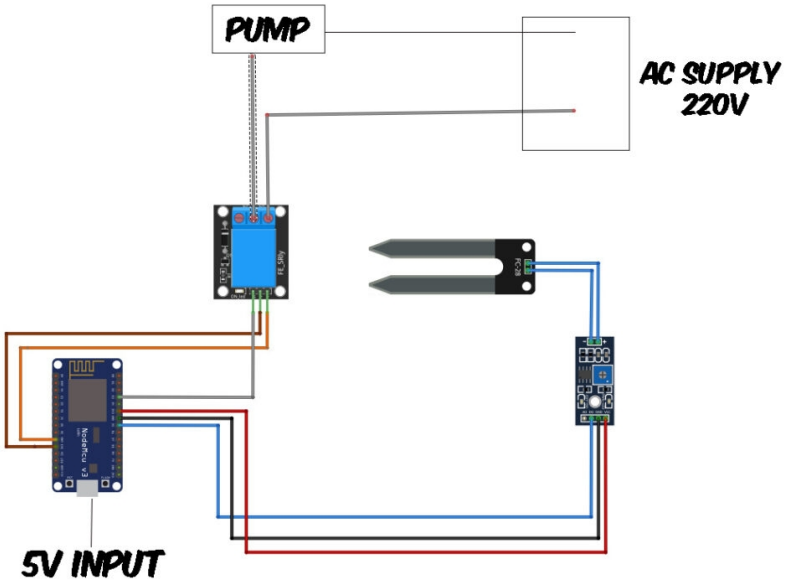
3.6.2 Block Diagram



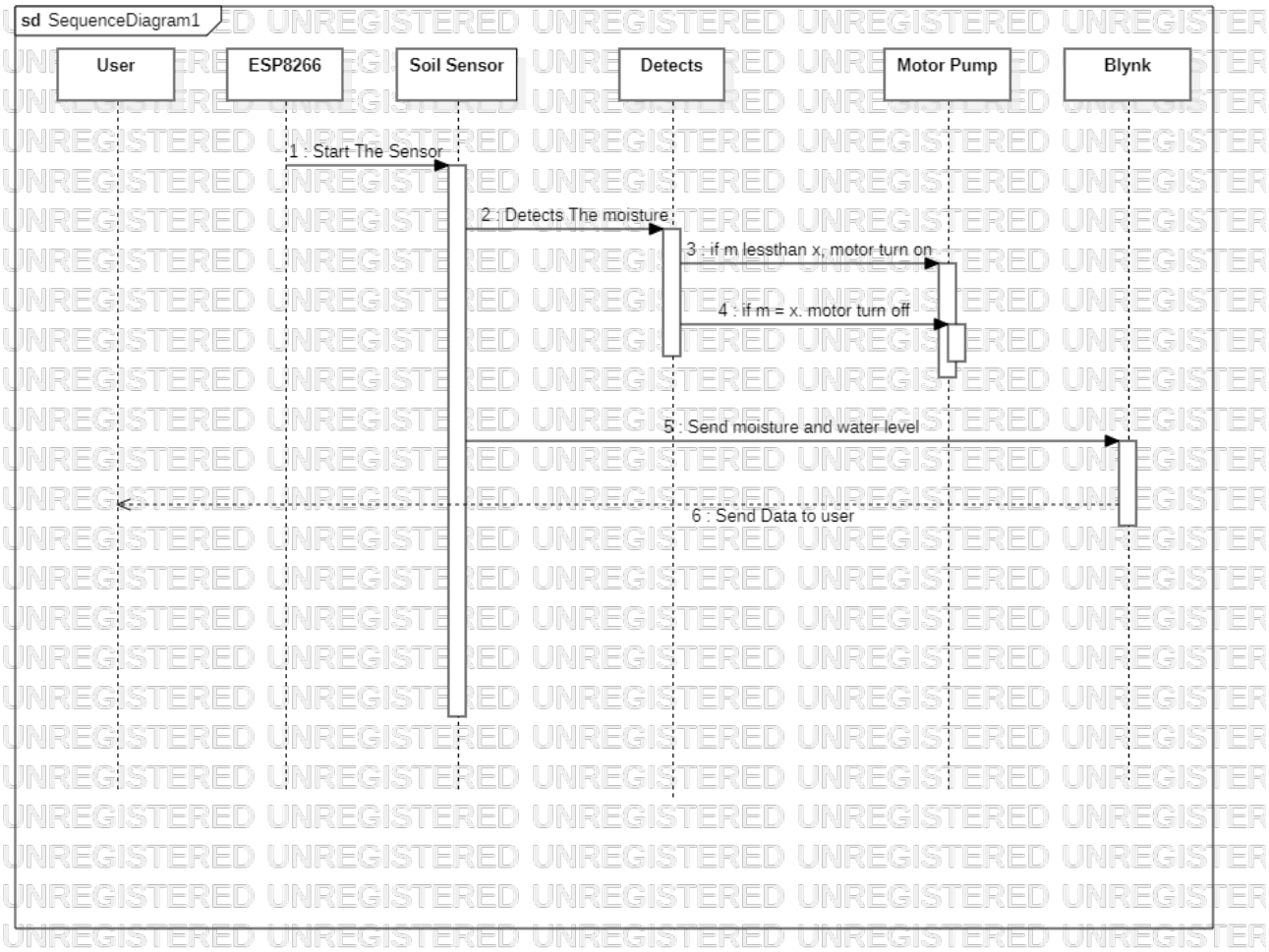
3.6.3 Use Case Diagram



3.6.4 Circuit Diagram



3.6.5 Sequence Diagram



Chapter 4

System Design

4.1 Basic Module

- Detects the moisture level of soil.
- Contains ESP8266 Wi-Fi module.
- Minimum power consumption.
- Cost efficient.
- Send Message over the Internet to the user
- Reduces man power.

4.2 Testing Approach

Here in this section there will be various test case which were done during finalizing the prototype. Testing is done to evaluate the system. It is performed on the basis of the output carried out by the system. Different test cases such as Unit and System testing with different sub heading have done with specific objective and the end results.

4.2.1 Unit Testing

No. of Test Case	**Objectives**
1	Checking if all the libraries are working properly or not.
2	Checking all the library are running according to requirement.
3	Checking if the moisture value is being detected in Analog or Digital.
4	To display the value of moisture sensor in analog value.

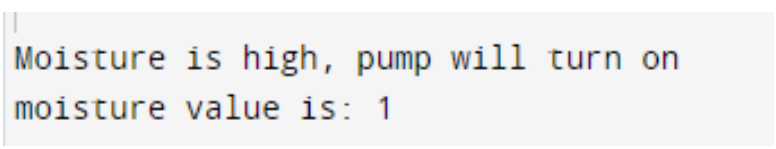
4.2.2 Test Case 1

Objective	**Checking if all the libraries are working properly or not**
Expected Result	While compiling the code no library related error should be shown.
Actual Result	Showed a file from library was missing and not matching board drivers is not installed
Analysis	IDE showed that sensor library was missing even. After that the proper solution was to download the library of sensor named as “dht.h”.
Further Analysis (if any)	After installing the library of the sensor, the program was successfully running

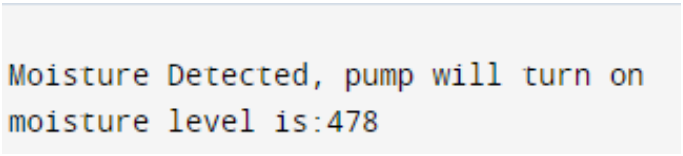
4.2.3 Test Case 2

Objective	**Checking if all the libraries are working properly or not**
Expected Result	While compiling the code no library related error should be shown.
Actual Result	Compiling the code was done successfully.
Analysis	IDE showed that sensor library was missing even. After that the proper solution was to download the library of sensor named as “dht.h”.
Further Analysis (if any)	After installing the library of the sensor, the program was successfully running.

4.2.4 Test Case 3

Objective	**Checking if all the libraries are working properly or not**
Expected Result	While compiling the code no library related error should be shown.
Actual Result	Showed The value in digital as 0 or 1.
Analysis	The value was shown in digital due the error in code and in the pin of the sensor
Proof:	Test was successful and proof of the testing can be found below in screenshot
	

4.2.5 Test case 4

Objective	**Checking if all the libraries are working properly or not**
Expected Result	While compiling the code no library related error should be shown.
Actual Result	According to objective the value of moisture is displayed in Analog value.
Analysis	The value of moisture is shown in analog so that help the user will be able to know the exact value of moisture
Proof:	Proof of the testing can be shown in screenshot
	

Finally, after performing the various different type of testing cases the successful APIS was developed as expected on aims and objective. The various testing cases was performed which made the system suitable and appropriate for using it in on real-time scenario. Some of the evaluation concluded from testing cases are:

- The system was able to communicate with the moisture to make sure it fulfills the requirement of irrigation.
- The comparison with similar system proved that the system is capable for market use.
- The farmers, agriculturist, nursery will be highly benefited with the system because it is cost effective, easy to operate and user friendly.

4.3 Event Table

EVENT	TRIGGER	SOURCE	USE CASE	RESPONSE	DESTINATION
Detecting The moisture level	ESP8266 and Motor	Soil	-	Motor will turn on if moisture is LOW	
Taking Input from soil moisture sensor	ESP8266	-	Read the Input from sensor	Displays the output over the internet to user	Device/User