PROJECT TITLE:

SmartFarmer – IoT Enabled Smart Farming Application

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ABSTRACT

Farming is backbone of economy and it is the fundamental method for occupation. The large population of world depends on farming for living day to day life. Around 70% of Indian population depends on cultivation. Internet of Things IoT is present and future of every field impacting everyone's life by making everything intelligent. It is a network of different devices which make a self-configuring network. The new developments of Smart Farming with use of IoT, by day turning the face of conventional agriculture methods by not only making it optimal but also making it cost efficient for farmers and reducing crop wastage. The aim is to propose a technology which can generate messages on different platforms to notify farmers. The product will assist farmers by getting live data Temperature, humidity, soil moisture, UV index, IR from the farmland to take necessary steps to enable them to do smart farming by also increasing their crop yields and saving resources water, fertilizers. Most of the cultivation cannot be productive only by physical activities so have to be handled by innovative technologies. Therefore, we use IoT innovation and SMS notification to address the critical part of farming. The past method of incorporating keen water supply system with smart idea. It regulates temperature, moisture and soil dampness of a particular crop. With the observation and results decision are to be made.

LIST OF FIGURES

CHAPTER 1

1.INTRODUCTION

Agriculture is the basic source of livelihood of people in India. In the past decade, it is observed that there is not much crop development in agriculture sector. Food prices are continuously increasing because crop rate is declined. Some of the factors which are responsible for this may be wastage of water, low soil fertility, fertilizer abuse, climate change, diseases, etc. There are number of factors which are responsible for this, it may be due to water waste, low soil fertility, fertilizer abuse, climate change or diseases, etc. It is very essential to make effective intervention in agriculture and the solution is better management and regular maintenance and checking of the crops which include the technologies-IOT in integration with Wireless sensor networks, sensing the parameters with sensors and notifying the concerned people by SMS features. It has potential to change the way of development in agriculture and gives great contribution to make it smart agriculture. Monitoring systems are used in the field to collect information on farming conditions (e.g., light intensity, humidity, and temperature) with the aim of enhancing crop productivity. Internet of things IoT technology is a recent trend in numerous fields, including monitoring systems for agriculture. In conventional farming, farmers need manual labor to handle crops and livestock, often leading to inefficient resource use. This downside can be addressed through the concept of smart farming, whereby farmers receive training in the use of IoT, access to the global positioning system (GPS), and data management capabilities to increase the quantity and quality of their products. Latest technologies such as Internet of Things and Cloud in combination with Wireless Sensor Networks can lead to agricultural modernization. IoT BASED SMART FARMING SYSTEM
Department of ECE is an ecosystem of connected physical devices that is accessible through the Internet. It consists of objects, sensor devices, communication

infrastructure, computational and processing units. The sensors communicate the information over the Internet to the cloud server which is a computational and processing unit. In this project, we developed a new farming monitoring system that has a robust design, high accessibility, and wireless communication. The system was integrated by using the input from sensors, interfaced with Arduino Uno, and using GSM as the interface with the end-user (Farmer mobile). Since our aim is to help the farmers, we tried to design the system to be more understandable to them without the need for complex theoretical background. Thus, the effectiveness of the process is improved compared to the traditional and manual appliances from the farmers.

1.1 Objectives of the Project:

- To do smart farming with the help of IOT.
- Usage of water effectively in farming.
- To modernize the farming by IOT.
- Detection of animal intrusion in the agricultural field.

1.2 Layout of the Project:

Listing the components to be used in the circuit. Drawing a block diagram of the circuit diagram to be used. Stating the methodology and processes to be done. Writing the detailed processes and working on it. Obtaining the results and try to make more improvisations. Taking note of the improvements in the subject and scope for future work

CHAPTER 2

2. LITERATURE SURVEY:

- The research in agriculture area is enhanced in various aspects to improve the quality and quantity of productivity of agriculture. Researchers have been worked on many different projects on soil attributes, different weather conditions.

- A few review studies examined the implementation of Artificial Intelligence (AI) and application of IOT for agricultural monitoring. The authors highlighted smart farming system based on acquiring data and utilizing them to make optimized decisions, there by reducing the costs and enhancing environmental friendly practices.

- A decision – making method was used for the identification and watering process, and they discussed the implementation of fuzzy logic system. A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system automated. By using wireless transmission, the sensed data forwarded towards to web server database. If the irrigation is automated, then that means if the moisture and temperature fields fall below the potential range.

- The user can monitor and control the system remotely with the help of application which provides a web interface to user. The complete real-time and historical environment is expected to help to achieve efficient management and utilization of resources. we can move to IOT Based Smart Agriculture Monitoring System develop with various features like GPS based remote controlled monitoring, moisture and temperature sensing, intruders scaring, security, leaf wetness and proper irrigation facilities.

CHAPTER 3

3. PROJECT DESCRIPTION:

- IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors.
- Farmers can monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. Watering the crop is one of the important tasks for the farmers.
- They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself.

3.1 Technical Architecture:

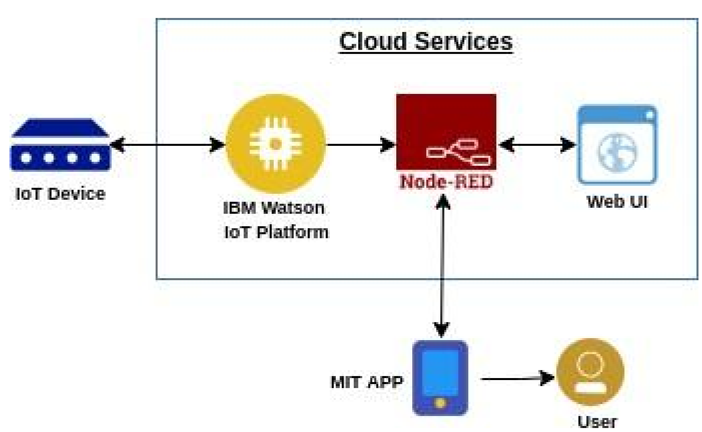

Fig.3.1.1. PROJECT DESCRIPTION

CHAPTER 4

4.HARDWARE REQUIREMENTS:

4.1 BLOCK DIAGRAM:

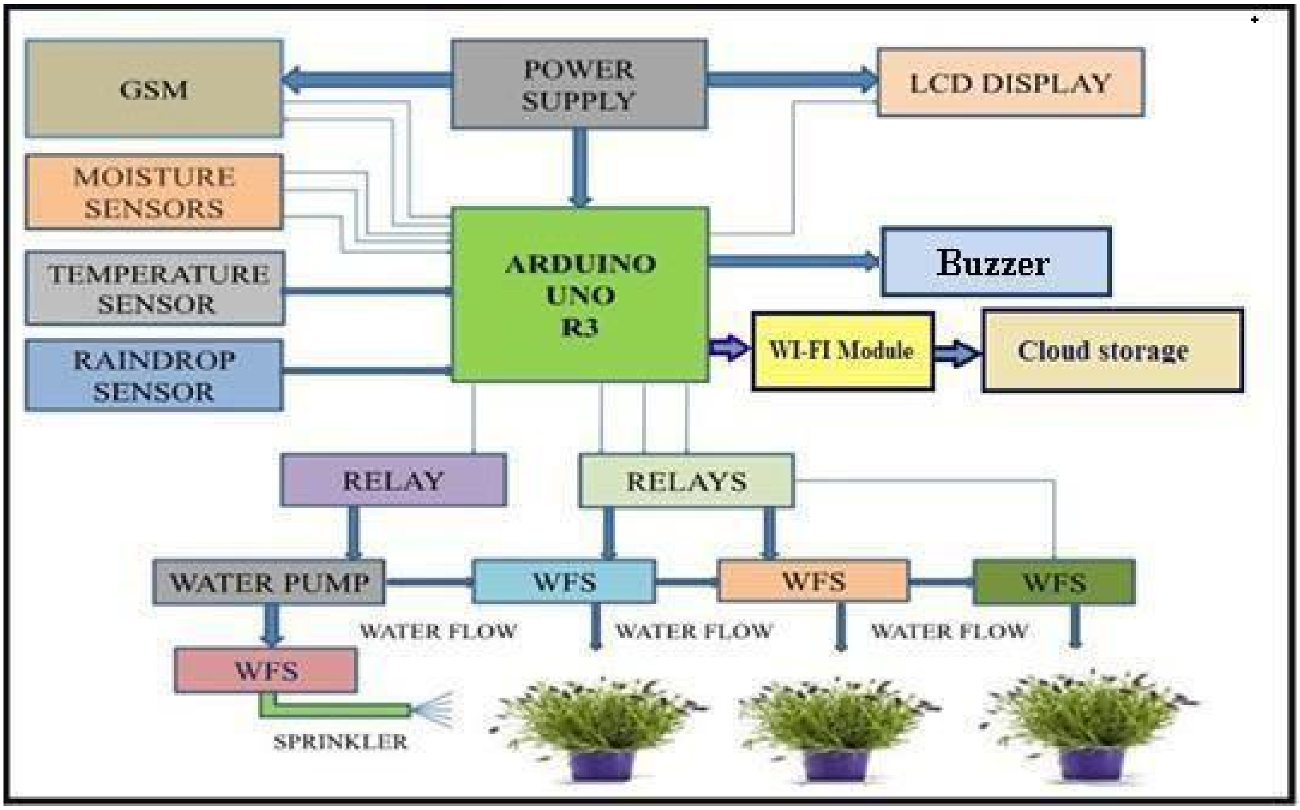

FIG.4.1.1 BLOCK DIAGRAM

4.2 ARDUINO UNO:

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. Simulation is done on Arduino IDE software. The ATmega 16U2 provides serial data to the main processor and has a built-in USB peripheral. Arduino Uno power cable Standard A-BUSB cable. It has 14 digital I/O pins.

- **Serial Pins 0 (Rx) and 1 (Tx):** Rx and Tx pins are used to receive and transmit TTL serial data. They are connected with the corresponding ATmega328P USB to TTL serial chip.
- **External Interrupt Pins 2 and 3:** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM Pins 3, 5, 6, 9 and 11:** These pins provide an 8-bit PWM output by using analogWrite() function.
- **SPI Pins 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK):** These pins are used for SPI communication.
- **In-built LED Pin 13:** This pin is connected with an built-in LED, when pin 13 is HIGH – LED is on and when pin 13 is LOW, its off.

CPU: Microchip AVR (8 bit) Memory:

RAM

Storage: Flash, EEPROM

Microcontroller	ATmega328P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 Ma
DC Current on 3.3V Pin	50 Ma
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB
EEPROM	1 KB

Frequency (Clock Speed) 16 MHz

Fig.4.2.1. ARDUINO UNO

4.3 PIR SENSOR:

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, lowpower, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

PIR Sensor: is used to sense the motion, always used to detect whether a human or animals has moved in or out of the sensor range. They are small, inexpensive, low power, easy to use and don’t wear out. It uses infrared rays to detect the motion within its range. Sensitivity range up to 7 meters. Power supply 5V input voltage. Output is digital signal (3V output high when motion detected). So it is called as Passive Infrared sensor or Pyro electric sensor.

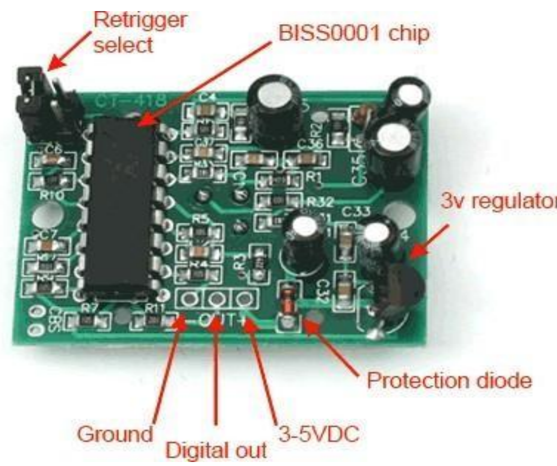

Fig.4.3.1 PIR SENSOR

PIRs are basically made of a pyroelectric sensor (which you can see below as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation .

4.4 Temperature Sensor:

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical −55°C to 150°C temperature range.

If the rating of the LM-358 exceed from these values it will be damage it will work on the rating given below:

- Integrated with two Op-Amps in a single package

- Wide power supply Range
- Singe supply – 3V to 32V
- Dual supply – ±1.5V to ±16V
- Input differential voltage range ±32
- Low Supply current – 700uA
- Input common mode voltage range -0.3 to 32
- Single supply for two op-amps enables reliable operation
- Junction temperature 150˚C
- Operating ambient temperature – 0˚C to 70˚C
- Storage temperature range – 65˚C to 150˚C
- Soldering pin temperature – 260 ˚C (for 10 seconds – prescribed)
- Short circuit protected outputs
- Available packages: TO-99, CDIP, DSBGA, SOIC, PDIP, DSBGA
- If we want to use it as comparator we can give voltage from 3V to 32V. If we want to use the LM-358 as operational amplifier then we will give the voltage from ±1.6V to ±16V. Pin 8 is main power supply input.LM-358 contains two operation amplifier the input of the first amplifier is pin 2 and pin 3 and the output is pin 1, if we want to use the second amplifier the input for this amplifier is at pin 5 and 6 and the output is at pin 7.
- If we want to compare two signals then we will give one signal at pin 2 and the other signal at pin 3. The voltage of pin 2 will be compared with that of pin 3, and the voltage of pin 6 is compared with that of pin 5, corresponding to two independent outputs: 1OUT and 2OUT.

- When the input at non-inverting (+) pin 2 is greater than input at inverting input (-) pin 3, similarly When the input at non-inverting (+) pin 5 is greater than input at inverting input (-) pin 6 the output of both op-amps will be high.

- When the input at non-inverting (+) pin 2 is less than input at inverting input (-) pin 3, similarly When the input at non-inverting (+) pin 5 is less than input at inverting input (-) pin 6 the output of both op-amps will be low.

- No pull-up resistor is required at the output of LM358.

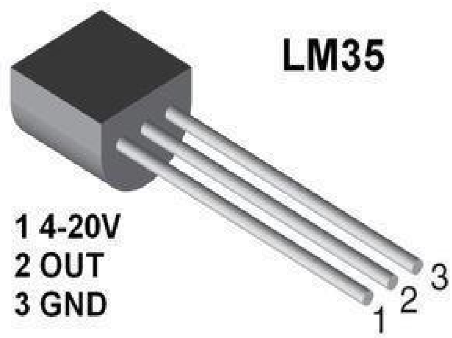

FIG 4.4.1. TEMPERATURE SENSOR

4.5. SOIL MOISTURE SENSOR:

It is used to detect the moisture of the soil. It is small, cheap, and easily available. Its operating voltage is 3.3-5V DC. It consists of a moisture sensor, resistors, capacitors, comparator LM393, Moisture detect LED. Easy to use with microcontrollers. The sensor has both analog and digital output. When there is more water is present in the soil, it will conduct more electricity that means resistance will be low and moisture level is high. When there is less water is present in the soil, it will conduct less electricity that means resistance will be high and moisture level is low.

Soil moisture sensors measure or estimate the amount of water in the soil. These sensors can be stationary or portables such as handheld probes.

Stationary sensors are placed at the predetermined locations and depths in the field, whereas portable soil moisture probes can measure soil moisture at several locations.

Soil water depletion/deficit (inches) = soil water content at field capacity (inches) - current soil water content (inches)

Note: %Soil water content measurements must be multiplied by the depth of the root zone to give total water in that soil depth. For example:

If a 12-inch soil profile has a VWC of 9%, then

Total water in a 12-inch profile = 0.09 x 12 inches = 1.08 inches water

If field capacity is 18%, then

Soil water depletion/deficit = (0.18 x 12 inches) - 1.08 inches = 1.08 inches

Volumetric water content (VWC) can be used to calculate %soil water depletion using the following formula:

$$\%\,Soil\ Water\ Depletion = \left[1 - \left(\frac{Sensor\ VWC(\%) - PWP(\%)}{FC(\%) - PWP(\%)}\right)\right] * 100$$

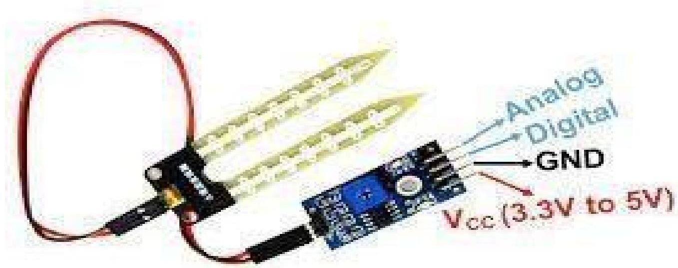

FIG.4.5.1. SOIL MOISTURE SENSOR

4.6. ULTRASONIC SENSOR:

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is $D = ½ T x C$ (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). For example, if a scientist set up an ultrasonic sensor aimed at a box and it took 0.025 seconds for the sound to bounce back, the distance between the ultrasonic sensor and the box would be:

$$D=0.5*0.025*343$$

or about 4.2875 meters.

Ultrasonic sensors are used primarily as proximity sensors. They can be found in automobile self-parking technology and anti-collision safety systems. Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology. In comparison to infrared (IR) sensors in proximity sensing applications, ultrasonic sensors are not as susceptible to interference of smoke, gas, and other airborne particles (though the physical components are still affected by variables such as heat).

Ultrasonic sensors are also used as level sensors to detect, monitor, and regulate liquid levels in closed containers (such as vats in chemical factories). Most notably, ultrasonic technology has enabled the medical industry to produce images of internal organs, identify tumors, and ensure the health of babies in the womb.

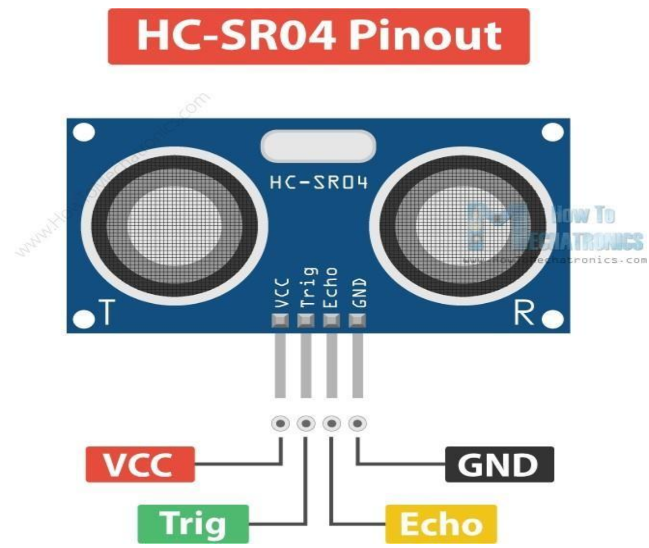

FIG.4.6.1.ULTRASONIC SENSOR

4.7 LCD 16*2:

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

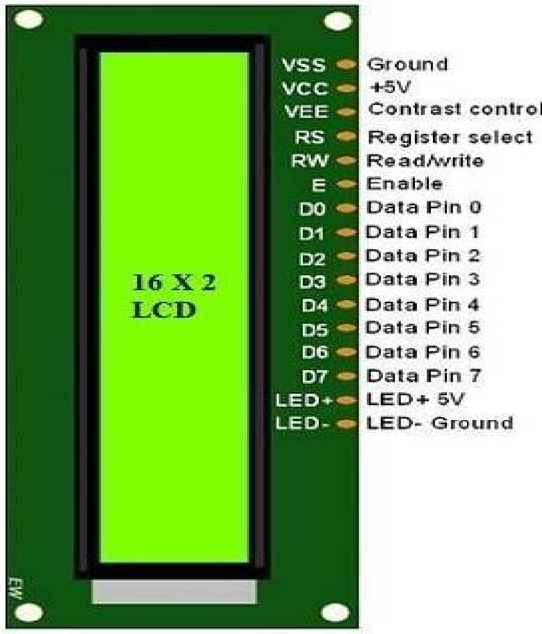

FIG.4.7.1 LCD 16*2

The 16×2 LCD pinout is shown below.

- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or power source.
- Pin2 (VCC/Source Pin): This is the voltage supply pin of the display, used to connect the supply pin of the power source.
- Pin3 (V0/VEE/Control Pin): This pin regulates the difference of the display, used to connect a changeable POT that can supply 0 to 5V.
- Pin4 (Register Select/Control Pin): This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1(0 = data mode, and 1 = command mode).
- Pin5 (Read/Write/Control Pin): This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).

- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read/Write process, and it is connected to the microcontroller unit & constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to the microcontroller unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7.
- Pin15 (+ve pin of the LED): This pin is connected to +5V
- Pin 16 (-ve pin of the LED): This pin is connected to GND.

4.8. VOLTAGE REGULATOR:

The power supply unit of an electronic device converts incoming power into the desired type (AC-DC or DC-AC) and desired voltage/current characteristics. A voltage regulator is a component of the power supply unit that ensures a steady constant voltage supply through all operational conditions. It regulates voltage during power fluctuations and variations in loads. It can regulate AC as well as DC voltages.

The most common DC linear fixed voltage regulator ICs used in electronic circuits are the 78XX and 79XX series for positive and negative voltage output respectively. The XX stands for the output voltage which ranges from 2.5 V to 35 V and can support up to 2 A of current. They are available in surface-mount, TO-3, and TO-220 packaging. They have three connection pins, an input, a common GND, and an output pin. Voltage regulator modules are also available commercially.

Linear voltage regulators are low-cost, and easy-to-use ICs with very low electromagnetic interference, and quick-response to voltage fluctuations. While they are useful for simple applications, there are a few drawbacks to using them.

- The 78XX and 79XX ICs can provide constant and rated output voltage only if the input voltage is at least 2.5 V or more than the output. For example, you can't obtain a 9 V output from an LM7809 IC if it is powered by a 9 V Li-Ion battery. The voltage drop happens because these ICs essentially behave as pseudo- resistors and release the extra input battery power as heat. This is inefficient, and the heat needs to be dissipated using heat sinks or fans. High-voltage high-current ICs need large heat sinks or continuous fan use to ensure stable temperature ranges. High input voltages for low outputs, like a 24 V input to an LM7805, have a very poor efficiency of 20%.

TI's LM317 is a DC linear adjustable voltage regulator that allows modifying the output voltage based on an external R1/R2 voltage divider principle using resistors. It is easy to use and needs two resistors as shown. It can provide up to 1.5 A current over a positive voltage range of 1.25 V to 37 V. Other variants of the LM317 IC family, LM317L and LM317M provide 100 mA and 500 mA current respectively.

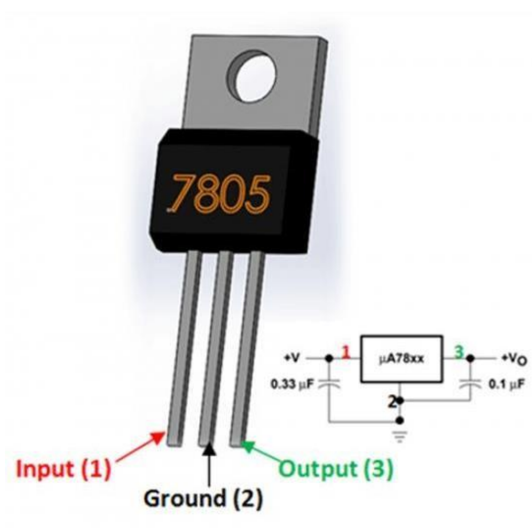

FIG.4.8.1 VOLTAGE REGULATOR

4.9. GSM MODULE:

GSM (Global System for Mobile Communications, originally Groupe Special Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI).

It was created to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones and is now the default global standard for mobile communications – with over 90% market share, operating in over 219 countries and territories.

The NetGuardian 216 G3 optional GPRS/GSM or CDMA wireless modem, allowing you to report alarms from your remote sites without LAN or dialup connections via SMS notifications over a cellular band. This allows you to take your alarm monitoring outside of your network and have the flexibility to report to a central location such as a T/Mon Master Station.

This new NetGuardian 216 G3 can also quadruple the analog inputs of its predecessor. Now that you can choose up to 8 analogs, you can monitor temperature, humidity, battery voltages, fuel levels, and other critical values from a single compact RTU.

The other major feature of the G3 that's superior to the G2 is standard web browser access, which offers intuitive monitoring for technicians without extensive training. This is the client-favorite web interface that's become a standard part of modern DPS remotes. Your techs simply type the IP address of the NetGuardian into their web browser and log in. They'll have access to all current alarms, real-time analog values, and a handy editing interface for adjusting RTU settings.

FIG.4.8.1 GSM MODULE

4.10. RELAY:

A Relay is a simple electromechanical switch. While we use normal switches to close or open a circuit manually, a Relay is also a switch that connects or disconnects two circuits. But instead of a manual operation, a relay uses an electrical signal to control an electromagnet, which in turn connects or disconnects another circuit. Relays can be of different types like electromechanical, solid state. Electromechanical relays are frequently used. Let us see the internal parts of this relay before knowing about it working. Although many different types of relay were present, their working is same.

- Relay works on the principle of electromagnetic induction.
- When the electromagnet is applied with some current, it induces a magnetic field around it.
- Above image shows working of the relay. A switch is used to apply DC current to the load.

- In the relay, Copper coil and the iron core acts as electromagnet.
- When the coil is applied with DC current, it starts attracting the contact as shown. This is called energizing of relay.
- When the supply is removed it retrieves back to the original position. This is called De energizing of relay.

FIG4.10.1. RELAY

4.11. POWER SUPPLY ADAPTER:

A power supply for electronic devices. Also called an "AC adapter" or "charger," power adapters plug into a wall outlet and convert AC to a single DC voltage. Computers use multiple DC voltages, and the power adapter is the external part of the power supply for a laptop. The additional DC voltages are created by internal circuits. Desktop computer power supplies are in one internal unit, which converts AC to all DC voltages.

Power adapters also exist for other purposes; for example, to output a different AC voltage, rather than DC.

FIG.4.11.1. POWER SUPPLY ADAPTER

4.12. TANK PUMP:

It is used to pump the water into the tank if the tank level is low. It is interfaced with the relay from protection of high current. In this project we have used submersible pump.

FIG.4.12.1. TANK PUMP

4.13. DRIP IRRIGATION PUMP:

It is used to pump the water from tank to farm field whenever necessary. It is also interfaced with the relay from protection of high current.

Drip irrigation is a low pressure applications, where there is need to reduce potential evaporation and run off as much as possible. Water has to be pumped through a network of lateral lines with emitters that release the water at target locations and keeping the pressure constant is very important.

FIG.4.13.1. DRIP IRRIGATION PUMP

CHAPTER 5

5.METHODOLOGY:

5.1 WORKING:

Power supplied to arduino uno through power supply adaptor and voltage regulator. Temperature sensor measures temperature of surrounding farm field analog output of the sensor send to the LCD through arduino. The respective temperature is displayed on the LCD. PIR Sensor detects the intruder in the farm field the output of the sensor is digital signal will be send to LCD and also send SMS(i.e Intruder Detected) to registered mobile number. If the sensor does not detect any motion in the farm field then no SMS will be sent to registered mobile. Soil Moisture sensor senses the moisture content in the soil. If the measured moisture content of the soil is higher than the predetermined value then no signal will be sent to relay2 through arduino Drip Irrigation pump will be in OFF State. If the measured moisture content of the soil is lower than the predetermined value then output signal will be sent to relay2 through arduino. Relay2 gets activated the electromagnet makes the switch in ON condition which in turn Drip Irrigation pump operates (ON State). SMS (i.e. DRIP IRRIGARTION PUMP ON) will send to registered mobile number. Ultrasonic sensor is used to measure the water level in the tank. If the water level is more than the predetermined value no signal will be sent to realy1 through arduino relay1 will be in off state Tank pump will also be in OFF State. If the water level is less than the predetermined (9 inches) value output signal will be sent to realy1 through arduino relay1 will be in ON state Tank pump will also be in ON State. SMS (i.e. TANK PUMP ON) will send to registered mobile number. LCD will display message “Intruder detected” when PIR Sensor detects the motion in the farm, “Temperature value in °C” displayed simultaneously, “Moisture low and tank pump on” will be displayed when soil moisture sensor measured moisture is low. “Water level in tank in inches” measured by Ultrasonic sensor will be displayed in the LCD display.

5.2 EXPECTED MODEL:

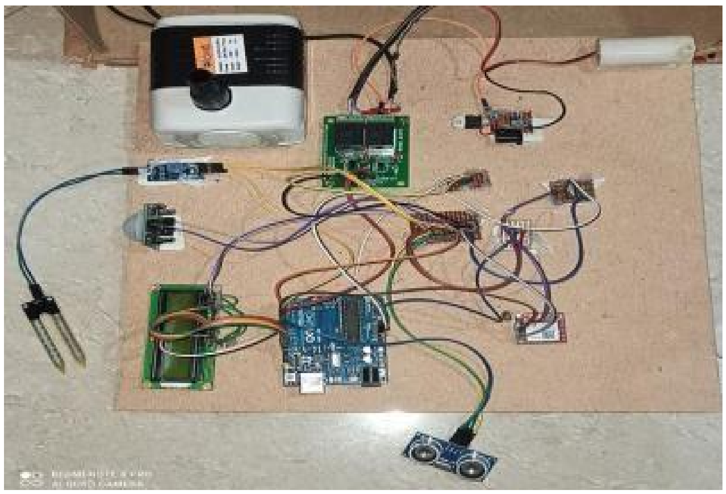

FIG.5.2.1 MODEL DESIGN

5.3 CONNECTIONS:

1. Arduino pins (13,12,11,10,9,8) connected to LCD pins (Rs,En,D4,D5,D6,D7) respectively.
2. Ultrasonic sensor trigger pin connected to 6th pin of arduino and echo pin connected to 7th pin of arduino input pin connected to 5V supply. Ground pin connected to gnd pin in arduino.
3. PIR Sensor output pin connected to 2 nd pin of arduino input pin given to 5V supply and ground pin connected to gnd pin arduino.
4. Soil moisture sensor output pin connected to 3rd pin of arduino input pin connected to 5V supply and remaining pin connected to gnd.

5. Relays input connected to 5V supply one terminal connected to 4th pin of arduino and another terminal connected to respective pumps.
6. Temperature sensor output pin connected to analog pin A0 in arduino.

CHAPTER 6

6.SIMULATION

6.1. SIMULATION PART 1:

Code:

```
#include <SoftwareSerial.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <dht.h>
#include <Adafruit_BMP085.h>


Adafruit_BMP085 bmp;
dht DHT;
LiquidCrystal_I2C lcd(0x27, 16, 2);
SoftwareSerial gsm(10, 11);


int chk; int
humi = 0;
int temp = 0;
int soil = 0;
int light = 0;
int BMP = 0;
int gas = 0;
boolean HT;
```

```
void setup()
    { gsm.begin(9600);
     pinMode(A0, INPUT);
     pinMode(A1, INPUT);
     pinMode(A2, INPUT);
     pinMode(A3, INPUT);
     lcd.init(); lcd.backlight();
     lcd.setCursor(0, 0);
     lcd.print("Please wait for");
     lcd.setCursor(0, 1);
     lcd.print("60 seconds.");
     delay(20000);
     delay(20000);
     delay(20000);
     modem_init(); data_init();
     internet_init(); lcd.clear();
    }


    void loop()
    {
     chk = DHT.read11(DHT11_PIN);
     temp = DHT.temperature; humi =
     DHT.humidity;           soil          =
     analogRead(A0);        light        =
     analogRead(A1);         gas         =
     analogRead(A2);       BMP        =
     bmp.readPressure();    lcd.clear();
     lcd.setCursor(0,                        0);
     lcd.print("Soil:"); soil = map(soil,
     0, 1023, 100, 0); lcd.print(soil);
```

```
lcd.print("%"); lcd.setCursor(0, 1);
lcd.print("Light:");       light       =
map(light,   0,   1023,   0,   100);
lcd.print(light);      lcd.print("%");
delay(3000);                lcd.clear();
lcd.setCursor(0, 0); switch (chk)
{
 case DHTLIB_OK:
HT  =  true;  break;
default:  HT  =  false;
break;  }  if  (HT  ==
true)
{     lcd.print("Temp:");
lcd.print(temp);
lcd.print("           *C");
lcd.setCursor(0,        1);
lcd.print("Humidity:");
lcd.print(humi);
lcd.print("%"); } else
{ temp = 0;
  humi = 0;
  lcd.print(
  "Temp:");
  lcd.print(
  "No
  Data");
  lcd.setCu
  rsor(0, 1);
  lcd.print(
  "Humidit
  y:");
  lcd.print(
```

```
 "No
 Data"); }
 delay(30
 00);
 lcd.clear()
 ;
 lcd.setCu
 rsor(0, 0);
 lcd.print(
 "Air Qlt:
 "); gas =
 map(gas,
 0, 1023,
 0, 100);
 lcd.print(
 gas);
 lcd.print(
 "%");
 lcd.setCu
 rsor(0, 1);
 lcd.print(
 "Pressure:
 "); if
 (!bmp.be
 gin())
{ lcd.print("No Data");
 BMP = 0;
}
else
{ lcd.print(BMP)
; }
lcd.print("Pa");
```

```
  delay(3000);
  Send_data();
}


void modem_init()
{
  Serial.println("Please wait .... "); gsm.println("AT"); delay(1000); gsm.println("AT+CMGF=1");
  delay(1000); gsm.println("AT+CNMI=2,2,0,0,0"); delay(1000);
}


void data_init()
{
  Serial.println("Please wait .... ");
  gsm.println("AT");
  delay(1000); delay(1000);
  gsm.println("AT+CPIN?");
  delay(1000); delay(1000);
  gsm.print("AT+SAPBR=3,1");
  gsm.write(','); gsm.write("");
  gsm.print("contype");
  gsm.write(""); gsm.write(',');
  gsm.write("");
  gsm.print("GPRS");
  gsm.write("");
  gsm.write(0x0d);
  gsm.write(0x0a);
  delay(1000); ;
  gsm.print("AT+SAPBR=3,1");
  gsm.write(','); gsm.write("");
  gsm.print("APN");
  gsm.write(""); gsm.write(',');
```

```
gsm.write("");
gsm.print("bsnlnet");
gsm.write("");
gsm.write(0x0d);
gsm.write(0x0a);
delay(1000);
gsm.print("AT+SAPBR=3,
1");
gsm.write(','); gsm.write("");
gsm.print("USER");
gsm.write(""); gsm.write(',');
gsm.write(""); gsm.print(" ");
gsm.write("");
gsm.write(0x0d);
gsm.write(0x0a); delay(1000);
gsm.print("AT+SAPBR=3,1");
gsm.write(','); gsm.write("");
gsm.print("PWD");
gsm.write(""); gsm.write(',');
gsm.write(""); gsm.print(" ");
gsm.write("");
gsm.write(0x0d);
gsm.write(0x0a); delay(2000);
gsm.print("AT+SAPBR=1,1");
gsm.write(0x0d);
gsm.write(0x0a); delay(3000);
}

void internet_init()
{
```

```
 Serial.println("Please wait .... ");
 delay(1000);
 gsm.println("AT+HTTPINIT");
 delay(1000);          delay(1000);
 gsm.print("AT+HTTPPARA=");
 gsm.print("");
 gsm.print("CID");
 gsm.print(""); gsm.print(',');
 gsm.println('1');
 delay(1000);
}


void Send_data()
{  lcd.clear();  lcd.print("Sending
 the  data");  lcd.setCursor(0,  1);
 lcd.print("to       Thingspeak...");
 delay(1500);
 gsm.print("AT+HTTPPARA=");
 gsm.print(""); gsm.print("URL");
 gsm.print("");
 gsm.print(','); gsm.print(""); gsm.print("http:"); gsm.print('/'); gsm.print('/');
 gsm.print("api.thingspeak.com/update?api_key=xxxxxxxxxxxxxx&field1=")
 ; gsm.print(soil); gsm.print("&field2="); gsm.print(light);
 gsm.print("&field3="); gsm.print(gas); gsm.print("&field4=");
 gsm.print(temp); gsm.print("&field5="); gsm.print(humi);
 gsm.print("&field6="); gsm.print(BMP); gsm.write(0x0d);
 gsm.write(0x0a); delay(1000); gsm.println("AT+HTTPACTION=0");
 delay(1000);
```

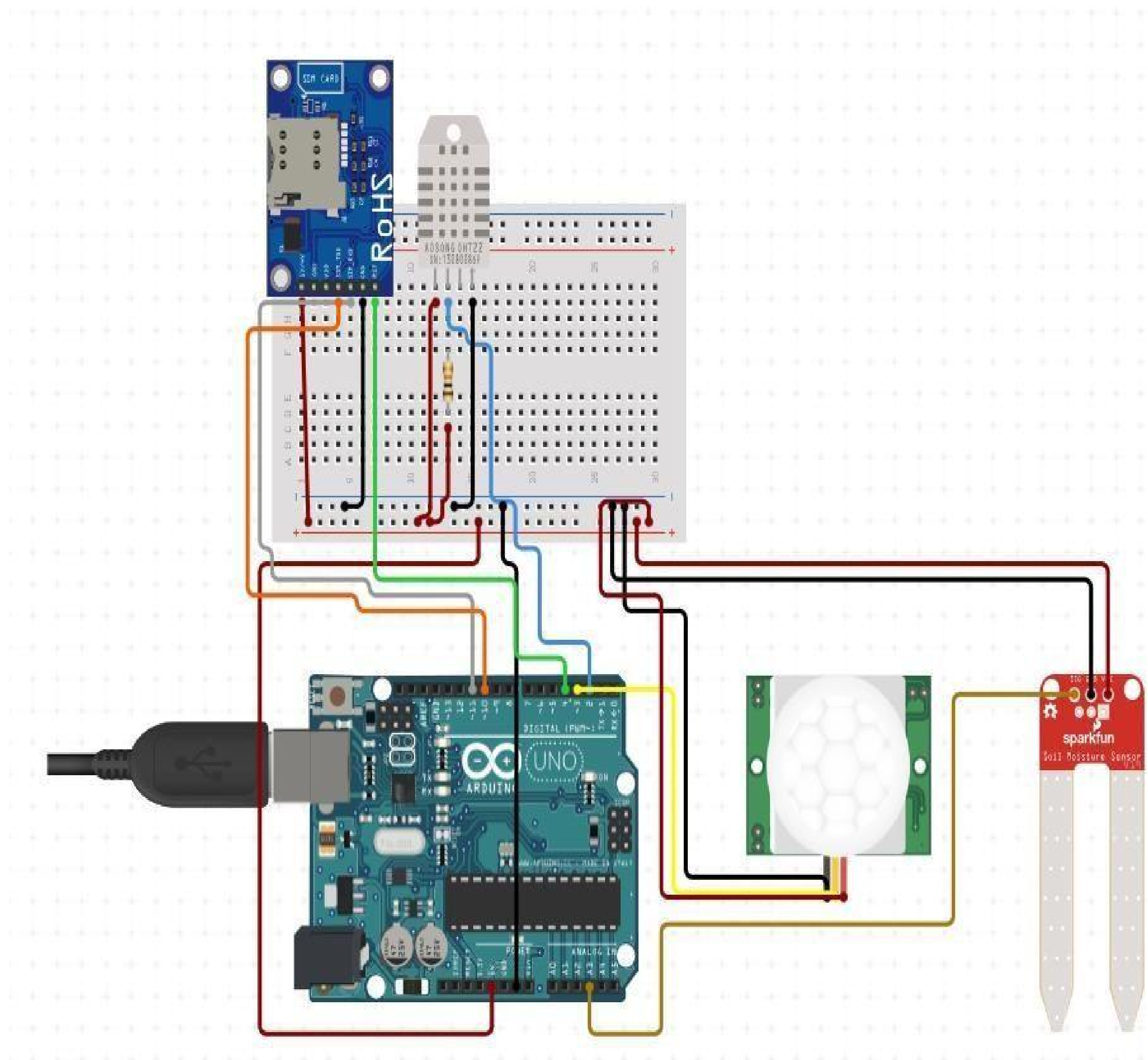

FIG.6.1.1 SIMULATION PART 1

Part1 simulation completed using TINKERCAD SOFTWARE. In this simulation we used bread boards, PIR sensor, 12V battery, LM 35 temperature sensor , arduino uno , potentiometer, resistor(300Ω), LCD 16*2 display.

6.2 SIMULATION PART 2:

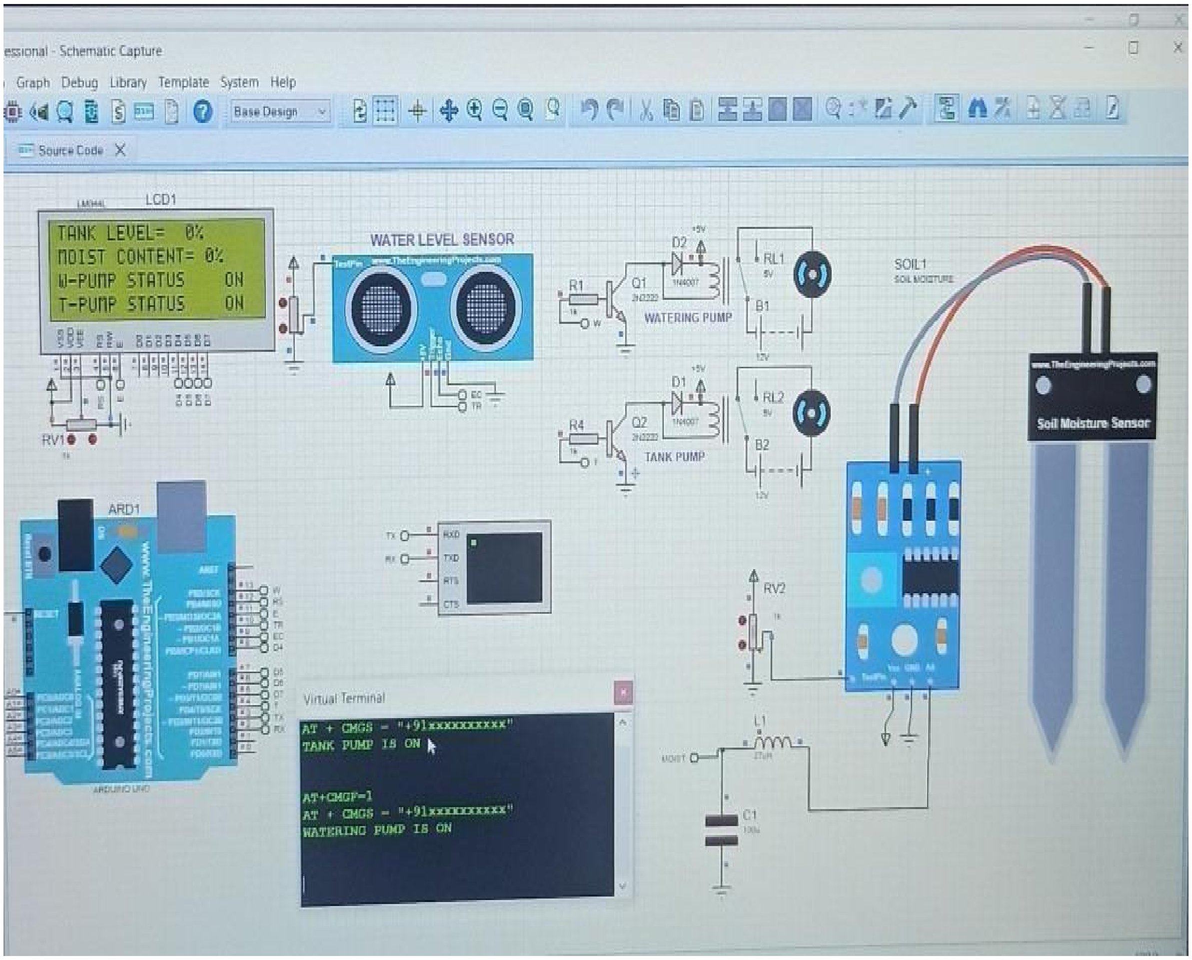

FIG.6.2.1 SIMULATION PART 2

Part 2 simulation is completed using PROTEUS SOFTWARE. In this simulation we used arduino uno, LCD display, Ultrasonic sensor, Soil Moisture Sensor, relays, resistors, capacitors, potentiometers, diodes, Tank pump, drip irrigation pump/watering pump etc.

Case 1: WATERING PUMP(WP) ON/TANK PUMP(TP) ON:

If soil moisture content in soil is less then the set value (65%) then WP gets on. If water level in tank is less then set value then the TP gets on. OUTPUT: shown on LCD and message is gone to the owner through GSM module.

Case 2: WP ON/TP OFF:

If soil moisture content in soil is less than the set value (65%) then WP gets ON. If water level in tank is greater than set value then the TP gets OFF OUTPUT: shown on LCD and message is gone to the owner through GSM Module.

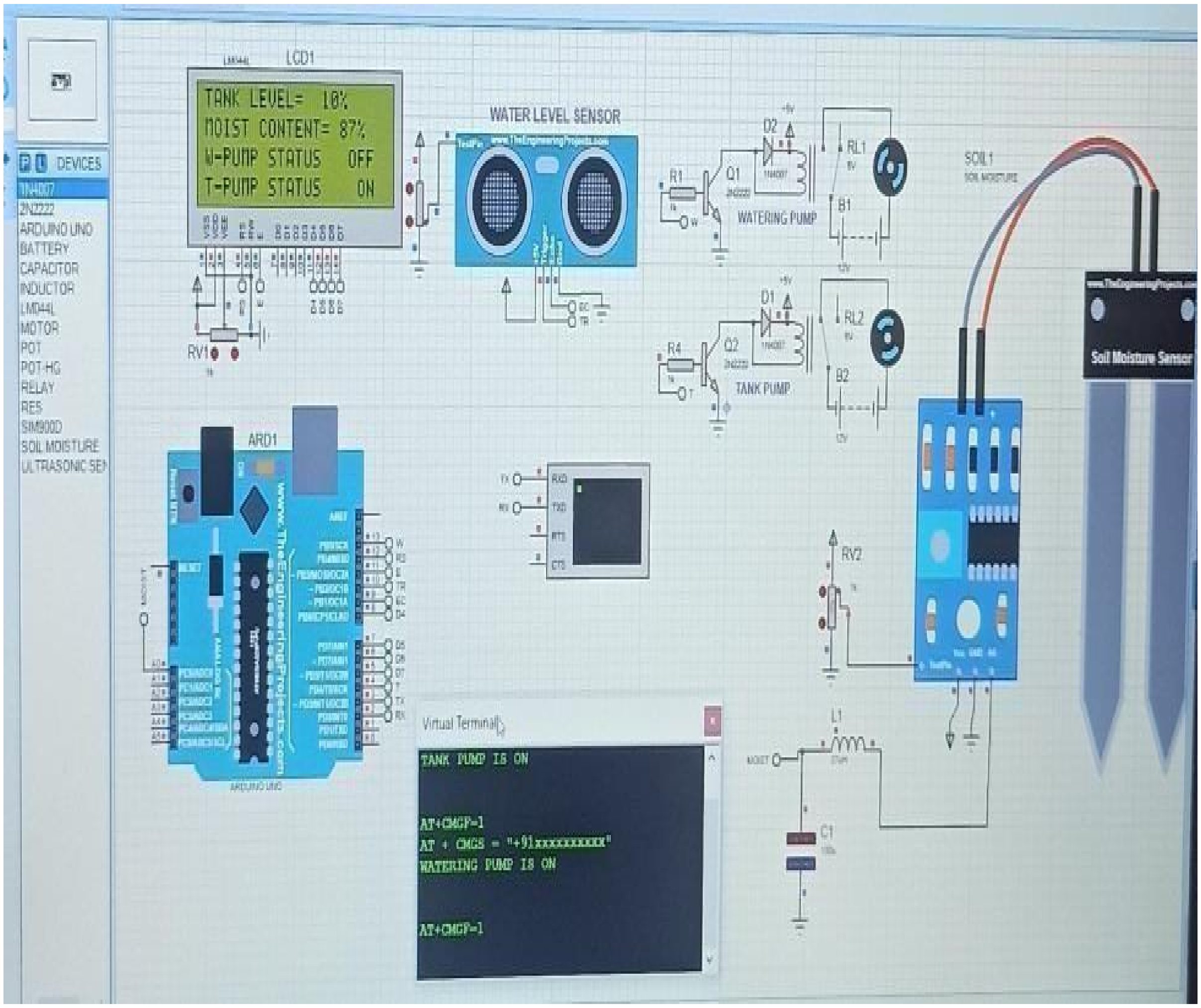

FIG.6.2.3 SIMULATION PART 2

WP OFF/TP ON:

If soil moisture content in soil is greater than the set value (65%) then WP gets off. If water level in tank is less then set value then the TP gets on OUTPUT: shown on LCD and message is gone to the owner through GSM module.

WP OFF/TP OFF:

If soil moisture content in soil is greater than the set value (65%) then WP gets off. If water level in tank is greater than set value then the TP gets off.

OUTPUT: shown on LCD and message is gone to the owner through GSM module.

CHAPTER 7

7.ADVANTAGES AND APPLICATIONS:

7.1 Advantages:

- Increased production and its quality.
- Water is used effectively.
- Remote monitoring.
- Automatic controlling of irrigation.
- Cost Effective.
- IOT technologies enables growers and farmers to reduce waste and enhance productivity.

7.2 Applications:

- System can be used in various farm lands.
- System can be used in green house farming.
- System can also be used in gardening.
- It can be used in Precision farming.

CHAPTER 8

8.CONCLUSION AND FUTURE WORK:

Agriculture monitoring system is needed to reduce the need for human intervention in farming. This process is aimed to educate the farmer on the use of an integrated technology system to monitor the farm land to increase the quantity of the production of the crops. This project helps in efficient usage of water. This project can also be used in various farm lands. It can be used in gardening, greenhouse farming, horticulture etc. In this project intruder can be detected by pir sensor farmer now no need to be afraid of theft of his crops and destruction of his crops by animals. For the future improvements we can implement the smart farming system with the use of AI, IoT, Machine learning and implement of cloud for the further improvement in the better analyses and getting more harvest in the agriculture field. The machine learning can be used to analyze the field and determine the harvest amount and quality. The AI technology, IoT and cloud computing technologies can be used to improvise the farming harvest and technologies. Cloud computing and technology is used to store the data and collect it and analyze it using machine learning. With more research and advancement in technology we can improvise the agriculture field so that we can minimize the wastage as much as much as possible and get maximum output to fulfill the demands of the growing population. Additional sensors like NPK sensor, humidity sensor and cameras can be used for better analysis and growth in the field of farming. For future enhancement, we would like to attain more data so that we can run training and testing of the data. We will also validate the data with different subset. The fuzzy systems itself will be adjusted to be applicable for all types of crops. Different kinds of sensors such as pH sensors, carbon dioxide sensors, and light sensors can be installed.

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