

# **SMART IRRIGATION SYSTEM**

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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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**DAFFODIL INTERNATIONAL UNIVERSITY**

**DHAKA, BANGLADESH**

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## **APPROVAL**

This Project/internship titled “**Smart Irrigation System**”, submitted by Bhuban Roy, ID No: 163-15-8323 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 September-13-2019

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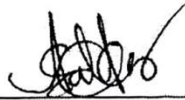
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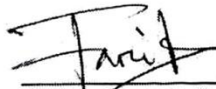
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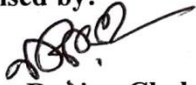
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## DECLARATION

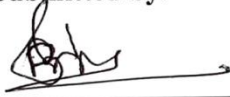
I hereby declare that, this project has been done by us under the supervision of Narayan Ranjan Chakraborty, Assistant Professor, Department of CSE Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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## **ABSTRACT**

With this project, I tend to achieve thriving results by testing out the queries asked at the beginning of the paper. the aim of the good irrigation system for giant or tiny scale and create it smarter and simpler. Different sensors (Soil wetness, Light, Temperature, level, rain, flow) with totally differentanother device | (water pump, Battery, LCD, magnet valve) are wont to create this project. Using Arduino proved profitable, it's able to serve numbers of various sensors, at constant time and the markets supply numerous sort and sizes of sensors. Arduino boards area unit another device. Furthermore, 2 woody tables and 3 sheets of froth are employed in the project. Several of criterion had employed in this technique. The sensors used was excellent in police work and causation signals to Arduino, to regulate the pump and to open the magnet valve, it's been tasted indoor because it is on the farm. The purpose of the screen monitor is to point out the flow for every line, that shows if there's any passing of water in pipes. Also, if it's descending the system won't add order to save lots of the water.The mobile application is to regulate the system remotely. which permit a user to observe the whole system and if there's any downside or passing of water user will cut the system through this application[1].

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Bangladesh is associate degree agricultural country, and each one amongst its resources depends upon the agricultural output. Even in the modern span of industry[1]. agriculture is the key space that decides the economic process of the country. Agriculture conjointly accounts for eight.56% of the country's total exports[1]. Agriculture is the most significant field as compared to others in bhagat. Irrigation is that the science of coming up with and coming up with an economical, low-cost, economical irrigation system designed in such some way to suit natural conditions. By the development of a correct distribution system and providing adequate installation can increase the yield of crops. Agriculture is the unquestionably the most important support supplier in an Asian country. With rising population, there's a requirement for increased agricultural production.[26]. To support larger production in farms, the need for the quantity of h2o utilized in irrigation conjointly rises. Currently, agriculture accounts for eighty-three of the entire water consumptions in the Asian nation. Unplanned use of water inadvertently leads to wastage of water. This suggests that there's associate degree imperative ought to develop systems that stop water wastage while not imposing pressure on farmers[28]. Over the past fifteen years, farmers started victimization computers and software system systems to organize their monetary knowledge and keep track of their transactions with third parties and conjointly monitor them crops additional effectively. Within the net era, where information plays a key role in people's lives, agriculture is speedily turning into a data-intensive a business wherever farmers ought to collect associate degree assess a huge quantity of data from a various variety of devices (e.g. Sensors, farming machinery, etc.) In order to become additional economical in production and communicating acceptable info. With the advent of ascii text file Arduino boards alongside cheap wetness sensors, it's viable to make devices that can monitor the soil wetness content and accordingly



irrigating the fields or the landscape as an associate degree when required. The planned system makes use of microcontroller atmega328p on Arduino Uno platform and IOT that allow farmers to remotely monitor the standing of sprinklers put in on the farm by knowing the detector values thereby, making the farmers' work a lot of easier as they'll think about other farm activities[7].

## **1.2 Motivation of work**

An irrigation system is designed to monitor the climatic condition. In this gateway sensor is used to handle sensor information and helps to transmit data to the user, wireless through ZigBee moisture, humidity and temperature sensors is programmed with a microcontroller-based gateway which is used to monitor agriculture area. The proposed system consists of 3 sensor nodes of msp430, each having temperature, moisture and humidity sensor. These source nodes are connected to the master node through ZigBee. The master node is of msp432 with wi-fi enabled so that it will receive data from all sensor nodes, store data on the cloud and it will get displayed on smartphone and web portal on pc in tabular and graphical format.[8].

## **1.3 Objectives**

The main objective of this project is to develop an Associate in Nursing automatic system that solves most problems related to irrigation and agriculture. Like dominant and saving the water and electricity, increasing agricultural production practice little quantities of water, minimize manual intervention in watering operations with increasing watering speed, conserving plants from fungi, and eventually. Of these options create the automatic system a property choice to be thought-about to boost agriculture and irrigation potency [2].

The goals of this study are to find the superb automation technique for irrigation system mechanically controlled through the software system during a means that permits the user to observe all data and manage the device directly from mobile.

Researchers within the last decade have mentioned the problem of the sensible irrigation system. Several solutions are resolved from these studies (e.g. Level of water within the land, management the system from mobile by SMS)[4] [8].

### **The Objectives to Consider Are:**

- Simplify the irrigation system by putting in and coming up with the entire irrigation system.
- Save energy, that permits the applying of a sensible irrigation system using an additional different application.
- Optimize water consumption.
- The automatic system.
- Decrease the price of operation.
- Make the system straightforward to use by farmers[8].

### **1.4 Expected Outcome**

- Easy and simple to place in and found out.
- Resources and energy could also be saved, in order that could also be utilized in Associate in Nursing passing correct manner and amount
- Distribution of associate equal quantity of water at the correct time by automatic irrigation to farm and nurseries. To avoid extra of overwatering at the inaccurate time of the day, this reduces saturated soils which may improve crop performance.
- Automated irrigation system uses valves to point out the motor on and off. Motors could also be merely automatic exploitation controllers that cut back labor work.
- These ways that for irrigation might be a valuable tool for proper soil wet management in very specialized greenhouse vegetable production [29].

### **1.5 Problem Statement**

To design associate degrees, develop an automatic irrigation system that switches a motor pump on/off by sensing wetness content of the soil through the applying of the web of things (IoT). The economy of varied countries depends on agriculture [2]. to achieve the foremost effective quality from this analysis, it is important to concentrate on some vital characteristics just like the appropriate amount of electricity furthermore as water and an appropriate schedule for irrigation of crops. Farmers face problems in meeting these standards, notably those living in financial

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condition. This project looks into developing associate degree automatic irrigation system which may be controlled through a mobile application. This methodology will work to attenuate the number of employees in associate degree passing crop field, management and save water and electricity, increase agricultural production practice little quantities of water, minimize manual intervention in watering operations with increasing watering speed and protecting plants from fungi. of those choices produce these researches property option to be thought-about to spice up agriculture and irrigation efficiency. build system straightforward to use by farmers [9].

## 1.6 Report Layout

The system technique includes the implementation of proto-type device work robotically and controlled via the mobile application. For the model format drawing up the timeline and reading, connected works square measure the primary step. once wanting into the benefits and drawbacks of previous studies among the topic of an associate automatic irrigation system, we are going to begin implementing the layout and automation technique for practicable. The timeline of the project became assault the flow chart of the project. The steps square measure among the subsequent methodology chart [10].

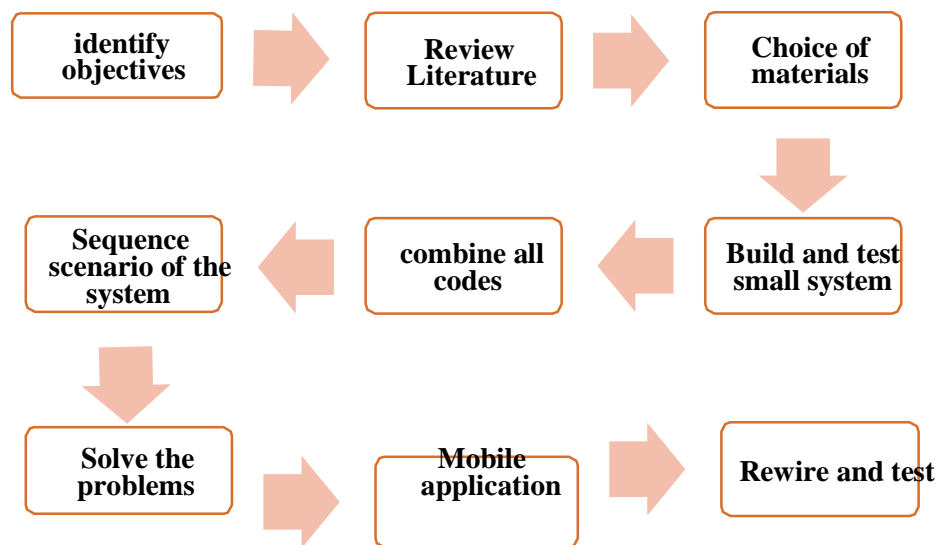


Figure1 Process Flowchart

## **CHAPTER 2**

### **BACKGROUND**

#### **2.1 Introduction**

In the starting, we should always have enough data of however irrigation systems work and the way it will be designed expeditiously. This chapter focuses on similar makes an attempt in alternative papers[11].

#### **2.2 Comparative Studies**

The appliance focuses on rice fields in nations betting on agriculture inside the economy, like India Pakistan. the first conception during this appliance is to cognizance on the amount of water in agricultural fields as a result of those fields lose legion their merchandise thanks to floods. The sensing element sends a message from the sector to the person about the extent of water inside the realm if it'll increase or decreases then the operator controls the pump to manage or flip off the phone. The blessings of this machine area unit that it depends on the Sun energy to induce hold of electricity. the risks of this technology area unit that it targeted on one type of sensing element, the water stage sensing element, notwithstanding whether or not the plant wishes water or not. There could also be no chance supply of energy just in case there's no star electricity to run the device[11].

#### **2.3 Scope of my Problem**

In this machine, the fundamental plan is to place confidence in the sort of soil and also the quantity of water required by every sort of soil. This method is completed by measure the extent of wetness in every sort and exploitation the pump to produce water[5]. The result indicates that sandy soil needs less water than clay soils. The blessings of this device area unit to concentrate on soil wetness and conservation. however, creating the machine, a lot of less power is to live the wetness of the soil from one location within the agricultural land. It's way viable that the

vegetation at the opposite finish of the agricultural land will now not would like watering. Also, the water supply is not constant[11].

## 2.4 Challenges

This widget works with 2 probes insert among the soil. once the soil is dry then the probes can no longer behavior and whereas the soil is wet then the probes can behavior[11]. Thy used HEX electrical converter and this offers the complement output for its input, i.e. while the center is high it offers low output. the running of the two probes within the soil depends upon on the resistance as an example if the resistance is the high manner the soil is dry and while the soil is wet then the resistance is low and therefore the voltage given to the 2 probes is given from the battery connected to the circuit [6].

Step 1: begin the method.

Step 2: Initialize power is provided to GSM.

Step 3: Check the wetness level (less than or additional than).

Step 4: If the amount is going to be quite mounted criteria, no want for irrigation.

Step 5: If the wetness level is a smaller amount than mounted criteria, begin irrigation.

Step 6: formatting of pump and rain gun.

Step 7: once the method completed, it moves to the initial state.

Step 8: Stop the method [13].

I believe the sole disadvantage of this study is that it works with Wi-Fi. typically, agricultural land is much from the town, therefore, the network isn't smart in these areas. Also, this method has to enter the farmer via his mobile [20].

## CHAPTER 3

### REQUIREMENT SPECIFICATION

#### 3.1 Business Process Model

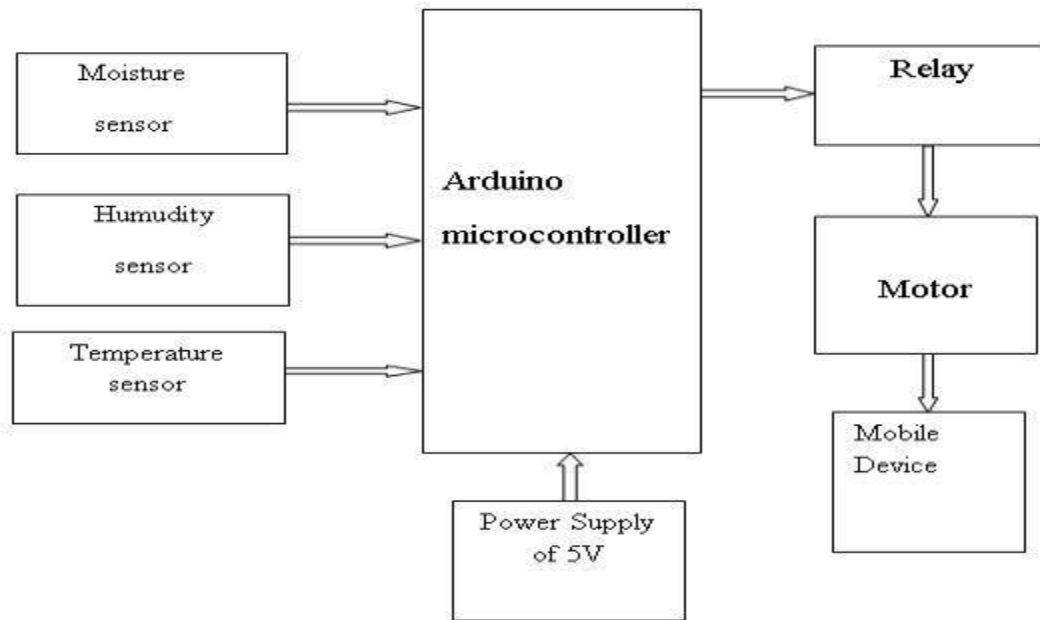


Figure 2: Block Diagram of Irrigation System

#### 3.2 Functional Requirements

##### 3.3 Easy to implement

- The materials needed for this project should be straightforward to put in to implement a productive project. additionally, materials ought to be straightforward to attach with one another to create this project and become simpler. Also, the materials of this project should be straightforward to switch it just in case of any harm.

•Open-source

The controller used for this project is the ASCII text file, that the used hardware in all fairness priced and has free development package[20].

- Strength

The tools required for this project should be robust to control for an extended amount of your time to realize the specified success. additionally, to achieving one in all the vital goals needed to avoid wasting cash.

- Quality

The tools needed to create this project should be of wonderful quality to control for an extended time. glorious quality is needed for this project to realize the specified success of this project[14].

- Modifiability

The material ought to be chosen supported its simple modifiability, as it is common to return across styles and connections. Also, to be straightforward to switch or modification needed within the future.

- Communication

Bluetooth connected to the system and period clock to require all information from

Example to mobile application

- Accuracy

The reading of all information ought to be in details as a result of it'll be saved in American state card for analysis and analysis.

- Performance

The system should work on the period [17].

- Operational

This system is figure mechanically and it's connected to the mobile application that the user should transfer the applying on their mobile to manage their system.

- Cost

the price of this technique should be not too dear as a result of we tend to aim to decrease the employee that means decrease the quantity of cash in irrigation method and solve the most drawback (reduce the water consumption) at a similar time[18].

### 3.4 Flow Chart of Implementation Process

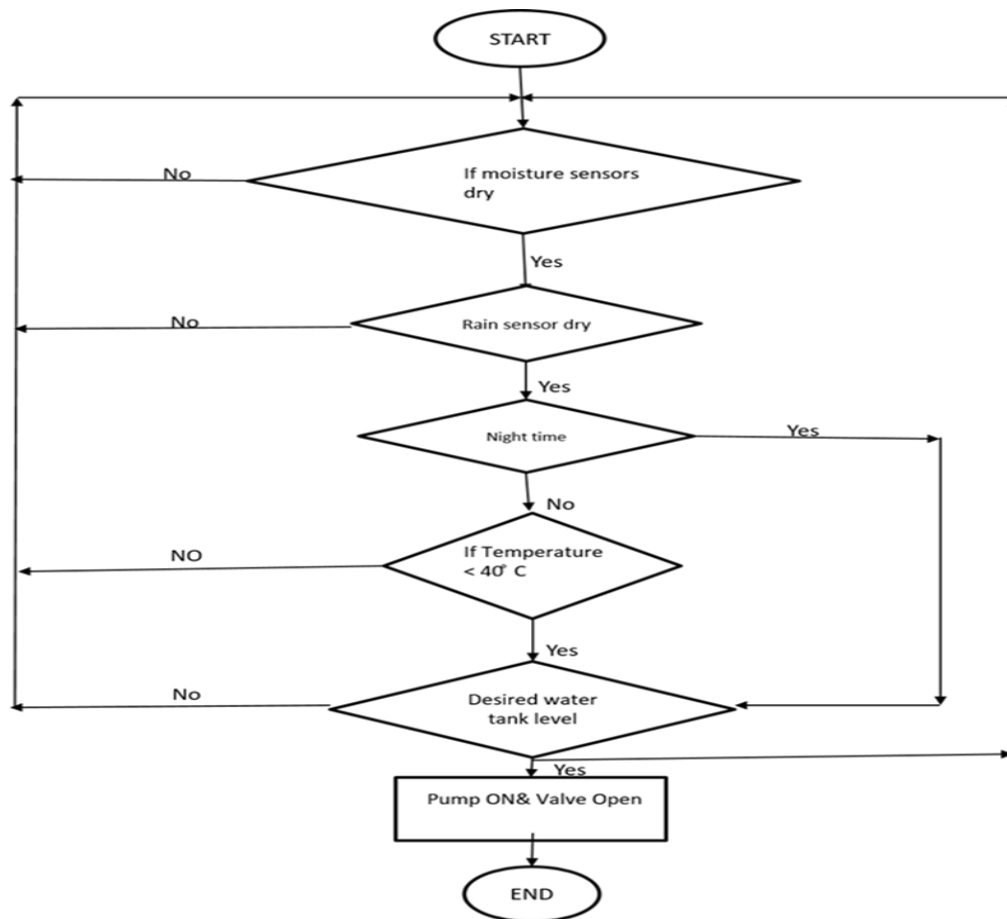


Figure 3: Flow chart of implementation process



### 3.5 Components List

SL NO	NAME OF COMPONENTS	QUANTITY
1	Arduino UNO	1
2	Real Time Clock	1
3	DHT11 Temperature and Humidity Sensor	1
4	Electric DC Motor	1
5	Relay Module	1
6	1 k Resistor	1
7	Power Supply cord for Arduino	1
8	MOSFET	1
9	Female Headers	10
10	Male Headers	10
11	Diode	1
12	Jumper wire	20

Table 1: Component list of proposed system

Figure 4: Components List

### 3.6 HARDWARE REQUIREMENTS

#### 3.7 Arduino/Uno (Esp8266 Node MCU)

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.

Arduino is an open-source physical computing platform based on a simple input/output board and a development environment that implements the Processing language.

IDE (Integrated Development Environment) can be downloaded for free from ([www.arduino.cc](http://www.arduino.cc))

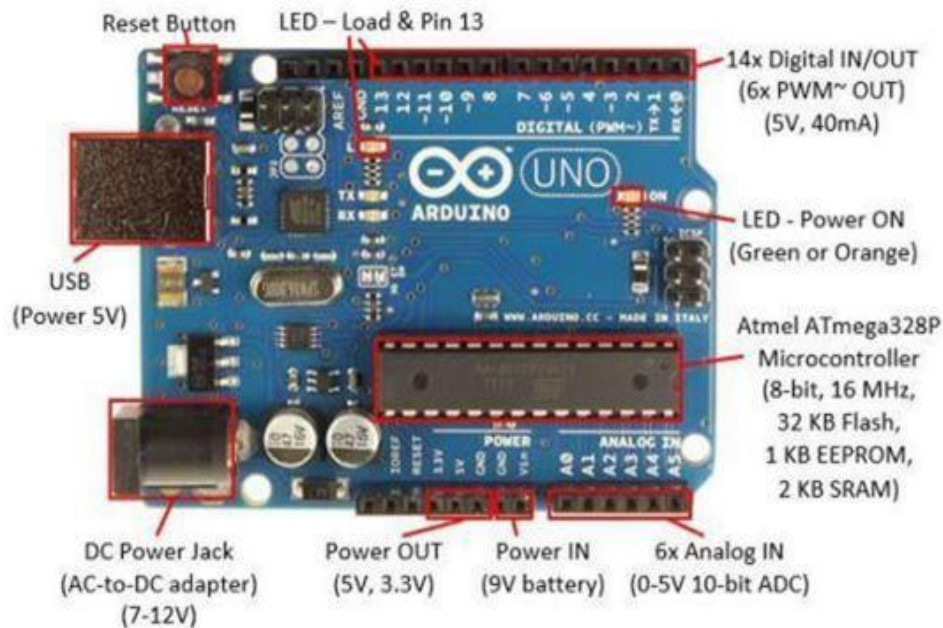


Figure 5: Arduino/Uno (Esp8266 Node MCU)

### 3.8 Pin Description Arduino Uno

The Uno could be a micro controller board supported the ATmega328P. It has 14 digital input/output pins (of that vi will be used as PWM outputs), vi analog inputs, a 16-megahertz quartz, a USB affiliation, an influence jack, Associate in Nursing ICSP header and a reset button. every of the fourteen digital pins will be used as Associate in Nursing input or output, exploitation pin Mode (), digital Write (), and digital scan () functions. They operate at five volts. every pin will provide or receive twenty mA as suggested operational condition and has an inside pull-up resistance (disconnected by default) of 20-50k ohm. A most of 40mA is that the value that has got to not be exceeded on any I/O pin to avoid permanent injury to the micro controller[21].

## 3.9 Breadboard

- **Breadboard Definition**

Breadboard is a plastic board for holding wires and electronic segments such as transistors and resistors

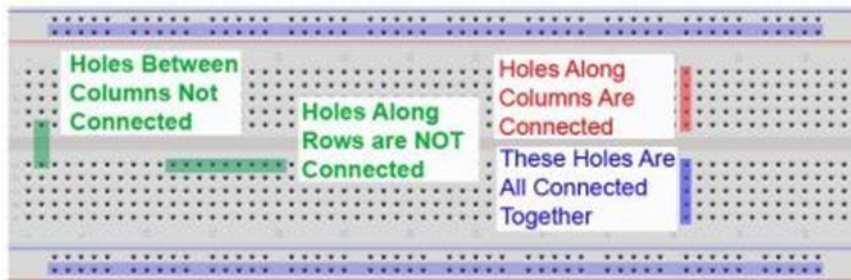


Figure 6: Breadboard

## 4.1 Soil Moisture Sensors

The soil wet sensor contains two tests that the unit of measurement used to the degree the meter substance of water. the two tests enable this to possess the soil, that provides the resistance esteem to the degree the condition esteem. once there is water among the soil there will be less resistance and so the soil will handle the extra power. however, if the soil is dry it conducts power weekly

and needs less power and extra resistance.

Soil wet device is utilized to measure the wet content gift among the soil. once the soil wet value browses by the device is over the edge value, low level (0V) area unit getting to be the digital output and if it's below the sting level, high level (5V) area unit getting to be the digital output. The digital pin is utilized to directly browse current soil wet value to look at if it's over threshold or not. the sting voltage is also regulated with facilitate of potentiometer [22].

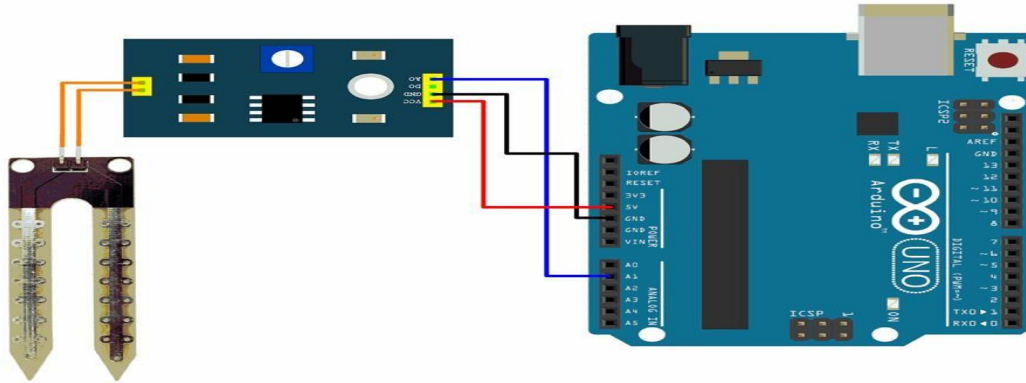


Figure 7: Soil Moisture Sensors with Arduino Uno

## 4.2 Dht22 Temperature and Humidity Sensors

DHT22 digital temperature and wetness sensing element could be a composite sensing element contains a label digital signal output of the temperature and wetness. Application of a zealous digital module's assortment technology and therefore the temperature and wetness sensing technology, to make sure that the merchandise has high liableness and glorious long stability. The sensing element includes a resistive sense of wet parts Associate in Nursing NTC temperature measuring devices, and connected with a high-performance 8-bit microcontroller. On the opposite hand, for measure temperature these sensing elements use an NTC temperature sensor or a thermal resistor. A thermal resistor is truly a resistor that amendments its resistance with change of the temperature. These sensors area unit created by sintering of semi semiconducting materials like ceramics or polymers so as to supply larger changes within the resistance with simply tiny changes in temperature[38].

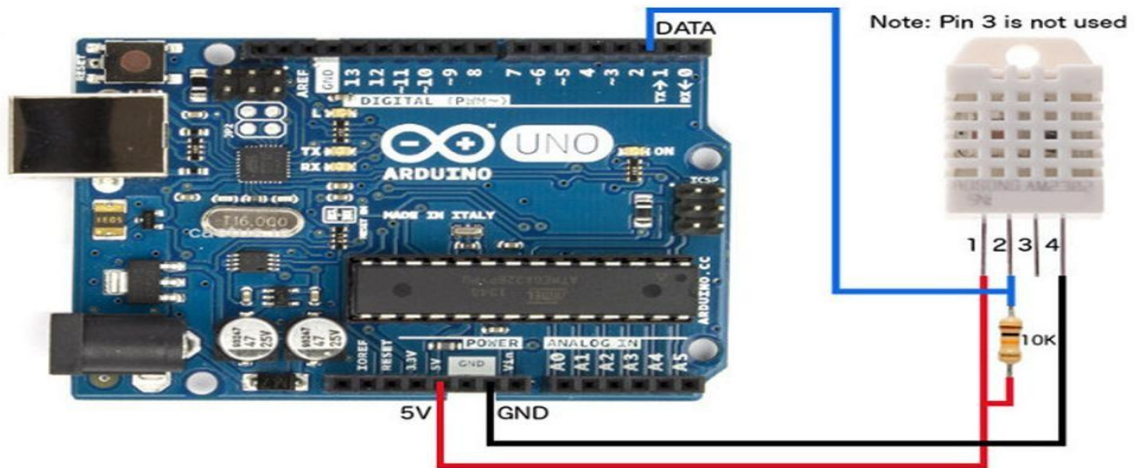


Figure 8: DHT22 with Arduino Uno

### Features of DHT22:

- It measures each air temperature and wetness.
- Relative humidity expressed as a proportion.
- HS1100 is employed for sensing humidness.
- The output in terms of frequency vary 5khz to 10khz.

### 4.3 Light Emitting Diode (Led)

A crystal rectifier (LED) could also be a two-lead semiconductor supply of illumination. it is a tangency diode that emits light-weight once activated. once associate degree applicable voltage is applied to the leads, leptons square measure able to recombine with lepton holes within the device, cathartic energy at intervals the type of photons. This impact is called electroluminescence,

and the color of the sunshine (corresponding to the energy of the photon) is determined by the energy bandgap of the semiconductor. LEDs square measure sometimes very little (less than 1mm<sup>2</sup>) and integrated optical components also are accustomed kind the graphical record [25].

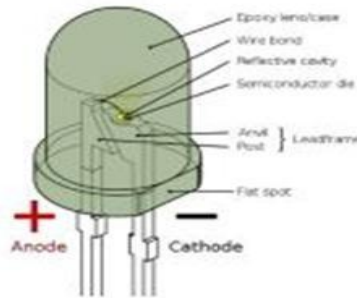


Fig 4: LED

Figure 9: LED

### 4.4 Resistor

An electrical device could be a passive two-terminal electrical element that implements electrical resistance as a circuit part. In electronic circuits, resistors are used to reduce current flow, modify signal levels, to divide voltages, bias active parts, and terminate transmission lines, among alternative uses. High-voltage resistors which will dissipate several watts of power as heat are also used as a part of motor controls, in power distribution systems, or as take a look at masses for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors are used to modify circuit parts (such as volume control or a lamp dimmer), or as sensing devices for pressure, light, humidity, force, or chemical activity [20].

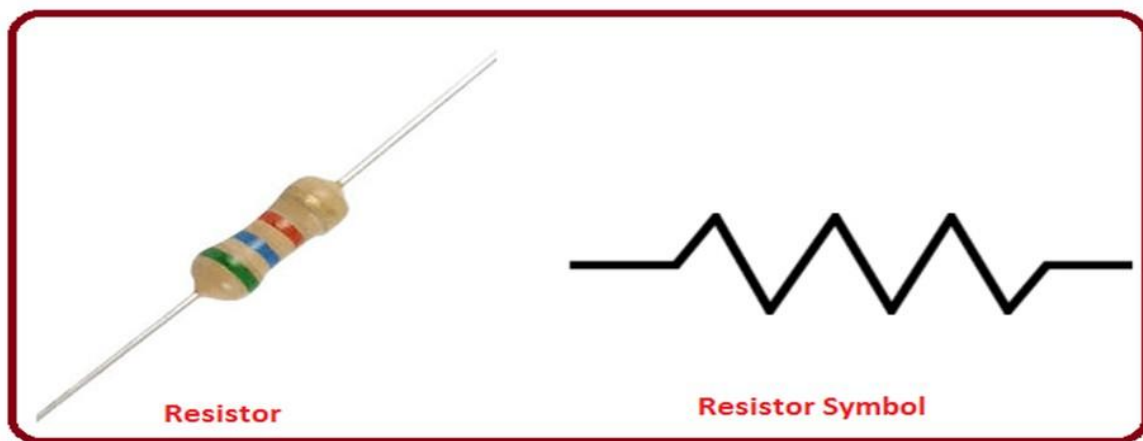


Figure 10: Resistor

## 4.5 Relay Module

Relay is an associate magnetic force device that is employed to isolate 2 circuits electrically and connect them magnetically. they're terribly helpful devices and permit one circuit to change another one whereas they're fully separated. they're typically accustomed interface associated electronic circuit (working at an occasional voltage) to associate circuit [12].

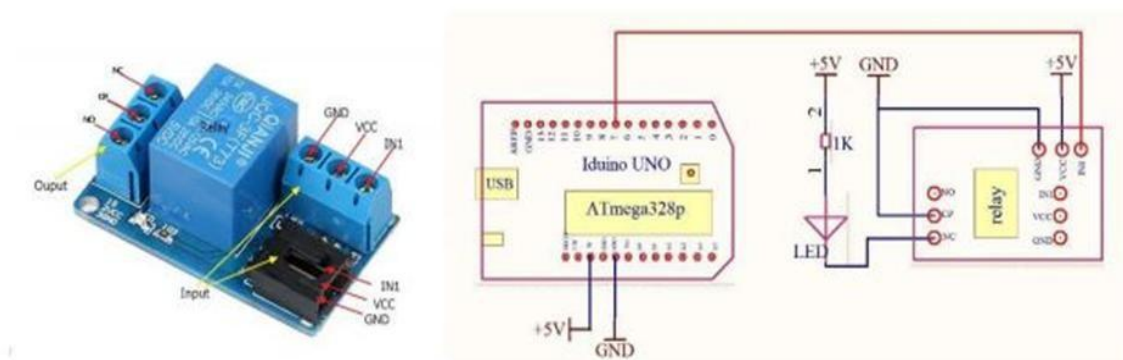


Figure 11: Relay Connection with Arduino

which works at terribly high voltage. as an example, a relay will build a 5V DC battery circuit to change a 230V AC mains circuit. so, any low detector circuit will drive, say, an addict or an electrical bulb. A relay switch is divided into 2 parts: input and output. The output section includes a coil that generates a force field once a tiny low voltage from the associate electronic circuit is applied thereto. This voltage is termed the operative voltage. normally used relays square measure offered during a completely different configuration of operative voltages like 6V, 9V, 12V, 24V, etc. the output section consists of contactors that connect or disconnect automatically. during a basic relay, there square measure 3 contactors: ordinarily open (NO), ordinarily closed (NC) and customary (COM). At no purpose state, the COM is connected to American state. once the operative voltage is applied the relay coil gets energized and also the COM changes contact to NO[26].



## 4.6 Water Pump Motor

It is utilized during this project to pump the water needed for irrigation from the foremost cistern through pipes. This pump is going to be used for numerous applications, in-unit embody cleansing, bathing, house heating and flower of water. This pump is chosen for this project as a result of its sensible edges. Such as, it is a light-weight. Also, it is a little low size, so it's easy to place in and replace it. what's a lot of, it's associate enough efficiency to pump water for irrigation? Since it operates in twelve volts, so it consumes lower power. to boot, this pump options a very Low of noise. Finally, price the value the price} of this pump is an implausibly low cost [5].



Figure 12: Water Pump Motor

## 4.7 Rechargeable Battery

When selecting an appropriate battery for this project, some tiny print ought to be thought-about. Firstly, it has to be compelled to be environmentally friendly it has to be compelled to be sealed construction. Secondly,



it has to be compelled to be a stable quality and high liableness. Also, it ought to be a rechargeable kind, therefore it'll not contribute to pollution of the setting. This battery might be a high-quality battery that is designed therefore on administer high performance, strength and long life [35].



Figure 13: Rechargeable Battery

# CHAPTER 4

## DESIGN SPECIFICATION

### 4.1 Front-end-Design

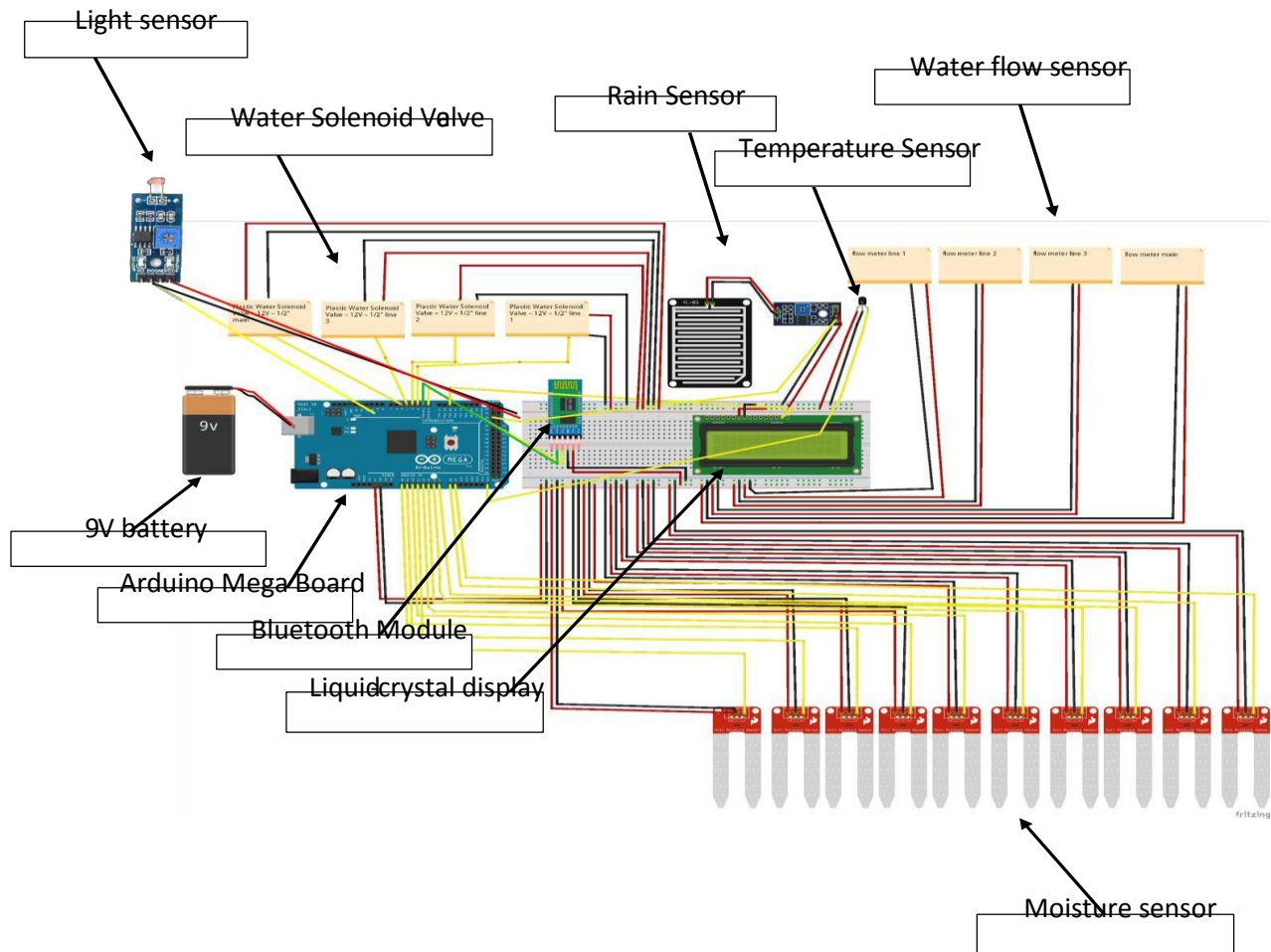


Figure 14: Full Circuit Diagram

## 4.2 Back-end-Design

As it shows in Figure16, the state of affairs of application begin from putting in the app on phone then open the appliance, 1st of all, the most screen of the app are going to be loaded once the user can opt for that device is connected to Bluetooth. The system can check if the device is connected if it's connected then it notifies the user that the device is connected otherwise apprise the user device isn't connected. within the main screen, the user will directly turn ON/OFF the complete system. Moreover, with whole system for instance if he ironed on plant1 button he is going to be able to see (quantity of water, Soil wetness, Temperature) if there's drawback solely during this line he will turn on /OFF line therefore he's ready during this page to manage line by line

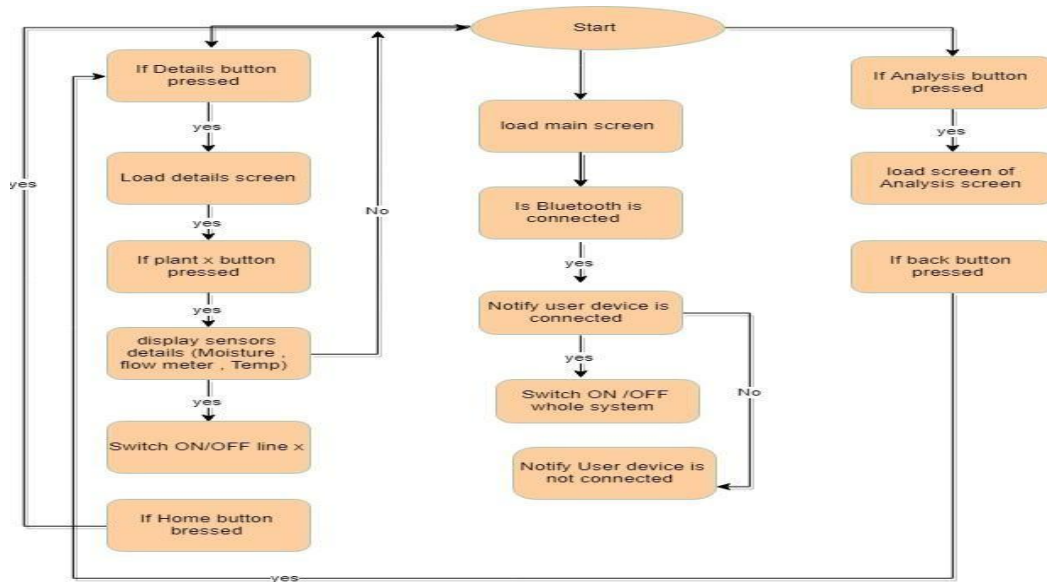


Figure 15: Flow chart of application process

## 4.3 Software Platforms

Atfirst, you'll be able to transfer Arduino UNO codeIDE.(<https://www.arduino.cc/en/Main/software>) following this link. And you'll be able to conjointly add Arduino UNO code library from Arduino board manager. This project is web-based comes. you'll be able to simply check your project reports on application program on following addresses 192.168.0.7/

## CHAPTER 5

### IMPLEMENTATION AND TESTING

#### 5.1 Implementation of Database

I recorded the tactic of manual irrigations system of three sorts of plants (lemon, mint, and mango) for three weeks. The irrigation method takes place doubly per week within the morning and therefore the alternative day within the evening. to investigate information, I take the information about the chosen plant doubly every day one between nine am - five pm and therefore the second between 6pm-11pm [8].

The line graph in (figure 18) shows the wetness information of the mint. the coordinate axis shows the amount of wetness and coordinate axis shows the day and time. Sunday and weekday have the most important quantity of wetness that is 900-800. once the wetness is quite 800 means that the plant is dry and want to be irrigated. the amount of wetness decreases on a weekday within the evening and Th within the morning and reach 200-120 that means the plant isn't dry and doesn't would like watering. From this information, we will say that the mint step by step dries up and it maintains water quite alternative plants.

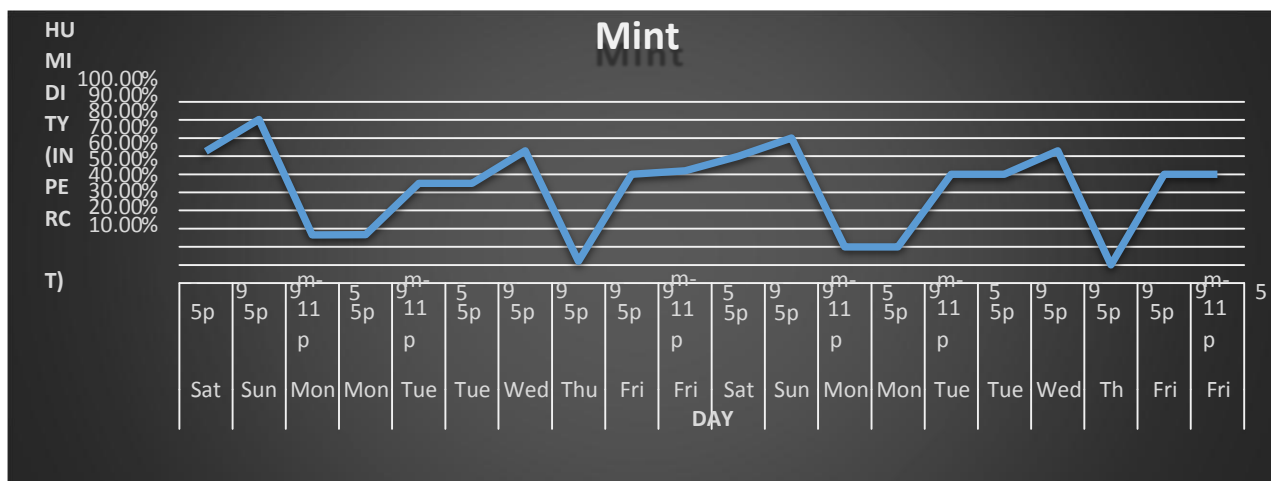


Figure 16: Humidity data of the Mint

The line graph in (figure319) shows the humidity data of lemon y-axis shows the number of humidity and x-axis shows the day and time. Sunday and Wednesday have the largest number which is 1000 which mean

The plant is very dray and it needs to be irrigated as soon as possible. On Monday and Thursday, the humidity decreased but what I notice from this data than the lemon needs to irrigate more than twice a week because it loses water faster. So, we can say that lemon needs water more than mint.

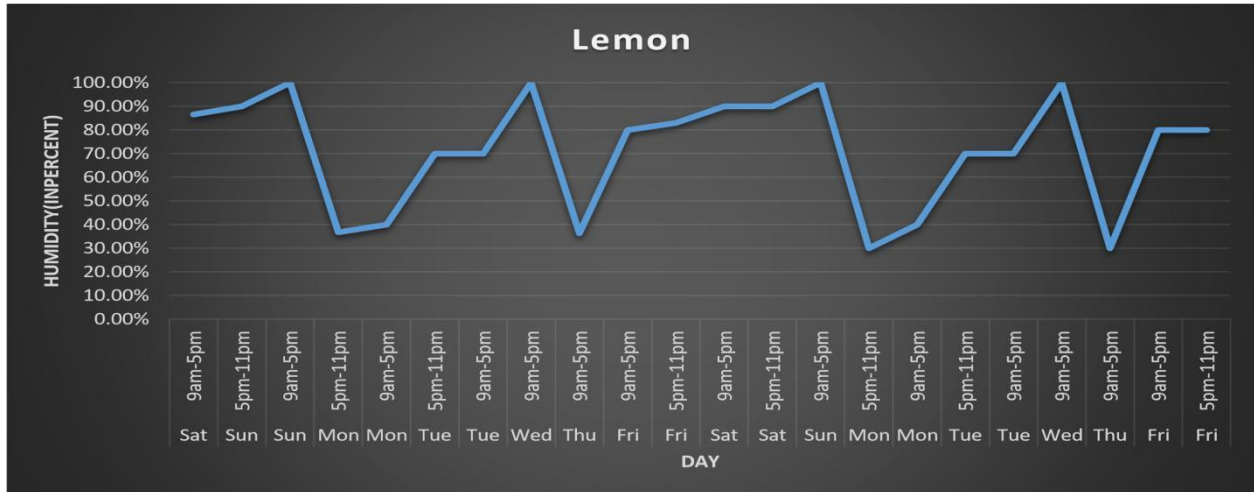


Figure 17: Humidity Data of the Lemon

The line graph in (figure19) shows the wetness information of lemon coordinate axis shows the amount of wetness and coordinate axis shows the day and time. Sunday and Wednesday have the biggest range that is a thousand that mean the plant is extremely horse-cart and it must be irrigated as shortly as potential. On Monday and Thursday, the wetness ablated however what I notice from this information than the lemon must irrigate over doubly every week as a result of it loses water quicker. therefore, we are able to say that lemon desires water over mint[35].

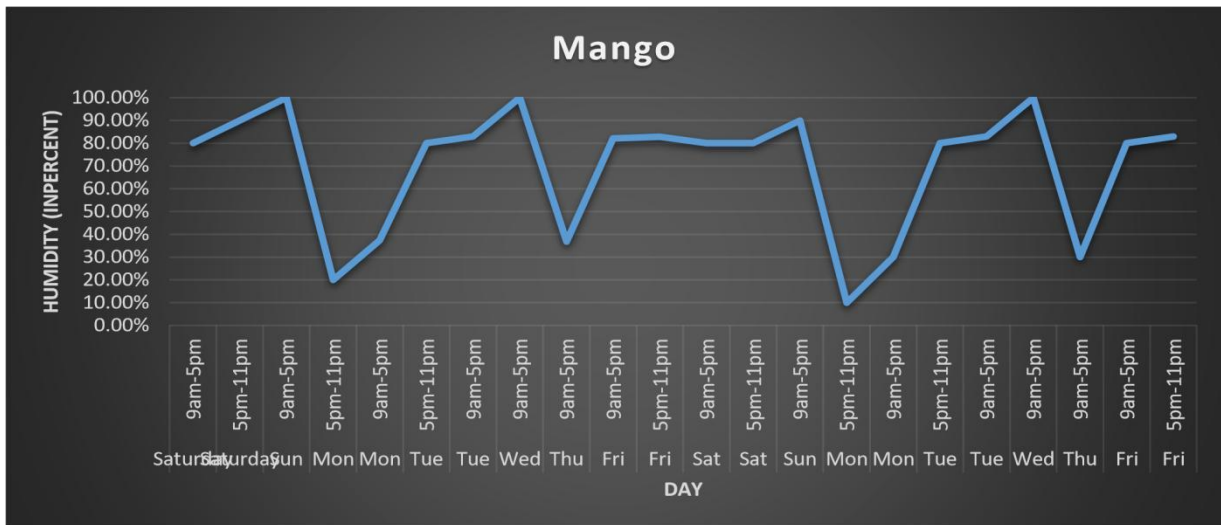


Figure 18: Humidity Data of the Mango

Through the information we will observe the subsequent in (Figure18), All the plants were patterned at just one occasion and in equal quantities nearly doubly per week, however when scrutiny the results we have a tendency to found that the lemon and mango required to water quite twice per week as a result of the humidness quantitative relation is considerably reduced taking under consideration the temperature and therefore the time of irrigation. once they irrigate within the morning plants lose humidness quickly and vary considerably as a result of the irrigate at the incorrect time that the sun evaporates water abundant quicker. As for the mint plant through the results, we have a tendency to found that this plant doesn't lose wet quickly because it will face up to an extended amount of mango and lemon. Through these results, we will conclude by oral communication that victimization associate automatic irrigation system is additional economical as a result of it solves the majority the issues of victimization the manual system. Automatic irrigation system works supported the wantsof plants, thus it solves the matter of irrigation in wrong time by victimization lightweight and temperature sensors along.

## 5.2 Test Result and Reports

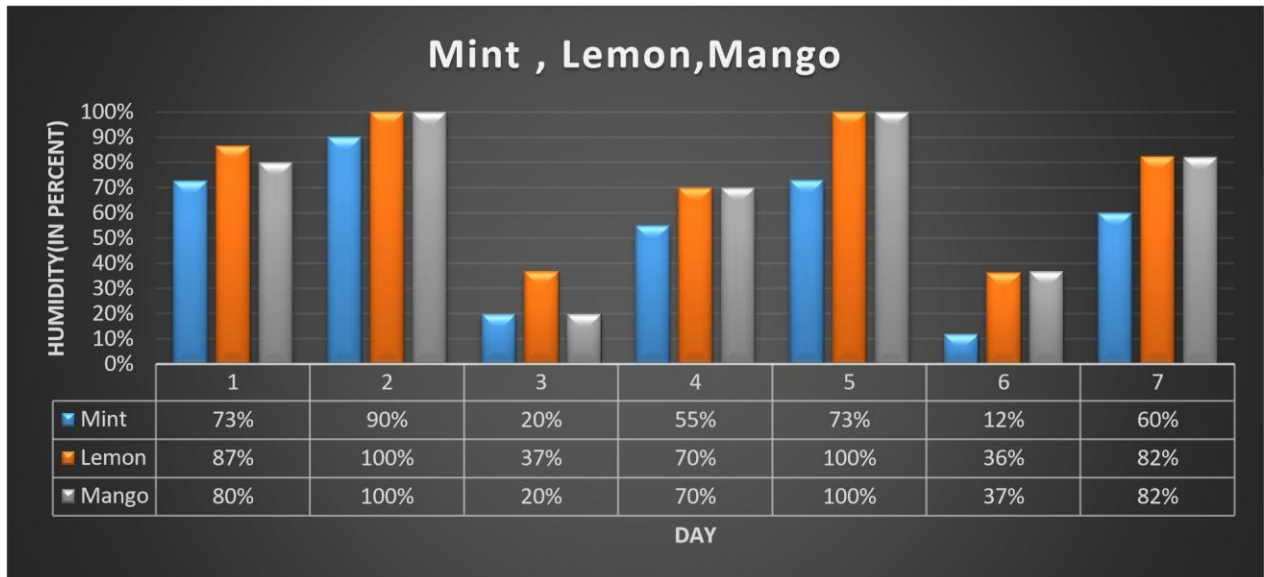


Figure 19: Humidity data of all plants

## 5.3 Result and Discussion

After finishing the set up and therefore the assortment of the parts of the good Irrigation system, it has been met the goal. Also, all of the necessities were enforced so as to complete this good Irrigation system, in order that it becomes full production and nail down. After that, the system became tested, and therefore the final result became as needed. The system cannot work till 2 or 3 of wetness sensors from any line of the three fields send a proof to the Arduino that the soil is dry and crop wants water. when the sign reaches the Arduino, it'll send a command to the relay of that specific line field valve to be energized to open the valve and a command to the relay of the pump to exchange it on to irrigate that field. Also, all three fields are irrigated at a same of your time, if 2 or 3 of all three plants wetness detector square measure activated. So, all magnet valve relays could also be energized to open all valves and therefore the pump can run to irrigate all three plants. There has been a haul at the start to decide on an acceptable pump to paintings to irrigate all flowers at a similar moment. The program of the system has been organized and therefore the system cannot operate unless (or 3 wetness sensors) square measure activated. however, if one detector is activated of any lines the system cannot perform, as a result of that

detector may also be defective. If the cistern level is low the system won't operate in any respect, even all plant sensors square measure activated to guard the pump [37].

Furthermore, this good Irrigation system has been organized that if there's a descending, it's reaching to not work, as a result of the descending detector can activate, and it'll send a proof to Arduino to prevent the pump and to shut all valves too. Further, on the daytime the system cannot work, thanks to the gentle detector can activate at the daytime which can reason to shut the plant's worth likewise on turn off the pump.

For the system programming, it's been exactly chosen as declared in previous chapters to use UNO Arduino, the wires connections from the controllers to the Arduino are pretty troublesome, thanks to one mistake will harm any electrical part. It absolutely was demanding to program the good Irrigation system and transfer it in Arduino to run the pump and beginning valves with eighteen sensors, however with the assist of Arduino library, this method became completed with best results.

Connecting the wires from twenty devices to the Arduino become terribly laborious and sophisticated, however by suggests that of mistreatment the plastic bread board became to facilitate the affiliation of these wires.



## CHAPTER 6

### CONCLUSION AND FUTURE SCOPE

#### 6.1 Discussion and Conclusion

Many issues were long-faced, like the tables want to be a base of this project size was larger than the required size for this epitome. Also, the materials that needed for this project has been troublesome to seek out. choice of the acceptable plant plate to mend it within the foam and artificial grass includes an important drawback. Also, since quite ten devices were connected to the Arduino, wires association are complexed to attach. moreover, the batteries of this project drain quickly in use, Sequence of the system state of affairs has been dangerous to make your mind up to operate[25]. The controllers to the Arduino were quite difficult, attributable to one mistake will harm any electrical half. it absolutely was dangerous to jot down the software system for the sensible Irrigation System and transfer it in Arduino to run the pump and gap valves with eighteen sensors, however with the assistance of Arduino library, the program was completed with good results. Connecting the wires from twenty devices to the Arduino was terribly troublesome and sophisticated, however by victimization the plastic board was to facilitate the association of those wires.

#### 6.2 Scope for Further Developments

With the results of the project start at intervals the longer-term square measure to transfer this project to large scale. in addition, to manage the system via angularity Bee instead of wire affiliation. Moreover, to form heaptionsplentyheapsloads a great deal of responsive mobile application that contains a lot of controlled data. in addition, we tend to {will we tend to square measure ready to} develop this technique by victimization renewable energy that's alternative energy instead of batteries victimization energy can facilitate to reduce future worth.

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## Appendices

Appendix A: Wiring connection between devices and Arduino's pins.

Devices	Pin number
Flow meter 1	D11
Flow meter 2	D12
Flow meter 3	D13
Flow meter 4 (MAIN)	D14
Moisture 1	A1
Moisture 2	A2
Moisture 3	A3
Moisture 4	A4
Moisture 5	A5
Moisture 6	A6
Moisture 7	A7
Moisture 8	A8
Moisture 9	A9
Valve 1	D3
Valve 2	D4
Valve 3	D6
Water Level sensor	A10
Light sensor	D28
Temperature sensor	A15
Rain sensor	D26

Appendix B: Material features that have been used in this project.

Material	Features
Arduino	<ul style="list-style-type: none"> <li>➤ Microcontroller AT mega328</li> <li>➤ Voltage of operating 5V</li> <li>➤ Recommended input voltage 7-9V</li> <li>➤ Range of input voltage 6-20V</li> <li>➤ Pins of digital I/O 14 (of which 6 provide PWM output)</li> <li>➤ Pins of Analog Input 6</li> <li>➤ Per I/O Pin DC Current 40 mA</li> <li>➤ Pin Current DC for 3.3V 50 mA</li> <li>➤ Memory of Flash 32 KB (ATmega328) (0.5 KB used by bootloader)</li> </ul>
Moisture sensor	<ul style="list-style-type: none"> <li>➤ Voltage of working 5v</li> <li>➤ Current of working <math>\leq</math> 20 mA</li> <li>➤ Analog interface</li> <li>➤ Detection depth 37mm</li> <li>➤ Working temperature range 10 <math>^{\circ}</math>C 30 <math>^{\circ}</math>C</li> <li>➤ Weight 3 gram</li> <li>➤ Size (36<math>\times</math>20<math>\times</math>8) mm</li> <li>➤ Arduino compatible interface</li> <li>➤ Power consumption low</li> <li>➤ High sensitivity</li> <li>➤ Signal output of voltage 0-4.2 v</li> </ul>



<p>Plastic Water Solenoid Valve – 12V – 1/2”:</p>	<ul style="list-style-type: none"> <li>➤ Resistance of coil: 37.5 ohms.</li> <li>➤ It can be actuated starting with 6v</li> <li>➤ - C</li> <li>➤ Opening reposing time <math>\leq 0.15</math> sec</li> <li>➤ Dimensions 3”x2.25”x2”</li> <li>➤ 320 mA @ 12 VDC</li> <li>➤ 1/2” Nominal non-taped National Pipe</li> <li>➤ Life actuating <math>\geq 50</math> million cycles</li> <li>➤ Closing response time <math>\leq 0.3</math> sec</li> <li>➤ Its weight 4.3 oz</li> </ul>
<p>Rain Sensor</p>	<ul style="list-style-type: none"> <li>➤ Adopts high quality of RF-04 double sided material.</li> <li>➤ Area: 5cm x 4cm plate on side made of nickel.</li> <li>➤ Good oxidation resistance, conductivity resistance.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ The output of Comparator features a sensible clean waveform, ability of driving, over 15 mA Potentiometer is used to adjust the sensitivity.</li> <li>➤ Voltage of working 5V</li> <li>➤ Format of Output: Digital switching output (0 and 1) and analog output of voltage AO</li> <li>➤ With bolt holes, so it is easy to install</li> <li>➤ The PCB board size: 3.2cm x 1.4 cm</li> <li>➤ Uses an extensive voltage LM393 comparator.</li> </ul>
<p>Water pump</p>	<ul style="list-style-type: none"> <li>➤ Voltage of Input: 6-12 VDC ➤ Rate of Flow: 1.5-2 L/min</li> <li>➤ Temperature of Operation: 80 °C</li> <li>➤ Current of Operating: 0.5-0.7A</li> <li>➤ Distance of Suction: 2 meter (Max)</li> <li>➤ Pump Life: 2500 Hour</li> <li>➤ Size of Pump: 90x40x35 mm</li> </ul>

Temperature of working range: 1 ■ C 75 ■



Rechargeable Battery	<ul style="list-style-type: none"><li>➤ Type Lead acid Battery.</li><li>➤ Model PP 2.3-12</li><li>➤ SV code 380301 AALV4</li><li>➤ Brand Power Plus</li><li>➤ Color Black</li><li>➤ Battery Voltage 12V</li><li>➤ Battery Capacity 2.3 Ah/20 HR</li><li>➤ Size (L × B × H) 10cm × 7cm × 4.3cm</li></ul>
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