Solar Based Automatic Garden Irrigation System

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It is declared hereby that this project paper or any part of it has not been submitted to anywhere else for the award of any degree.

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Abstract

This is most important cultural practice by watering and most labor intensive task in daily greenhouse operation. Watering systems ease the burden of getting water to plants when they need it. Knowing when and how much to water is two important aspects of watering process. To make the gardener works easily, the automatic plant watering system is created. There have a various type using automatic watering system that are by using sprinkler system, tube, nozzles and other. This project uses watering sprinkler system because it can water the plants located in the pots. This project uses Arduino board, which consists of ATmega328 Microcontroller. It is programmed in such a way that it will sense the moisture level of the plants and supply the water if required. This type of system is often used for general plant care, as part of caring for small and large gardens. Normally, the plants need to be watered twice daily, morning and evening. So, the microcontroller has to be coded to water the plants in the greenhouse about two times per day. People enjoy plants, their benefits and the feeling related to nurturing them. However for most people it becomes challenging to keep them healthy and alive. To accommodate this challenge we have developed a prototype, which makes a plant more selfsufficient, watering itself from a large water tank and providing itself with artificial sunlight. The pro-To type reports status of its current conditions and also reminds the user to refill the water tank. The system automation is designed to be assistive to the user. We hope that through this prototype people will enjoy having plants without challenges related to absent or forgetfulness Bangladesh is a third world country with less economic growth. About36 %(Bangladesh) of GDP and 64% (Bangladesh) of its employment comes from agriculture. But our agricultural history is declining due to lack of irrigation facility. At the same time the existing irrigation facilities cost the government a huge amount of subsidy every year. So it's a high time that we find an alternative way of irrigation so that our subsidy is reduced as well as people get water throughout the year. And gives birth to our project. In our project, we will be analyzing the feasibility of Automatic water irrigation system for surface irrigation in the context of Bangladesh.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Bangladesh's significant wellspring of pay is from agribusiness area What's more, 70% of ranchers and general individuals rely upon the agribusiness. In Bangladesh the vast majority of the water system frameworks are worked physically. These old fashioned strategies are supplanted with semi-computerized and mechanized systems. His accessible conventional procedures resemble dump water system, terraced water system, dribble water system, sprinkler framework. The worldwide water system situation is arranged by expanded interest for higher agrarian profitability, poor execution and diminished accessibility of water for Agribusiness. These issues can be fittingly amended on the off chance that we utilize robotized framework for water system. A. Need of Automatic Irrigation Simple and simple to introduce and arrange. Sparing vitality and assets, with the goal that it tends to be used in legitimate way and sum. Agriculturists would have the capacity to spread the appropriate measure of water at the perfect time via computerizing homestead or nursery water system. Evading water system at the wrong time of day, diminish spillover from over watering soaked soils which will enhance trim execution. Mechanized water system framework utilizes valves to turn engine ON and OFF. Engines can be mechanized effectively by utilizing controllers and no need of work to turn engine ON and OFF. It is exact technique for water system and a profitable apparatus for precise soil dampness control in exceedingly concentrated nursery vegetable generation. It is efficient, the human mistake end in accessible soil dampness levels.

Watering system is an experimental methodology of misleadingly supplying water to the area or soil that is the main base of our farming system. Primarily water must be supplied to the fields either through trenches. This system would decrease the workload of the rancher and help keep up fitting quality of soil for better growth. Henceforth with the development of innovation it was conceivable to outline frameworks that killed the immediate inclusion of the agriculturist concerning watering system of their fields. These frameworks mechanized the whole watering system framework by controlling the engines that inundated the fields. A

GSM based homestead watering system framework has two noteworthy advancements behind it, essential being the "GSM" and optional one is the controller or processor. GSM (Global System for Mobile Communication) is a standard situated used to depict conventions for computerized cell systems.

The watering system on field and sending the outcomes to the agriculturist utilizing coded signs to a cell phone which by implication controls the whole homestead watering system framework. The processor or the controller acts as a focal center for working of the robotized process after it has been launched by the GSM based gadget lastly exhibits the yield to the gadget.

This paper contains five point by point similar investigation of GSM based homestead watering system approach. It gives a neat gritty investigation of the preferences and detriments of the different advances proposed by the frameworks in the papers under study.

1.2 Problem Statement

Water system has been distinguished as one of the mainstays of accomplishing vision 2030 by the legislature of Kenya in 2007. In its pronouncement named Kenya vision 2030 the nation plans to preserve water and begin better approaches for gathering also utilization of rain and underground water to advance farming efficiency. Kenya is a water rare nation as per the world nourishment software engineer, the vision 2030 activity proposes escalated use of science, innovation and advancement to raise profitability and productivity however water system extension is probably going to expand the shortage of water which will prompt the opposition for the accessible substance by irrigators, ventures and pastoralists.. It perceives the basic pretended by innovative work in quickening financial improvement in all the recently industrialized nations of the world. As of late propelled water system plans e.g. the one million section of land Galana-Kulalu water system conspire still grasp the utilization of manual water system which will include utilization of more water since there is no control and consequently this undertaking proposes the utilization of programmed water system control framework.

1.3 Background of the Study

Bangladesh has a primarily agrarian economy. Agriculture is the single largest producing sector of the economy since it comprises about 18.6% (data released on November, 2010) of the country's GDP and employs around 45% of the total labor force. It holds lots of

agricultural land and the amount of total cultivable land is 8.52 million hectares. About 37.266% million metric ton crops and other vegetables are cultivated in various seasons in this land. About 70% people lives in rural areas and they are directly linked with irrigation. Bangladesh's energy infrastructure is quite small, insufficient and poorly managed. The per capita energy consumption in Bangladesh is one of the lowest (433 kWh) in the world. Bangladesh's installed electric generation capacity (public, private and import) was 15821MW Source: BPDB & EBLSL research (as on 30 September, 2017); only three-fourth of which is considered to be available. Only 62% of the population has access to electricity with a per capita availability of 433 kWh per annum. The electricity generation rate is shown in Figure 1.1 The government's vision of electrifying the entire country by 2020 through grid expansion is not realistic due to inaccessibility and low consumer density in many rural areas, as well as financial constraints. To reach the government's vision of universal electrification, renewable energy sources, in particular solar energy will have to play a vital role for off-grid electrification.

A summary of energy access based on presence of expenditure for electricity is shown in Table 1.

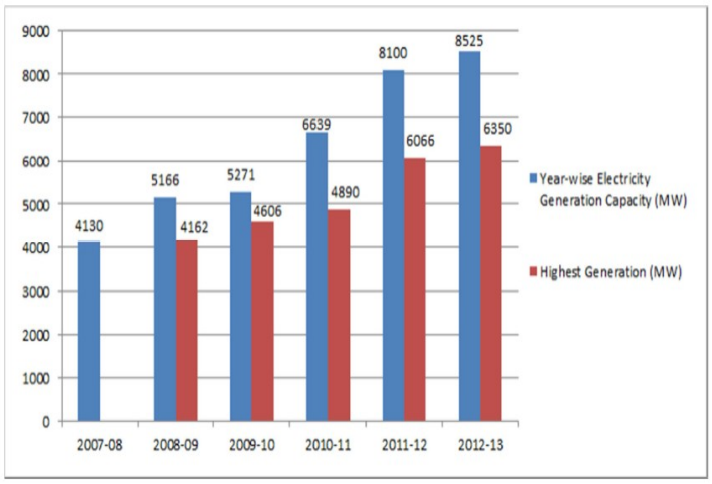

Figure 1.1: Year wise electricity generation capacity and Highest Generation

Public sector accounts for highest power generation of the country while the contribution from private sector is also on the rise driven by the government policy toward increasing power producing capacity at the earliest by encouraging more private investment in this sector. Out of the total 15,821 MW power generation capacity of the country as on 30 September 2017, public sectors capacity stands at 7,476 MW, which is 47% of the total power generation capacity including captive power plants (55% of total excluding captive

power projects) and private sector capacity stands at 6145 MW (including 660 MW power import), which is 39% of the total power generation capacity of the country (45% of total excluding captive power projects). Besides, power generation capacity of the captive power projects now stands at 2,200 MW (14% of total capacity

Table 1. Energy access based on presence of expenditures for electricity (HIES* 2010).

	Total	Rural	Urban
National	55.26%	42.49%	90.1%
Barisal	40.12%	31.62%	82.33%
Chittagong	60.34%	48.84%	92.31%
Dhaka	67.34%	47.36%	96.15%
Khulna	54.13%	45.55%	83.83%
Rajshahi	51.88%	46.94%	75.53%
Rangpur	30.07%	24.44%	68.68%
Sylhet	47.22%	39.09%	88.94%

Table 1.1: Energy access based on presence of expenditures for electricity

Irrigation is the lifeline of agriculture in Bangladesh. Irrigation plays a vital role in this country for half of the year when water scarcity seriously handicaps farming operation. Farmer, now a days, cultivate irrigation based different high value crops throughout the year. In advanced farming, irrigation is no limited to one season only. At present irrigation system is operated by conventional power system and diesel run irrigation pump. As the country is facing acute power crisis a diesel running irrigation cost is high. There is a good prospect for solar powered irrigation system in Bangladesh. Existing state owned and private conventional power plants generate only 5000 to 6145 MW of electricity a day, whereas the country's total demand is about 6000 to 7000 MW. The demand is growing by 500 MW a year due to increasing industrialization, other developments and demands.

During Burro season 120 million acre rice field in Bangladesh is irrigated 1.33 million different types of water pumps among which 87% are diesel operated which require 800 million liter diesel per year. It is estimated that solar irrigation system can save 760 MW of electricity power and 800 million liter of diesel every year. Solar irrigation system can save all these power to use in other development purpose for the government of Bangladesh. This project will be implemented with the help of Infrastructure Development Company Ltd.

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This project will be implemented with the help of Infrastructure Development Company Ltd. (IDCOL) [8]. Solar photovoltaic (PV) systems are in use throughout the country with over 2.9 million household-level installations having a capacity of 122.2 MW (April 2014). Scaling-up of solar PV systems assisted by the development partners are being implemented through Infrastructure Development Company Limited (IDCOL), Rural Electrification Board (REB), Local Government Engineering Department (LGED), Bangladesh Power Development Board (BPDB), NGOs and Private Organizations implementing solar energy program. There is a strong potential for solar energy within the country. Dissemination of solar home systems (SHSs) is being promoted mainly by IDCOL, private sector companies and NGOs based on the direct-sale approach and provision of refinancing funds for micro financing of SHSs to participating organizations (mostly NGOs) through IDCOL. Bangladesh is situated between 20.30°-26.38° north latitude and 88.04°-92.44° east longitude which is an ideal location for solar energy utilization. Daily average solar radiation varies between 4 to 6.5 kWh per square meter. Bangladesh has 15 MW solar energy capacities through rural households and the annual solar radiation availability in Bangladesh is as high as 1700 kWh/m2. Maximum amount of radiation is available on the month of April-May and minimum on December-January. Different R&D Organizations, Institutes and Universities are collecting solar insolation at different parts of Bangladesh.

1.4 Objective

This thesis work is designed with an aim with following objectives

- To prevent the waste of water used for agricultural purposes.
- To managing irrigation projects using renewable energy.
- To generate electricity using solar energy.
- To reduce the cost of irrigation.
- To digitalization of irrigation projects using GSM and microcontroller and moisture sensor.
- To reduce labor costs for irrigation.
- To control an irrigation system Using soil Moisture sensor
- Decrease the amount of work pressure in workplace

1.5 An overview of Irrigation in Bangladesh

In Bangladesh adaptation of irrigation techniques is reported to play a vital role in the improvement in the field of food grain. In this regard we need huge number of pumps in rural areas of the country for irrigation in upcoming days. Present pumps are mostly diesel engine operated where electricity from the national grid is not sufficient to maintain them properly. On the other hand, there is a great problem for grid connected irrigation pumps because supply of electricity in Bangladesh is not regular due to deficiency of electrical energy and electricity has not served in every irrigational zones of Bangladesh. Both diesel and grid operated pumps are generating huge amount of GHG which is very detrimental for the existence of our environment. Conventional irrigation system is dependent on fossil fuel or hydro carbon which is limited in nature. This is right juncture to think the alternative, renewable, green energy like solar energy which is abundant in nature. Alternative to the conventional method, solar energy is very suitable sustainable option.

1.6 Methodology

For designing an automatic irrigation system, we can be used many methods such the device of switching but all methods need of human helpful. Using electronic control to supply the water except human interaction is designed in this project. It has designed diligently put on to irrigate the water, finally shut down the water pump is automatically any time and the pump is off while soil is wet. The methodology utilized in this work is the measured structure

access the general plan was broken into capacity square charts. Where every square in the chart speak to an area of the circuit that does an explicit capacity.

CHAPTER 2

THEORY OF THE PROJECT

2.1 Require Instrument of the system

1. Ardunio (Processor ATmega328P)
2. Moisture Sensor
3. Relay Module
4. Liquid Crystal Display
5. GSM Module
6. Motor / Pump
7. Solar panel & battery
8. Female rail
9. Connector
10. Jumper Wire (male to female)
11. PVC Board
12. Vero Board

2.2 Project Working Principle

This system is usually used for GSM Based automated Irrigation System. Where we use some specific electronic devices. In our country food purpose depend on agriculture base. So that's our target point is improve the system. Irrigation system is available in your country but where we feel some poverty motor controlling system, water dissipation and loss of accurate water distribution.

In this situation we disclosure a system to solving all problem. This is GSM Based automated Irrigation System. When water level is less than 30% , microcontroller will sent a sms including soil condition by using gsm module, when the water level is more than 80% microcontroller also sent a sms. Whole messaging system are operated GSM. Where use a specific number for text send or receiving.

2.3 Arduino UNO

In this project has used an Arduino uno R3 in which microcontroller board based on the ATmega328. There are total 32 pins in this Arduino UNO R3 and 14 pins are digital pin of them in the Arduino. 6 pin can be used PWM outputs , for analog input used 6 pin, ceramic resonator is 16 MHz it's called clock frequency .it has one port USB connection and one 12 volt power supply port by which supply the power another circuit, it has a reset button which is reset the program. TXD and RXD both are digital pin. TXD is serially transmitting and RDX is serially receiving port. On the other hand it has 6 analog inputs 5v vcc pin, 3.3v vcc pin, ground pin (it has 3 ground pin but all analog pin), ROW input, RESET pin, and at last Analog reference pin. Now another 6 pins are MOS-0, MOS-1, SS, SCK, SDA, and SCL, all this six pins are called pin header. Two 8 bits microcontroller has used in this Arduino and other two pins are input/output pin and only boot loader (its programming loading system). The microcontroller supported require everything it has contains; USB cable or power used simply connect it to a computer with a AC-to-DC adapter or battery to get started The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip.

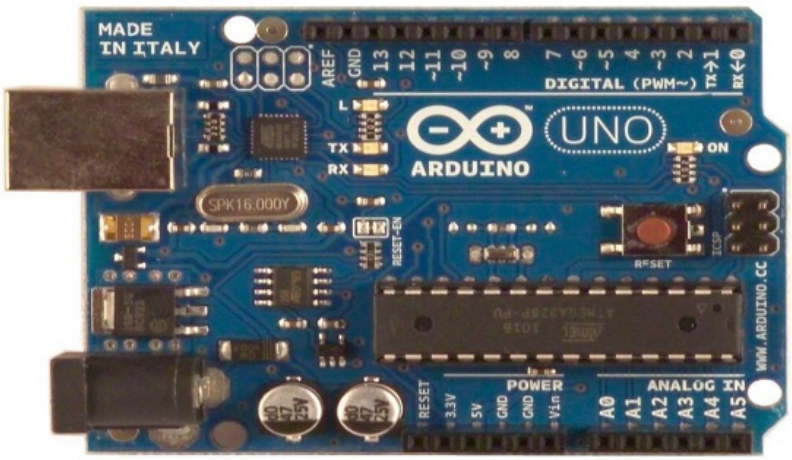

Figure 2.1: Arduino UNO

The power source is chosen consequently. Outer (non-USB) power can come either from an AC-to-DC connector (divider mole) or battery The Arduino Uno can be fueled by means of the USB association or with an outside power supply. 2.1mm focus positive fitting into the board's capacity jack associated by plugging with adapter. Connector. By 6 to 20 volts can operate the board an external supply. If supply voltage

2.3.1 Function of Different Pin

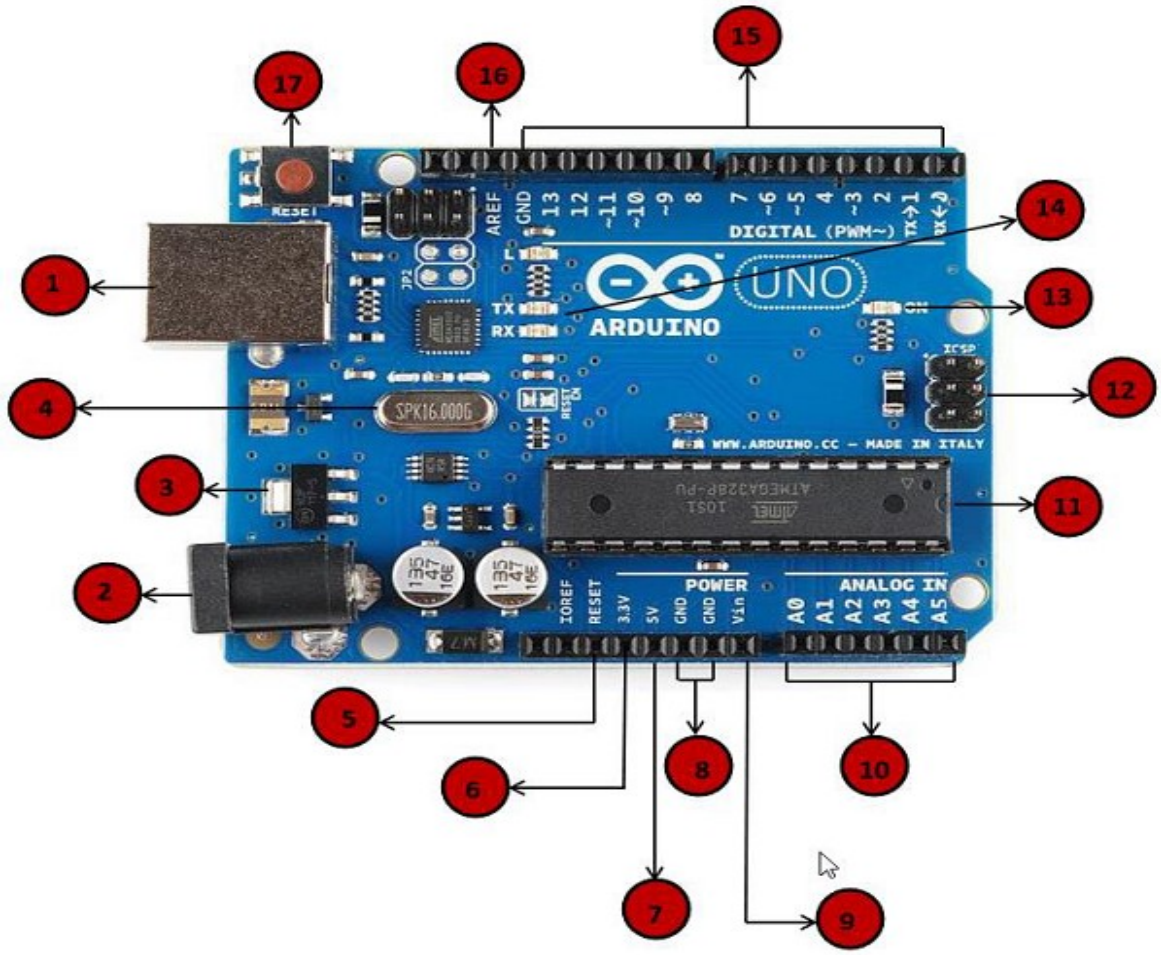

Figure 2.2 Function of Different Pin

I, USB power port Using the USB cable Arduino board can be got power from our PC. Connected USB link to the USB association you need to do.

II, Barrel Jack of power By connecting it to the Barrel Jack (2). Arduino sheets can be controlled straightforwardly from the AC mains control supply.

III, Voltage Controller The amount of voltage is required control the Arduino board and balance out the DC voltages discover by the different components and processor. That's voltage control by the voltage regulator

IV, Arduino Crystal Oscillator Arduino in managing time issues is helped by the precious stone oscillator. The Arduino ascertain the time by utilizing the gem oscillator. Best of the number printed of Arduino gem is 16.000H9H. It has the measure of recurrence is 16,000,000 Hertz or 16 MHz

V, 17 Reset pin of Arduino Arduino board can be reset by you, i.e., from the earliest starting point will be start begin your program. Two separate ways, you will be reset the UNO board. First way, by utilizing the reset catch (17) on the board. And 2nd way, the Arduino stick named RESET (5) can be associate an outer reset catch by you.

6,7,8,9 Pins (3.3v, 5v, GND, VIN) ♣ 6 pin is supply 3.3 output volt ♣ 7 number pin is 5 volt output supply ♣ Arduino board works fine most of the component with 3.3 volt and 5 volt. ♣ 8 number pin is GND (Ground) – in the Arduino has several GND pins, these are used to ground our circuit. ♣ 9 number pin is Vin −by the Vin pin you can supply the power at Arduino board from an external power source, like the mains power supply of Ac.

X, simple or (Analog) pins There are five Analog pins in the Arduino UNO board, like A0 through A5. Here the humidity sensor and temperature sensor are analog sensor. When any signal come from analog sensor which is converted into digital value By These pins and read it by the microprocessor.

XI, Prime microcontroller

This is own microcontroller (11) of Each Arduino board. You think the microcontroller is the brain of an Arduino board. On the Arduino is slightly different from board to board by the main IC (integrated circuit).generally ATMEL Company makes the microcontrollers. You should recognize what IC your block has before stacking another program from the Arduino IDE. This data is accessible on the highest point of the IC. To know more insights concerning the IC development and capacities,

XII, ICSP pin

ICSP (12) is an AVR it is the most important part of an Arduino, for the Arduino comprising of MISO, RESET, MOSI, VCC, SCK, and GND in a modest programming header. As a SPI (Serial Peripheral Interface) it is frequently alluded, and as a "development" of the yield it

could be considered. Really, the output substance to the master of the SPI transport are solved by you.

XIII, indicator as a Power LED

Power LED indicate the power when the power supply in the board. When we connect the plug with our Arduino into a power source to indicate that your board is powered up correctly. When the connection will be something wrong then the light dose not turn on,.

XIV, the pin of TX and RX LEDs

This is another important part of Arduino board. There are two functions: like for transmit is TX (transmit) and for receiving is RX (receive). Appear these pin is first, pins 0 and 1 are digital pin, by these pin indicate the serial communication. Second, the RX and TX a led (13). The TX led flashes while sending the serial data with different speed. Flashing speeds depends on the baud rate used by the board. When the receiving process happen that time is RX flash time

XV, Digital Input/output pin

There are total 14 digital I/O pins in this Arduino 0 to 13 pin are Digital pin. There are 6 PWM (pulse Width Modulation) These pins can be arranged to fill in as information computerized pins to peruse rationale esteems (0 or 1) or as advanced yield pins to drive diverse modules like LEDs, transfers, and so forth. The pins named "~" can be utilized to produce PWM.

XVI, AREF

It is sometimes, the upper limit for the analog input pins. used to set an external reference voltage (between 0 and 5 Volts) as AREF stands for Analog Reference.

2.4 GSM Module

This GSM module can easily achieve data. Its operating frequency is among the 900/1800/1900 MHz frequency band. In SIM800L signal transmit time of different devices stands at a 0.5 seconds interval so that the workload of SIM chip can be reduced substantially

and more sleeping time can be saved for GSM module. This module is set with serial interface, which is easy to use and simplifies the overall design.

- Long Distance Coverage
- Function description
  - Supply voltage: 3.5V - 4.2V
  - Power consumption: sleep mode < 2.0mA, idle mode < 7.0mA
  - GSM transmission (avg): 350 mA
  - GSM transmission (peek): 2000mA
  - Module size: 25 x 23cm
  - SIM card socket: microSIM
  - Antenna connector: IPX
  - Status signaling: LED
  - Working temperature range: -40 do + 85 ° C
- Has high-performance
- Low Cost

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.

Figure 2.3: GSM Module

GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an

extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM/GPRS MODEM can perform the following operations:

1. Receive, send or delete SMS messages in a SIM.
2. Read, add, search phonebook entries of the SIM.
3. Make, Receive, or reject a voice call.

The MODEM needs AT commands, for interacting with processor or controller, which are communicated through serial communication. These commands are sent by the controller/processor. The MODEM sends back a result after it receives a command. Different AT commands supported by the MODEM can be sent by the processor/controller/computer to interact with the GSM and GPRS cellular network.

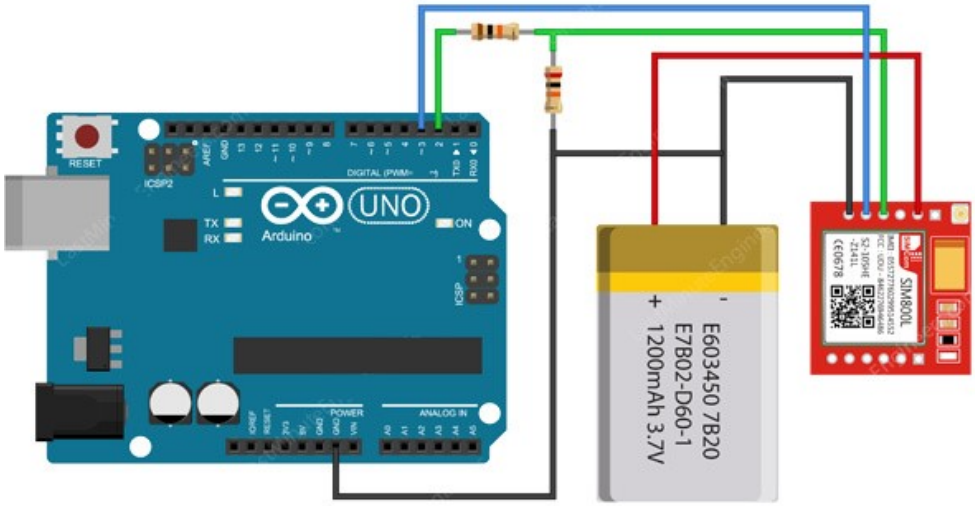

Figure 2.4: Circuit Diagram for Arduino and GSM module Connection.

2.5 Pump

Figure 2.5: DC Pump

The motor was powered from the 5 V dc output from the power supply circuit. The pump was able to supply 660 cm3 of water in 10 seconds. The pump used was constructed using a miniature dc motor powered by the output of the power supply unit. The mechanical output point of the motor was loaded with miniature bidirectional fan blades and secured firmly using glue. The pumping was achieved by placing the fan blades in an enclosure made from two cylindrical plastic stoppers. The motor was also inserted into a stopper to protect it from contact with water. The electrical connections to the motor were passed through a tight hole in the side of the stopper. The stopper containing the motor was then taped with a water-tight cellophane tape to the pumping enclosure to make the pumping system one single unit. When placed in water (the pump has to be lying horizontally) and connected to the power from the power supply unit, water is taken through the hole at the top of the pump, the blades attached to the rotor spin the water around in the pumping enclosure and the water exits through the pipe attached to the hole at the side of the enclosure.

2.6 Soil Moisture Sensor

Soil moisture is generally the amount of water that is held in spaces between soil particles. It's is a very important factor that determines the growth of crops and their health. Instead of the old gravimetric method of measuring soil water content, the soil moisture sensor measures the volumetric water content indirectly by using other properties associated with the soil. The soil moisture sensor used for this tutorial uses electrical resistance of the soil to determine the soil humidity. The electrical resistance of the soil reduces with increase in the amount of water in the soil. The electrical resistance in the soil, however, increases with

reduction in the amount of water in the soil. The sensor consists of a probe and a comparator with an adjustable potentiometer which can be used to set the sensitivity of the sensor.

The soil moisture sensor consists of two probes which are used to measure the volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value.

When there is more water, the soil will conduct more electricity which means that there will be less resistance. Therefore, the moisture level will be higher. Dry soil conducts electricity poorly, so when there will be less water, then the soil will conduct less electricity which means that there will be more resistance. Therefore, the moisture level will be lower.

This sensor can be connected in two modes; Analog mode and digital mode. First, we will connect it in Analog mode and then we will use it in Digital mode.

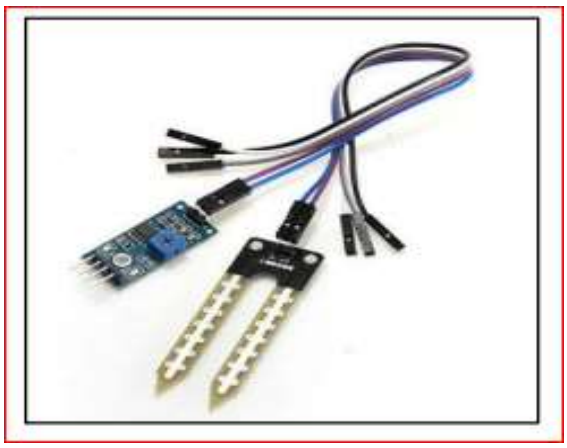

Figure 2.6: Moisture Sensor

Specifications

- Detection depth: 38mm
- Power: 2.0V ~ 5.0V
- Dimension: 20.0mm * 51.0mm
- Mounting holes size: 2.0mm

Applications

- Auto watering system
- Flowerpot soil moisture detection
- Auto pouring system

2.7 Relay Module

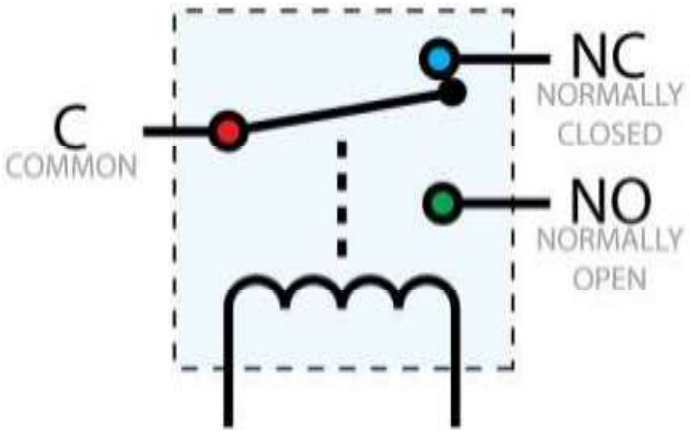

Figure 2.7 : Relay

Relay is an electrically worked switch. Various exchanges use an electromagnet to mechanically work a switch, yet other working models are similarly used, for instance, solid state exchanges. Exchanges are used where it is vital to control a circuit by a low-power signal (with complete electrical withdrawal amidst control and controlled circuits), or where a couple of circuits must be controlled by one sign. The main transfers were utilized as a part of long separation broadcast circuits as enhancers they rehashed the sign rolling in from one circuit and re-transmitted it on another circuit.

2.8 Solar Panel

Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones are available, based on thin-film cells. The cells must be connected electrically in series, one to another. Externally, most of photovoltaic modules use MC4 connectors type to facilitate easy weatherproof connections to the rest of the system. Modules electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability. The conducting wires that take the current off the modules may contain silver, copper or other non-magnetic conductive transition metals. Bypass diodes may be

incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated.

Figure 2.8: Solar Panel

2.9 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 4 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

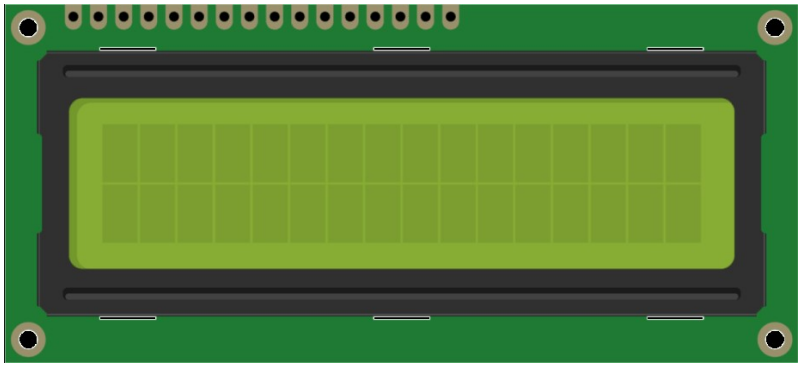

Figure 2.9: 16x2 LCD Display

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc.

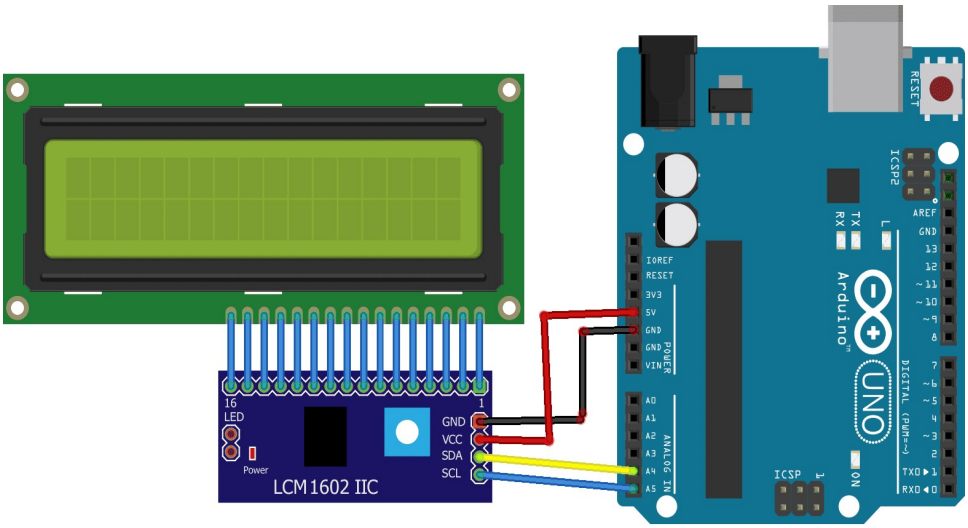

Figure 2.10: Arduino and LCD Connection

Features of LCD Display

5 x 8 dots with cursor

Built-in controller (KS 0066 or Equivalent) + 5V power supply (Also available for + 3V) 1/16 duty cycleB/L to be driven by pin 1, pin 2 or pin 15, pin 16 or A.K (LED) N.V. optional for + 3V power supply.

CHAPTER III

DESIGN & FEBRICATION

3.1 Introduction

In this Chapter, we are going to explain about the system Design construction through Hardware and development of software. In addition, the chapter elaborates the hardware and the software stage by stage. All the operations of hardware and software are also included in this chapter. The system design of the total project is shown in below Figure3.1 with block diagram.

3.2 Block Diagram

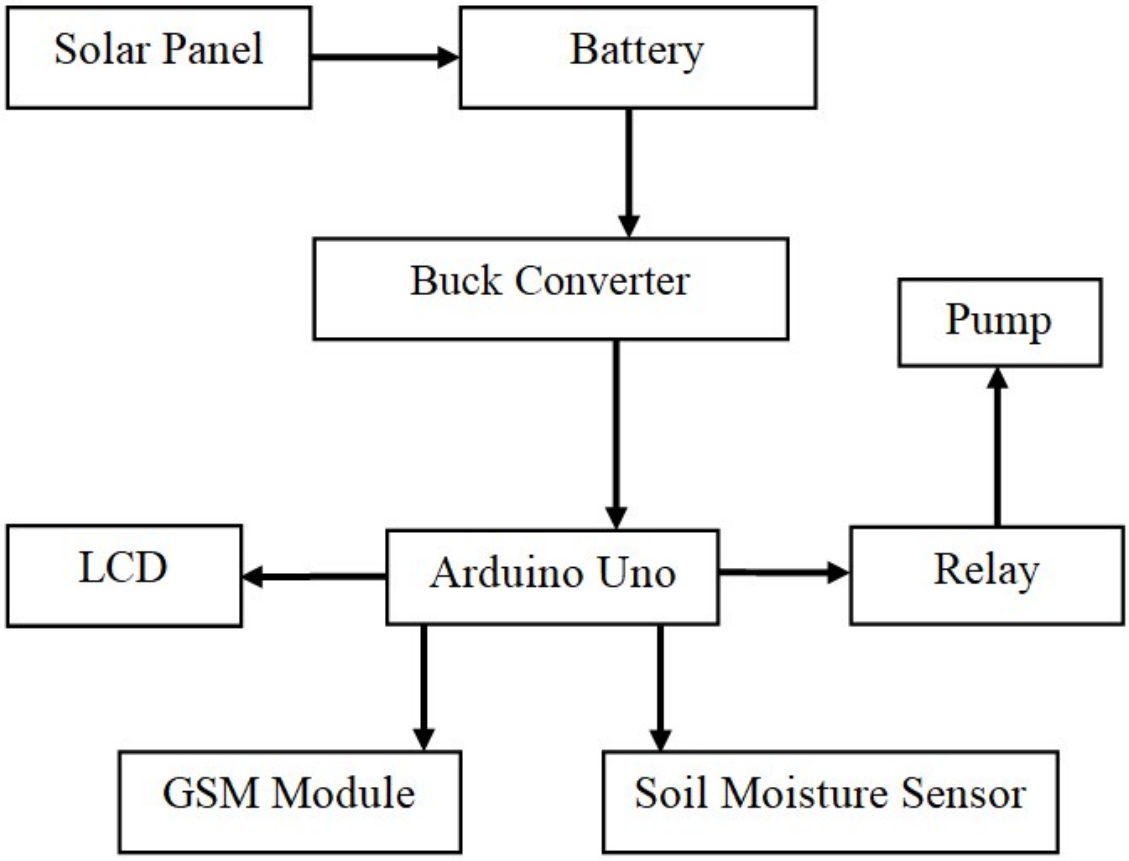

Fig 3.1: Block Diagram of the irrigation system

3.3 Methodology

- After the detail literature survey through the books, periodical, journal, magazine, websites. The idea of the project is well defined.
- The logic is derived for the system. It is programmed and burn it to the Arduino by using the software Arduino IDE.
- The accuracy and viability of the program and electronic components is tested in the simulation software Proteus**.**
- After the successful simulation result it is implemented in the hardware.
- After the finishing the programming, electrical and electronics part, the stable, reliable and flexible mechanical design and fabrication is completed.
- Finally system is tested and encountered error is omitted.

3.4 Working principle

Behind this system the soil moisture sensor is connected the circuit this the main working principle in this plant, which was earlier embedded into the plant, other electronic components listed above as shown in Figure 3.1 which are also connected to the Arduino Microcontroller. The soil moisture to the microcontroller which controls the pump when Measurement of soil moisture is done by the sensor which forwards the information and parameters regarding. The sensor connected with Microcontroller when the soil moisture drops below a certain value. Then the relay module get a signal from the microcontroller as a results start the pump and necessity amount of water supplied to the plant .when the needed water is supplied, the pump stops its Action. Power supply has an undertaking to control the entire framework and the prescribed voltage should regard the info supply go for the microcontroller, that is, from 7V to 12V. With relay module, Water pump is connected. When the microcontroller gives a command to relay module then works the water pump, when soil moisture is below then soil moisture sensor send a signal to microcontroller then microcontroller gives a command to relay module then starts the motor pump otherwise stop the motor.

3.5 Circuit Diagram

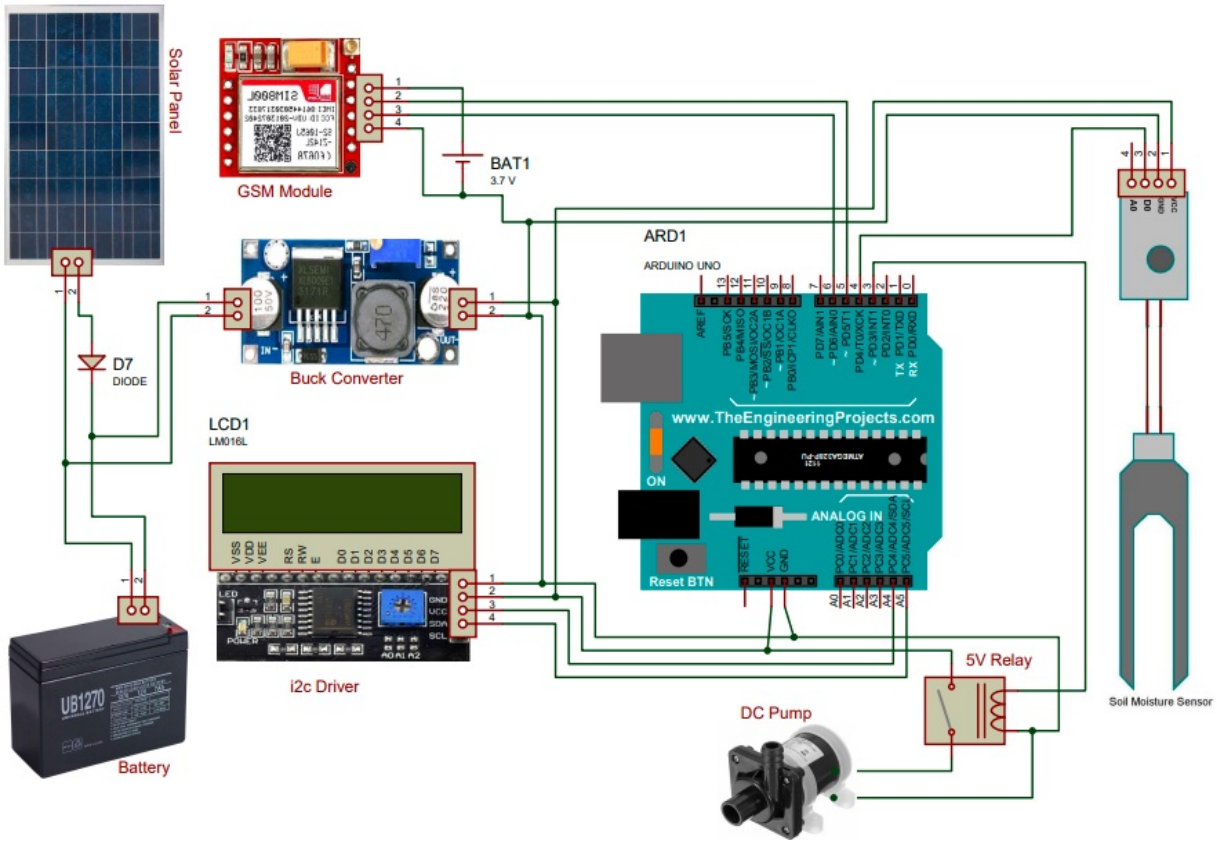

Fig 3.2: Circuit Diagram

3.6 Project Picture

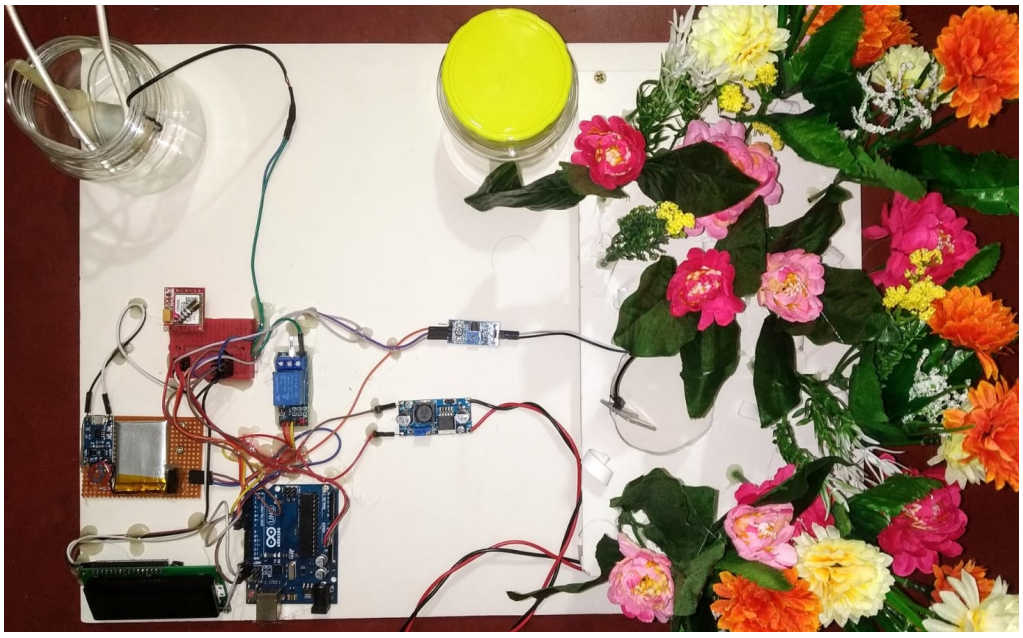

Fig 3.3: Project Picture

3.7 Program Code

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include<SoftwareSerial.h>
SoftwareSerial mySerial(5,6);
LiquidCrystal_I2C lcd(0x27,16,2);
int pump=3;
int sensor = digitalRead(4);
String number ="01911866960";

void setup()
{
lcd.init();
lcd.backlight();
pinMode(pump, OUTPUT);
pinMode(sensor, INPUT_PULLUP);
digitalWrite(pump, HIGH);
lcd.setCursor(0,1);
lcd.print("Solar Irrigaton");
lcd.setCursor(4,0);
lcd.print("Welcome");
delay(2000);
lcd.clear();
}

void loop()
{
int sensor = digitalRead(4);

////////////HIGH Moisture/////////////////
if(sensor==LOW)
{
lcd.setCursor(0,0);
```

```
lcd.print("HIGH Moisture   ");
lcd.setCursor(0,1);
lcd.print("Pump is OFF");
digitalWrite(pump, HIGH);  //Set relay off
delay(1500);
mySerial.println("AT+CMGF=1");
 delay(50);
 mySerial.println("AT+CMGS=\"" + number + "\"\r"); //Mobile phone number to send message
 delay(50);
 mySerial.print("Soil Moisture is HIGH. Pump is now OFF");
 delay(10);
 mySerial.print((char)26);// ASCII code of CTRL+Z
 delay(100);
 }

//////////////////LOW Moisture//////////////////////////

if(sensor==HIGH)
{
digitalWrite(pump, LOW);
lcd.setCursor(0,0);
lcd.print("LOW Moisture   ");
lcd.setCursor(0,1);
lcd.print("Pump is ON ");
delay(1500);
mySerial.println("AT+CMGF=1");
 delay(50);
 mySerial.println("AT+CMGS=\"" + number + "\"\r");
delay(50);
 mySerial.print("Soil Moisture is Low. pump is now ON");
 delay(10);
 mySerial.print((char)26);// ASCII code of CTRL+Z
```

```
 delay(100);
}
}


void sendSMS(String msg)
{
mySerial.println("AT+CMGF=1");
  delay(300);
mySerial.print("AT+CMGS=");
mySerial.print("");
mySerial.print("+8801707607712");    // number
mySerial.print("");
mySerial.println();
  delay(300);
mySerial.println(msg);
  delay(300);
mySerial.write(26);
}

void gsmInit()
{
lcd.clear();
lcd.print("Finding Module..");
boolean at_flag=1;
  while(at_flag)
  {
mySerial.println("AT");
    while(mySerial.available()>0)
    {
      if(mySerial.find("OK"))
at_flag=0;
    }
```

```
    delay(1000);
  }
mySerial.println("ATE0");
lcd.clear();
lcd.print("Searching Network..");
boolean net_flag=1;
  while(net_flag)
  {
mySerial.println("AT+CPIN?");
    while(mySerial.available()>0)
    {
      if(mySerial.find("READY"))
net_flag=0;
      break;
    }
    delay(1000);
  }
mySerial.println("AT+CNMI=2,2,0,0,0");
   delay(1000);
mySerial.println("AT+CMGF=1");
   delay(1000);
mySerial.println("AT+CSMP=17,167,0,0");
lcd.clear();
mySerial.flush();
}
```

3.8 Summary

A circuit diagram (electronic schematic, electrical diagram, fundamental layout,) is a graphical depiction of an electrical circuit. The presentation of the interconnections between circuit sections in the schematic diagram does not by any means identify with the physical approaches in the finished device. A pictorial circuit plot uses essential pictures of parts, while a schematic diagram exhibits the sections and interconnections of the circuit using regulated symbolic depictions.

CHAPTER IV

RESULT & DISCUSSION

4.1 Introduction

In this section is discussed about results of works. We can see the flow chart the when the soil temperature has gone below then the pump only start the point and when the soil temperature has reach minimum to the point the pump will be stop. The system operate on using several possibilities and including power

4.2 Result

According to the circuit diagram the experimental model was made and the results were as prospective. When the soil was about to go dry the motor pump switched ON and switched OFF when the soil was about to overflow. We can see the figure 3.3 is based on the Arduino microcontroller and sensor technology. The system has been designed and tested successfully in a successful manner. Represents results of our experiment in the form of the overall representation of our tested automatic plant watering system. The system is also functionality, the overall behavior as well as of the plant. As result of our observation we noticed that plant maintained its homeostasis in desired, without any deficiencies observed with Regular and health manner. When need the water the sensor sent a signal to microcontroller after that microcontroller sent a signal to the pump to until enough quantity of water was not delivered, Start watering the plant.

4.3 Advantages

Reduced labor: here no need many labor for working. Because it works automatically. Only one labor is required in the system.

Life style will improve: since it works automatically .so no need check the water progress again and again. The motor no need start and stop by any person. So the people can sleep through the night and live relax with a family.

More timely irrigation: when the plants need water that time Irrigators with automation are more inclined to irrigate, not when it suits the irrigator. it works perfect timely

Assists in the management of higher flow rates: the irrigation flow rate want to increase by the many irrigators. They receive through installing bay outlets and bigger channels. Such flow rates require an increase in labor as the time taken to irrigate a bay is reduced thus requiring more frequent change over. Automation allows for these higher flows to be managed without an increase in the amount of labor.

Most perfect cut-off: when the sufficient water is delivered to the land then automatically cut-off it. Automation of the irrigation system allows cut-off of water at the appropriate point in the bay. This is usually more accurate than manual checking because mistakes can occur if the operator is too late or too early in making a change of water flow.

Decrease nutrients and runoff of water: Holding compost on ranch has both monetary and natural advantages. Mechanization can help keep manure on ranch by adequately diminishing keep running off from the property.

Decrease costs of used irrigation vehicles: As the irrigator is not required to constantly check progress of an irrigation, motor bikes, four wheelers and other vehicles are used less. Since we can give water supply in right time so this reduces the running costs of these vehicles and they require less frequent replacement.

4.4 Disadvantage

Cost: there are various costs like installing, maintaining automatic and purchasing cost.

Equipment Reliability: as an automatic system sometimes it does not work accurately failures will occur. This is occurs by human error in setting and it's maintain system. To collect any excess runoff when failures occur by a re-use system is good insurance

Maintaining channel Increased: There is a need to expand support of channels and hardware to guarantee the framework works accurately. Channels ought to be fenced to shield the programmed units from stock harm.

4.5 Costing

Average price of parts used in this project is given bellow,

Sl. No	Parts Name	Qty	Unit Price	Total Price
1	Arduino Uno	1 Unit	600	600
2	LCD display	1 Unit	160	160

3	LCD Driver	1 Unit	150	150
4	Soil Moisture Sensor	1 Unit	100	100
5	Solar Panel	1 Unit	1200	1200
6	12V Battery	1 Unit	800	800
7	Buck Converter	1 Unit	90	90
8	Relay Module	1 Unit	90	90
9	GSM Module	1 Unit	480	480
10	3.7V Battery	1 Unit	150	150
11	Jumper wire	10 Unit	3	30
12	Wire	1 Unit	30	30
13	Screw, Glue, etc	1 Unit	50	50
14	Project Board	1 Unit	300	300
Total				**4,230/-**

Table 4.1: Price list of hardware used at solar monitoring System

4.6 Discussion

Extraordinary and expected aftereffects of our investigation were finished up from the way that our plant has effectively maintained a strategic distance from lack of hydration and continued developing with no issues Furthermore, lacks, because of the sensor that is inserted inside the plant estimating the dirt dampness level and controlling the water siphon. The framework deals with the rule of estimating the dirt dampness level by methods for the sensor innovation which thus controls the water siphon by means of microcontroller with the end goal to give the plant enough measures of water when essential. Next couple of sections talk about the conceivable utilizations of this framework. Computerized plant watering framework can be utilized to understand numerous issues on the planet giving both restricted and wide applications and arrangements, where for the previous there is a case of robotized watering of plant at whatever point somebody takes some time off and disregards plants at home, which empowers the plants to get the correct measure of required water and counteracts unpredictable watering which prompts mineral misfortune in the dirt; and for the last application, there is a case of utilizing this framework for restorative and rural purposes to take care of some greatest human-related issues like undernourishment, air contamination and

event of respiratory illnesses. Being perfect for reasons for having huge patio nurseries, estates or explicit plants with possess watering needs, this framework can be extremely useful in agribusiness to keep vegetable plants watered for greater gather with negligible misfortune because of water vanishing and spillover.

CHAPTER V

CONCLUSION AND FUTURE WORKS

5.1 Conclusion

Thus the "**ARDUINO BASED AUTOMATIC GARDEN IRRIGATION SYSTEM**" has been designed and tested successfully. The hardware components and of all integrated features has used to developed the system. All of the Presence of each module has been placed carefully and reasoned out, as the unit can contribute for best working. Thus, Watering System of the Arduino Based Automatic Plant has designed and tested successfully. Automatically tested the function of this system. The moisture level (water content) of the different plants measured by the moisture sensors. The moisture sensor sends the signal to the Arduino board when the moisture level is found to be below the desired level, and triggers the Water Pump to turn ON and supply the water to respective plant using the Rotating Platform/Sprinkler. At the point when the coveted dampness level is achieved, the framework ends without anyone else and the Water Pump is killed. Consequently, the usefulness of the whole framework has been tried altogether and it is said to work effectively.

5.2 Limitations of the Work

It is significant to know that in this design we used metallic contacts as sensor which is becomes rusty in the presents of water and makes the sensors less sensitive. So we need to clean the sensors after certain time period.

a. Start motor when soil will be dry

b. It cannot Soil water measurement

c. Soil water balance

5.3 Future Scopes of the Work

To reduce much of human labor and at the same time minimize on water usage Agricultural monitoring is very much needed. Predicting the soil condition for irrigating and Wireless Sensor in monitoring the field for Lot of system been developed employing. Moreover machine learning strategies been utilized product sickness expectation just and towards

harvest yield. Presently with the appearance of Machine to Machine correspondence (M2M) which includes gadgets to impart among themselves in making a move, we here have built up a condition for watering the field this water system framework was observed to be possible and financially savvy for upgrading water assets for horticultural creation. The water system framework can be acclimated to an assortment of explicit yield needs and requires least support. In addition, the Internet interface allows the supervision through adaptable media transmission contraptions, for instance, a Smartphone. Other than the cash related save assets in water use, the noteworthiness of the preservation of this normal resource legitimize the use of this kind of water framework structure. there are numerous different conceivable outcomes like making complex associations of plants of comparable assortment or alleged Internet of Plants Also, Although it is by all accounts all the more requesting and testing, utilizing more than one sensor is another thought for a trial adventure, yet there are additionally numerous other trial and test like thoughts, for example, clock for setting water system framework utilizing sun oriented power supply and so forth. Nonetheless, autonomously of the route used to build it, there is no uncertainty that this framework can be exceptionally useful in taking care of numerous issues, from those that appear to be innocuous to those that are on the size of the most vital and most risky ones for human populace. By means of this system, from the process of watering the plant that is possible to control the amount of water released. Despite the fact that it very well may be extremely useful for mankind when all is said in done, botanists, agriculturists, and experts, are the general population who could have the greatest advantage of utilizing this framework

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