

AUTO AGRICULTURE DRIP IRRIGATION SYSTEM

Submitted in Partial fulfilment of the Requirements for the Award of

**Bachelor of Engineering Degree in
Electronics and Communication Engineering**

by

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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

**SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING
SATHYABAMA**

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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May- 2022



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **HEMA.
S.V. (38130082), JENIFAR. M (38130088)** who carried out the Project
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Submitted for Viva voce examination held on _____

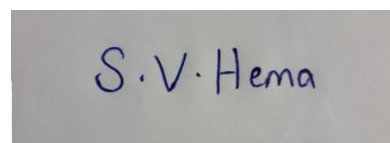
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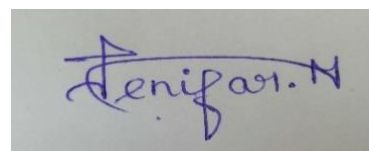
DECLARATION

We **HEMA. S.V. (38130082)**, **JENIFAR. M (38130088)**, hereby declare that the Project Report entitled “**DESIGN OF AUTO AGRICULTURE DRIP IRRIGATION SYSTEM**” done by us under the guidance of **Dr. V. J. K. KISHOR SONTI., M.TECH., Ph.D.**, (Department of ECE) is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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We convey our sincere thanks to **Dr. N. M. NANDHITHA, M.E., Ph.D. Dean, School of Electrical and Electronics Engineering** and **Dr. T. RAVI, M.E., Ph.D. Head of Department, Department of Electronics and Communication Engineering** for providing us necessary support and details at the right time during the progressive reviews.

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ABSTRACT

In this world agriculture plays a vital role for the development in food production, Agriculture is the back bone of India. India is an Agricultural country and most of the Indian population is depend upon it. In most of the countries agriculture mainly depend upon the monsoon season which is not sufficient source of water. So farming in India takes place with the help of irrigation techniques and it plays a vital role to improve the agriculture production. According to the latest survey the global warming was increases a lot in recent days. Due to global warming and gradual depletion of natural resources, the use of the water resources should be done in the efficient and precise manner for farming. So now a days- drip irrigation are used in the agriculture farming which plays an important role in future to save water because the rainfall is decreasing day by day. Even though in drip irrigation which is done now a days with the help of manual power there will be a loss of water due to manual mistakes, to overcome this problem we come up with the solution of auto agriculture drip irrigation system. Automatic drip irrigation system is used to reduce the time money and man power. This automatic drip irrigation system can be done by interfacing the various component with ST Microcontroller. The microcontroller which is programmed to receive the input signal from the moisture sensor for various moisture condition of the soil according to this value, the automatic drip irrigation system switch on the water supply to the plant. In this method the consumption of water is reduced when compare to traditional method. The automatic drip irrigation method is not only helps farmers but also others for watering their gardens as well.

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CHAPTER-1

INTRODUCTION

1.1. INSPIRATION:

In many agricultural cropping systems irrigation is necessary. Now a days the usage of water resources should be done in effective and efficient manner. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Large amount of water goes waste due to improper planning of water usage. The demand for new water saving techniques in irrigation is increasing rapidly right now. The aim of farmer is to produce “more crop per drop”, hence there is need to find the irrigation techniques which consumes less fresh water. So these techniques are helpful in the regions where there is a scarcity of water. In the modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants drip by drip due to which a large quantity of water is saved. At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land from time to time. This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried. Water deficiency can be hazardous to plants before wilting becomes visible. This problem can be perfectly solved if automatic micro controller based drip irrigation system is used in which irrigation will take place only when there is intense requirement of water. Irrigation system uses valves to turn ON or OFF automatically. Automatic Agriculture Drip Irrigation is a valuable tool for accurate soil moisture control in highly specialized in agriculture production and it is a simple, precise method for irrigation. It also helps in time saving, removal of human error in adjusting available soil moisture levels and to maximize their net profits. Along with water the other important resources to the crop are the nutrients. If the nutrients are available in the right amount for the growth of crops then the yield of the crops also increases. Thus the productivity can be raised with the proper management of water resources and nutrients.

1.2. PROPOSED MODEL:

This project includes the smart and affordable drip irrigation system interfaces with many sensors. For implementing this project, we will be using the moisture sensor, flow sensor, solenoid valve and other hardware devices. This moisture sensor measure the moisture content of the soil and it sends the information to the micro controller, then the microcontroller checks the present values with the threshold value which is stored in the micro controller memory, if the current value is less than the threshold value then the irrigation starts by opening the valve of the solenoid valve and the flow sensor is used to measure the amount of water supplied to the plants. The flow sensor value is send to the microcontroller which compares the current value with the value stored in the microcontroller memory, if the value stored in micro controller memory matches then the irrigation stops with the help of the solenoid valve [i.e the solenoid valve open based on the value of moisture sensor and it closed based on the value of the flow sensor]. Therefore this project is mainly used for the agriculture farm where different types of plants are harvested.

1.3 ORIGIN OF IDEA:

Our team has always been interested in the field of internet of things (IOT) and Embedded system. Automatic drip irrigation system have been a revolution in Agriculture farming. Incorporating the idea of automatic drip irrigation in farming has intrigued us. So, we came up with the idea to make a Auto agriculture drip irrigation system to prevent the overflow of water in farming due to global warming.

CHAPTER-2

LITERATURE REVIEW

2.1. LITERATURE SURVEY:

Darshana Chaware, Ashwini Raut, Mrunal Panse, Aniruddha Koparkar (2015), have designed the sensor based automated drip irrigation system with the sensors and microcontroller.

The farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals.

Irrigators who monitor soil moisture levels in the field which greatly increase their ability to conserve water and energy.

The drip irrigation system can be adjusted to a variety of specific crop needs and requires minimum maintenance.

The modular configuration of the automated irrigation system allows it to be scaled up for larger greenhouses or open fields.

Kavianand, G; Nivas, V M; Kiruthika, R; Lalitha, S (2016), have designed the Smart Drip Irrigation System for sustainable Agriculture, This paper presents a fully automated drip irrigation system which is controlled and monitored using ARM9 processor.

This drip irrigation system uses the gsm module to monitor frequently about the soil status and these information are received by the ARM9 processor, depending upon the processor information irrigation is done, if there is any abnormal condition the SMS is send through the gsm module.

The drip irrigation system uses the gsm module to monitor and control frequently and these information are received by the ARM9 processor, depending upon the processor information irrigation is done.

Akash Kaluse, Arvind Kadam, Vishal Patil, Sharad Dhage (2016), have designed the automatic drip irrigation system. The Irrigation system, depends upon the soil type and water provided to plant.

It uses a microcontroller which is programmed to receive the input signal of various sensors. In automatic drip irrigation system, we can control their flow of water and also give required water to plant by checking moisture level of soil by soil the moisture sensor.

Singh, Dhawan; Thakur, Aditi (2018) have designed the Smart Drip Irrigation System for Remote hilly Areas, This paper proposed a new design concept of smart drip irrigation system for remote hilly areas where electricity and water connectivity are poor so this system is powered through solar energy and provide a better alternative to conventional automatic irrigation systems.

This system uses AURDINO UNO and RASPBERRY PI to get the plant information for the different sensors and the depending upon the threshold value the irrigation is done with the plant.

Math, Anushree; Ali, Layak; Pruthviraj, U (2018) have designed the Development of Smart Drip Irrigation System Using IoT. Irrigation is the supply of an appropriate amount of water to the plants at a precise time so drip irrigation is used To achieve this, open source platform is used as a central controller of the system.

Various sensors have been employed which continuously provide the existing parameters to govern healthiness of plants.

Based on the information obtained from the RTC module water is supplied to the plants at regular interval of time by controlling a solenoid valve.

The entire irrigation system can be monitored and managed by the webpage.

The solenoid valve is used to control the water supply of the plants with regular interval of time and these irrigation system is monitored and managed by webpage.

Shonkora, S. S., & Olalekan Salau, A (2020) have designed the Modeling and Implementation of an Automatic Drip Irrigation System. This paper presents the implementation of an automatic drip irrigation system.

The proposed system uses sensors to monitor the status of the soil moisture and temperature depending on the information received by the microcontroller it allows the drip irrigation to the plant.

In the case of any defect, the system automatically sends a message to the system operator which monitors the operation of system from a LCD screen.

The information from soil moisture and temperature sensor is send to the micro controller At this state, the pump of the irrigation system is initiated. On the other hand, if the sensor indicates that the moisture sensor is maximum , irrigation stop.

During irrigation the motor starts running and indicator light is turned ON. The overall results displayed by the LCD are the status of the motor, the valve, and the soil moisture level; whether wet or dry.

Chandra. S, Bhilare. S, Asgekar. M, Ramya.R. B. (2021) have designed the Crop Water Requirement Prediction in Automated Drip Irrigation System.

It proposes to automate the tedious process by proposing a micro controller based system for automatic smart drip irrigation and to predict the precise amount of water needed by the crop.

There is moisture and temperature sensor which plays a crucial part in determining the water content that has to given to the soil.

2.2 PROBLEM FORMULATION:

India is an agricultural country and the majority of the population depends on agriculture. Agriculture is the main source for food production. Due to global warming and gradual depletion of natural resources, the use of water resources should be done in an efficient and precise manner for farming. Here in this paper, trying to reproduce the comprehensive literature study related to the various automatic agriculture irrigation system, in past the research is based on the traditional method using different sensors and microcontroller. Each system has its own advantage and disadvantage. In most of the system sensors are used to monitor the status of the soil and drip irrigation is done for a single variety of plant. As water scarcity become a major problem now a days, Auto agriculture drip irrigation system are introduce for different varieties of plants.

CHAPTER-3

OBJECTIVES AND COMPONENTS OF THE PROJECT

OBJECTIVES OF THE PROJECT:

The main objectives of this project are:

- ☐ To Efficient and reliable use of water resources in agriculture and to save valuable water resources and to detects the water level.
- ☐ To apply the system for improvement of health of the soil and hence the plant via multiple sensors.
- ☐ To save the water in the greater extent in which water and nutrients are allowed to drip slowly into the root zone of the soil.
- ☐ To Handles the irrigation system automatically and to improve the crop productivity.
- ☐ To provide an automatic irrigation system thereby saving time, money and power of the farmer.
- ☐ To improve the usage of water the accurate amount of water required by a particular crop is calculated.
- ☐ To promote water management practices that optimizes the volume and timing of water distribution.
- ☐ To ensure enough moisture essential for plant growth and to provide crop insurance against short duration drought.
- ☐ To stabilizes farm production by protecting against drought and by increasing crop yields and quality.
- ☐ To generate positive economic consequences for farmers and their families.

COMPONENTS REQUIRED:

The components required for this project are shown in below table 3.1.

SL.NO	COMPONENTS NAME	DESCRIPTION	QUANTITY
1.	Micro controller	ST micro controller - STM32F103C8	1
2.	Soil moisture sensor	Capacitive soil moisture sensor	2
3.	LCD Display	LCD Display	1
4.	Flow sensor	5 – 18V Flow meter -0.3-10L/min	2
5.	Solenoid valve	Solenoid valve	2
6.	Push button	Selection keypad	3
7.	Relay	1 Channel 5V Relay Module	1
8.	DC to DC convertor	12V to 5V convertor	1
9.	Power Supply	12V, 2A DC- SMPS Power Supply	1
10.	Connecting Wires	Jumper Wires	25
11.	Bread Board	-	1

TABLE 3.1. Components Required

3.1 ST - MICROCONTROLLER

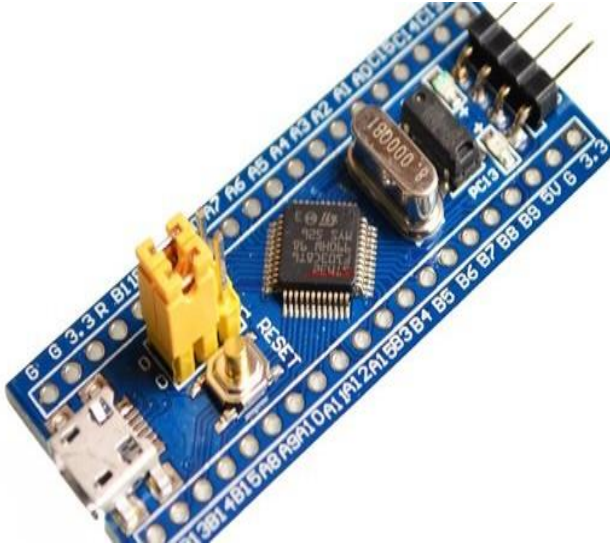


Fig 3.1 STM32F103C8 MICROCONTROLLER

The STM32F103C8 medium-density performance line family incorporates the high-performance ARMCortex-M3 32-bit RISC core operating at a 72 MHz frequency, high-speed embedded memories (It has Flash memory up to 128 Kbytes and SRAM up to 20 Kbytes), and an extensive range of enhanced Inputs outputs and peripherals connected to two APB buses. All types of STM32F103xx has 10 analog I/O pins and 37 digital I/O pins, two 12-bit Analog to digital convertors(ADCs), three general purpose 16-bit timers plus one PWM timer, as well as standard and advanced communication interfaces: up to two I²Cs and SPIs, three USARTs, an USB and a CAN. The devices operate from a 2.0 to 3.6 V power supply. They are available in both the -40 to +85 °C temperature range and the -40 to +105 °C extended temperature range. A comprehensive set of power-saving mode allows the design of low-power applications. The STM32F103xx medium-density performance line family includes devices in six different package types: from 36 pins to 100 pins. Depending on the device chosen, different sets of peripherals are included. These features make the STM32F103C8 medium-density performance line microcontroller is suitable for a wide range of applications such as motor drives, application control, medical and

handheld equipment, PC and gaming peripherals, GPS platforms, industrial applications, PLCs, inverters, printers, scanners, alarm systems, video intercoms, and HVACs.

3.1.1 GENERAL PIN FUNCTIONS OF STM32F103C8:

- **5V:** This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 – 20V), the USB connector (5V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- **3.3V:** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND:** Ground pins.
- **RESET:** Typically used to add a reset button to shields that block the one on the board.

3.1.2 STM32F103C8T6 Blue Pill Pinout Configuration

Category	Pin Name	Details
Power	3.3V, 5V, GND	• 3.3V – Regulated output voltage from the onboard regulator (drawing current is not recommended), can also be used to supply the chip. • 5V from USB or onboard regulator can be used to supply the onboard 3.3V regulator. • GND – Ground pins
Analog Pins	PA0 – PA7 PB0 – PB1	Pins act as ADCs with 12-bit resolution

Input/output pins	PA0 – PA15 PB0 – PB15 PC13 – PC15	37 General-purpose I/O pins.
Serial	TX1, RX1 TX2, RX2 TX3, RX3	UART with RTS and CTS pins
External interrupts	PA0 – PA15 PB0 – PB15 PC13 – PC15	All digital pins have interrupt capability
PWM	PA0 – PA3 PA6 – PA10 PB0 - PB1 PB6 – PB9	15 PWM pins total
SPI	MISO0, MOSI0, SCK0, CS0 MISO1, MOSI1, SCK1, CS0	2 SPI
Inbuilt LED	PC13	LED to act as a general-purpose GPIO indicator
I ² C	SCL1, SDA1	Inter-Integrated Circuit communication ports

	SCL2, SDA2	
CAN	CAN0TX, CAN0RX	CAN bus ports

3.2 ST MICROCONTROLLER PIN CONFIGURATION

3.1.3 STM32F103C8T6 Technical Specifications

MICROCONTROLLER	STM32F103C8T6
Operating voltage	3.3V
Analog inputs	10
Digital I/O pins	37
DC source/sink from I/O pins	6Ma
Flash memory (KB)	64/128
SRAM	20KB
Frequency (clock speed)	72MHz max.
Communication	I ² C, SPI, UART, CAN, USB

3.3 ST-MICROCONTROLLER TECHNICAL SPECIFICATION

3.2 FLOW SENSOR



Fig 3.2 FLOW SENSOR

Red wire -VCC(+5V)

Black wire – GND (ground)

Yellow wire – Pulse Output

A flow sensor is commonly referred to as “FLOW METER”. Flow sensor is an electronic device which is used to measure or regulates the flow rate of liquids and gases within pipes and tubes. Flow sensors detect when water is flowing and transmit signals to indicating devices. Flow sensors with indicating devices can also measure the flow rate and the amount of water being delivered to an irrigation system.

3.2.1 WORKING:

Flow sensors measure how slowly or quickly water is flowing through an irrigation system with the help of rotating fan inside the sensor and it send that information to an ST-microcontroller. This is incredibly helpful in detecting issues and conserving water. For example, if water is flowing at an unusually high rate, a flow sensor works in conjunction with an irrigation controller to take corrective action. Such action could include stopping the water flow, sounding an alarm or sending alert messages.

3.2.2 TECHNICAL SPECIFICATIONS OF FLOW SENSOR:

Working voltage: DC- 1.8-5V (low consumption), DC 5-18V (regular consumption)

Rated voltage: 5 to 18V

Pulse output duty cycle: 50+-10%

Insulation resistance: 100MOhm and above

Input/Output diameter: 9.5mm

ADVANTAGES:

- Less weight, small in size, easy to install
- Sealing ring design to prevent water leaks
- Complaint with RoHS standard
- Wide range of applications

3.3 SOIL MOISTURE SENSOR



Fig 3.3 Moisture sensor

- Red wire - +VCC(5V).
- Black wire – GND (ground).
- Yellow wire - Analog Output.

The capacitive soil moisture sensor is an analog device in which it measures the soil moisture level by capacitive sensing rather than resistive sensing with the other sensors. The capacitive soil moisture sensor works by measuring the changes in capacitance which is caused by the changes in the dielectric. It does not measure the moisture directly, instead it measures the ions that are dissolved in the moisture.

These ions and their concentration can be affected by the number of factors, for example adding fertilizer for instance will decrease the resistance of the soil. Capacitive basically measures the dielectric that is formed by the soil and the water is the main factor that affects the dielectric. It not only avoids corrosion of the probe but it also gives a better reading of the moisture content of the soil. The capacitance of the sensor is measured by an 555 based circuit that produces a voltage proportional to the capacitor inserted in the soil. The capacitive moisture level sensor output is in analog form. The capacitive moisture level sensor is connected to the ADC pin of the ST microcontroller as the output is in analog form. Since we need digital output for processing we connect the Moisture sensor to the ADC pin of the ST microcontroller.

3.3.1 TECHNICAL SPECIFICATION OF MOISTURE SENSOR:

- Operating Voltage :3.3 ~ 5 VDC.
- Operating Current :5 mA
- Interface :PH2.54 – 3P.
- Dimensions mm(L*W*H) :98*23*4.
- Supports 3 – Pin Gravity Sensor Interface.

3.4 SOLENOID VALVE:



Fig 3.4 Solenoid valve

- Red wire -+VCC(12v).
- White wire - GND (ground).

A solenoid valve is an electrically controlled valve. The valve features of the solenoid, which is an electric coil with a movable ferromagnetic core in its center. The rest position, is the plunger which closes off a small orifice. The basic principle which is used to open and close the solenoid valve is an electric current which passes through the coil, creates a magnetic field in which this magnetic field exerts an upwards force on the plunger opening the orifice. Solenoid valves differ in the characteristics of the electric current. The strength of the magnetic field they generate, the mechanism they use to regulate the fluid, and the type and characteristics of fluid they control. The mechanism varies from linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators. The valve can use a two-port design to regulate a flow or use a three/more port design to switch flows between ports. Solenoid valves are the most frequently used control elements in fluidics. In automatic agriculture drip irrigation system, Solenoid valve is used to control the water flow to the plant through the flow sensor. The solenoid valve allows the water flow(open the valve) to the plant depending upon the moisture sensor readings and in blocks the water flow(close the valve) depending upon the flow sensor readings.

3.4 ADVANTAGES OF SOLENOID VALVE:

- Solenoid valve offers fast and safe switching, high-reliability, long service life, good medium compatibility of the materials used, low control power and compact design.
- Solenoid valve is used for different tasks like to shut off, release, dose, distribute or mix fluids.
- Solenoid valve is used in many applications like heating systems, compressed air, vacuum, drip irrigation, car washes, etc.

3.5. RELAY:



Fig 3.5. Relay

The relay is the device that open or closes the contacts to cause the operation of the other electric control. It detects the undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area through ON or OFF.

Every electromechanical relay consists of:

1. Electromagnet
3. Mechanically movable contact
3. Switching points and
4. Spring

COM: common pin.

NO: Normally open – there is no contact between the common pin and the normally open pin. So, when you trigger the relay, it connects to the COM pin and power is provided to the load.

NC: Normally closed – there is contact between the common pin and the normally closed pin. There is always connection between the COM and NC pins, even when the relay is turned off. When you trigger the relay, the circuit is opened and there is no supply provided to the load.

3.5.1 TECHNICAL SPECIFICATIONS OF RELAY:

- Supply voltage : 3.75V to 6V
- Quiescent current : 2mA
- Current when the relay is active : ~70mA
- Relay maximum contact voltage : 250VAC or 30VDC
- Relay maximum current : 10A

3.5.2. WORKING OF RELAY:

It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energises the electromagnetic field which produces the temporary magnetic field. This magnetic field moves the relay armature for opening or closing the connections. The small power relay has only one contacts, and the high power relay has two contacts for opening the switch.

The inner section of the relay is shown in the figure below. It has an iron core which is wound by a control coil. The power supply is given to the coil through the contacts of the load and the control switch. The current flows through the coil produces the magnetic field around it.

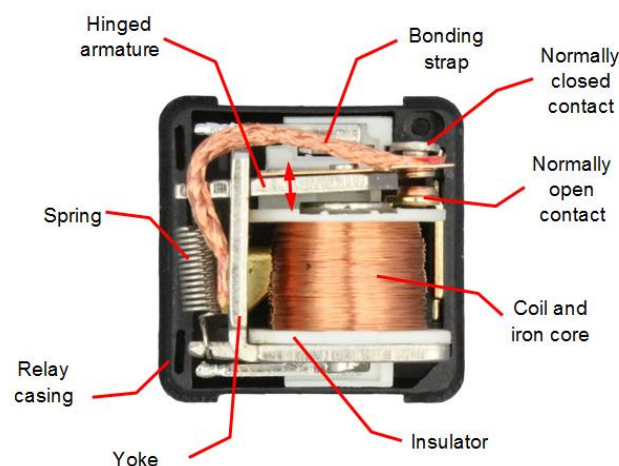


Fig 3.5.1. Relay Inner Section

Due to this magnetic field, the upper arm of the magnet attracts the lower arm. Hence close the circuit, which makes the current flow through the load. If the contact is already closed, then it moves oppositely and hence open the contacts.

The current required to activate the relay is much smaller than the current that relay contacts are capable of switching, and the coil and the contacts are galvanically isolated, meaning there is no electrical connection between them. This means that the relay can be used like a microcontroller.

3.6 LCD DISPLAY:

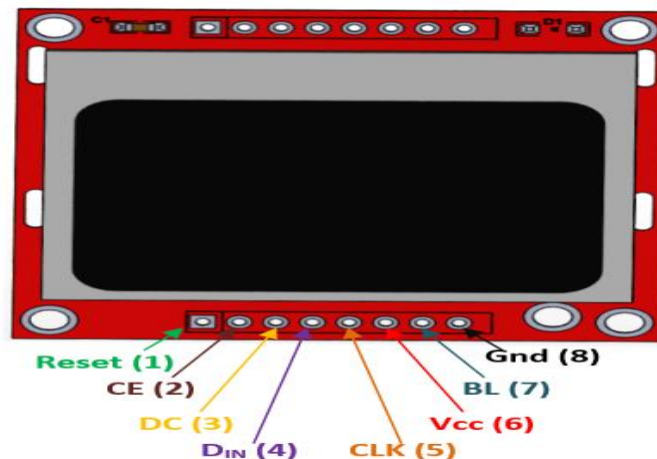


Fig 3.6 LCD Display

We come across Liquid Crystal Display (LCD) displays everywhere around us. Computers, calculators, television sets, mobile phones, digital watches use some kind of display to display the time. 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 LED 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.

3.6.1 FEATURES:

- 84 X 48 dot matrix LCD, can show 4 lines of characters.
- Use serial interface communicate with the master processor, the number of interface signal line reduced greatly, only 8 signal lines including power and GND.

- Support different types of MCU, such as the Arduino, AVR, SPI, MCS51 and so on.
- Transfer rate up to 4Mbps, can full speed write display data without waiting time.
- Can use the conductive glue to connect the module to the printed board, without cables. The metal hooks on the module can fix the module on the printed board, which is very easy to install and replace.
- LCD controller/driver chip has been bound to LCD chip, the volume of LCD is small.
- Low power supply, the working current in a normal situation is lower than 200 μ A and has the power-down mode.
- "LIGHT" linked with GND, the backlight to be lit.
- Need you to compress the screen and PCB tighter, might be got loose after the delivery.
- Use a 5 to 7V controller, otherwise, the display could be quite vague.

3.6.2 TECHNICAL SPECIFICATION OF LCD:

Pin No:	Pin Name:	Description
1	Reset	This pin resets the module. It an active low pin (resets when 0V is provided)
2	Chip Enable (CE)	This pin is made low (0V) to select this particular display when more than one SPI peripherals are used.
3	Data/Command (DC)	This pin is used to switch between Data mode (high) and Command mode (low)
4	Serial Input (DIN)	This is the input pin (MOSI) through which serial instructions are sent
5	Clock (CLK)	All SPI modules require a common clock, this clock source is supplied to this pin
6	Power (Vcc)	This pin is used to power the display the supply voltage is from 5V to 7V
7	Back Light (BL)	Connects to the ground of the circuit.

8	Ground (Gnd)	Connects to the ground of the circuit.
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3.4 Technical specification of lcd display

3.7. PUSH BUTTON:

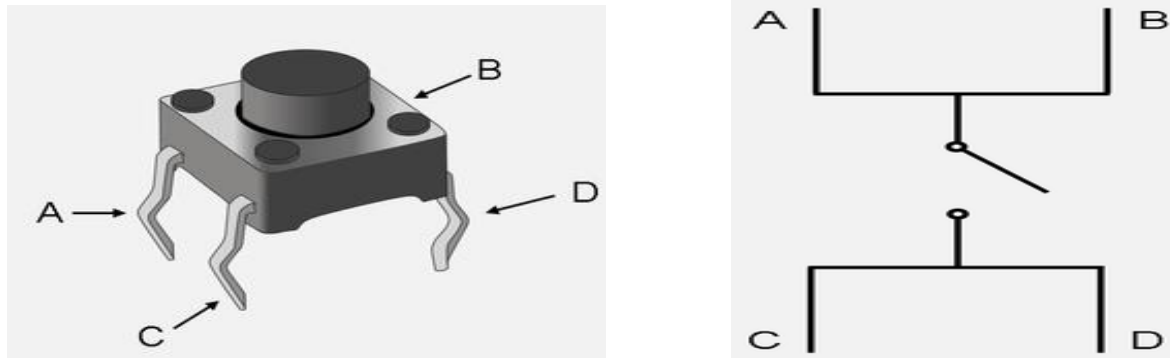
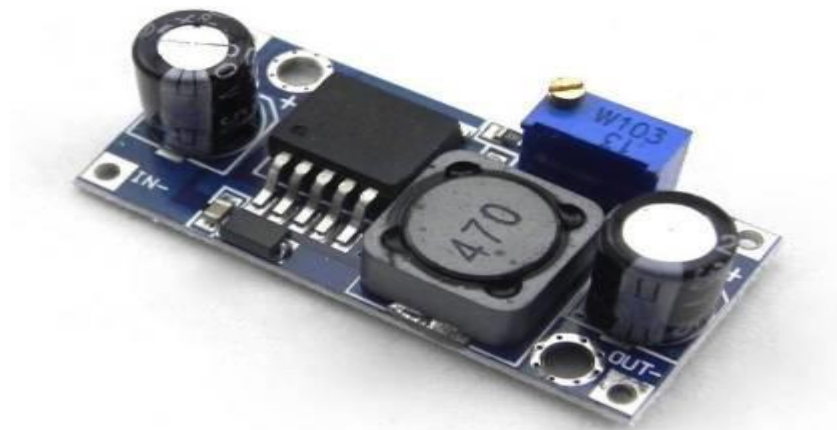


Fig 3.7 Push button

A push-button is a simple switch mechanism to control some aspect of a machine or a process. The push button switch is usually used to turn on and off the control circuit and it is a kind of control switch appliance that is widely used. It is used in electrical automatic control circuits to manually send control signals to control contactors, relays, electromagnetic starters, etc. They are common features within the home and workplace, and are also referred to as pushbutton switches or push switches. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, although many un-biased buttons (due to their physical nature) still require a spring to return to their un-pushed state.

Push button is used in keypad for selection purpose. There are three push buttons in keypad they are as follows (i) select button (ii) down button (iii) up button. These three push buttons are connected to the GPIO input output pin in ST Microcontroller. The select button is used to select the plant in LCD display. The Up button and Down Button is used to adjust the threshold value of the specified plant in which it is selected by the Select Button.

3.8 DC TO DC CONVERTER:



- 12 TO 5 VOLT CONVERTER.

Fig 3.8 DC to DC convertor

A DC to DC Converter is an electronic circuit or electromechanical device which converts a source of direct current (DC) from one voltage level to another. DC to DC Converter is a non-isolated step-up boost voltage converter featuring adjustable output voltage, high efficiency. DC to DC Converter is a type of electric power converter. In DC to DC Converter the Power levels range from very low (small batteries) to very high (high-voltage power transmission). DC to DC Converters, called choppers, which are supplied from a dc voltage source, typically a diode rectifier and a dc link. DC-DC converters are high-frequency power conversion circuits that use high-frequency switching and inductors, transformers, and capacitors to smooth out switching noise into regulated DC voltages. Closed feedback loops maintain constant voltage output even when changing input voltages and output currents. DC-to-DC converters are used to reduce high voltage DC input to low voltage DC for some specific appliances. They are also used to isolate some highly sensitive components in a circuit from other components of the circuit to avoid any kind of damage. It converts input

voltage of 5-32V DC to an output voltage of 4-38V DC. In auto agriculture drip irrigation system a DC to DC Converter is used to convert the 12v into 3.3v or 5v, because the ST microcontroller requires only 3.3v or 5v power supply.

3.8.1 TECHNICAL SPECIFICATIONS :

- Input Voltage Range: 3V ~ 32V.
- Output Voltage Range: 5V ~ 35V.
- Input Current: 4A (max), no-load 18mA.
- Conversion efficiency: $\geq 94\%$.
- Switching frequency: 400KHz.
- Output Ripple: 50mV.
- Load Regulation: $\pm 0.5\%$.
- Voltage Regulation: $\pm 0.5\%$.
- Rectification : Non-synchronous Rectification.
- Module properties: Non Isolated boost (BOOST).
- Dimensions: 43mm*21mm*14mm (L*W*H).

3.8.2 FEATURES:

- Wide input voltage 3V ~ 32V, optimum operating voltage range is 5 ~ 32V.
- Wide Output voltage 5V ~ 35V .
- Built-4A efficient MOSFET switches enable efficiency up to 94%; (LM2577 current is 3A).
- High switching frequency 400KHz, can use a small-capacity filter capacitors that can achieve very good results, the ripple smaller and smaller. (LM2577 frequency only 50KHz).

3.9 SMPS POWER SUPPLY:



- 12 v to AMPERE

Fig 3.9 SMPS Power supply

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. A switch mode power supply (SMPS) is a type of power supply that uses semiconductor switching techniques, rather than standard linear methods to provide the required output voltage. The basic switching converter consists of a power switching stage and a control circuit. The main function is to convert a level of voltage to the voltage or current required by the client through different forms of architecture. An SMPS differs from a linear power supply in how it converts the primary AC voltage into the output DC voltage. SMPS incorporate higher efficiency, reduced weight, smaller size, increased durability, and they allow a more extensive input voltage range. SMPS works by turning the main power on and off at a high speed to reduce the voltage. In such a case the reduction in voltage depends on the ratio of time and off time. Switching happens very quickly, 10,000 times or faster per second. In auto agriculture drip irrigation system SMPS power supply is used to give a power supply of 12v.

3.9.1 TECHNICAL SPECIFICATIONS:

- ☐ Input Voltage 100 – 270V AC.
- ☐ Output Voltage 24 V DC.
- ☐ Output Current 3A.
- ☐ Leakage Current @ 230 V ac < 2mA.
- ☐ Line regulation < 1%.
- ☐ Load regulation < 1%.
- ☐ Ripple content 150mV p-p.
- ☐ Efficiency: 60% - 95%.
- ☐ Isolation: 2 kvac for 1 min between I/P & O/P and 1.5 kvac for 1 min between I/P & Earth.
- ☐ Dimension: 450 W x 450 D x 220 H mm.

3.9.2 FEATURES:

- ☐ SMPS is used to convert input AC to high voltage DC and convert this High voltage DC to high voltage, high frequency square wave.
- ☐ This High Voltage and Frequency AC is converted to Regulated DC.
- ☐ The output voltage is always more or lesser than the input voltage.
- ☐ SMPS power supply has high Noise and Interference.
- ☐ The regulation method is varied by the duty cycle of PWM.
- ☐ SMPS consists of switching element, high frequency transformer, rectifiers and filters, feedback circuit.
- ☐ SMPS has been used for high power, complex and stable power requirements.

CHAPTER-4

HARDWARE SETUP

4. 1. CIRCUIT CONNECTION:

The microcontroller used in this project is ST MICROCONTROLLER. The moisture level sensor is connected to the ADC pin of the microcontroller because we need digital output but the output of the moisture level sensor is analog in order it to convert to digital we have connected the ADC pin of microcontroller to moisture level sensor. The LCD(Liquid Crystal Display) is connected to the input and output pins of the microcontroller which displays the welcome message and the plant information such as the moisture content of the plant, the amount of water supplied to the specific plant and the status of the solenoid valve. The Keypad(Switch) is connected to the input and output pins of the microcontroller to set the input values for the selected(specific) plant. The power supply used here is SMPS power supply in which it is used to supply the power to the circuit. The flow sensor is connected to the external interrupt pin of the microcontroller in which it is used to calculate the amount of water supplied to the specific plant, amount of water supplied to the plant is measure using a rotating fan inside the flow sensor depend upon the rotation of the plant amount of water supplied is calculated. The DC to DC converter is connected to both the power supply and the microcontroller because the microcontroller requires only 3v but the power supply gives 12v so, in order to convert the 12v into 3v we have connected the DC to DC converter to the microcontroller and the power supply. The value Driver is connected to the input and output pins of the microcontroller because the microcontroller has 3v but the solenoid valve required 12v in order to convert 3v into 12v we have connected the value driver to the input and output pins of the microcontroller. The solenoid valve is connected to the value driver because the value driver supplies the power to the solenoid value. Solenoid valve is open depend upon the moisture content of the soil and it closes depend upon the flow sensor value. The water tank is connected to the solenoid valve in which it is used to supply the water to the specific plant through the flow sensor. The moisture level sensor is inserted in the plant to the know the moisture

content (threshold value) of the plant, depending upon the moisture content (threshold value) of the plant the drip irrigation takes place.

These are the connections of the auto agriculture drip irrigation system.

The below shown figure is the circuit diagram connection of this project “Auto Agriculture Drip Irrigation System”.

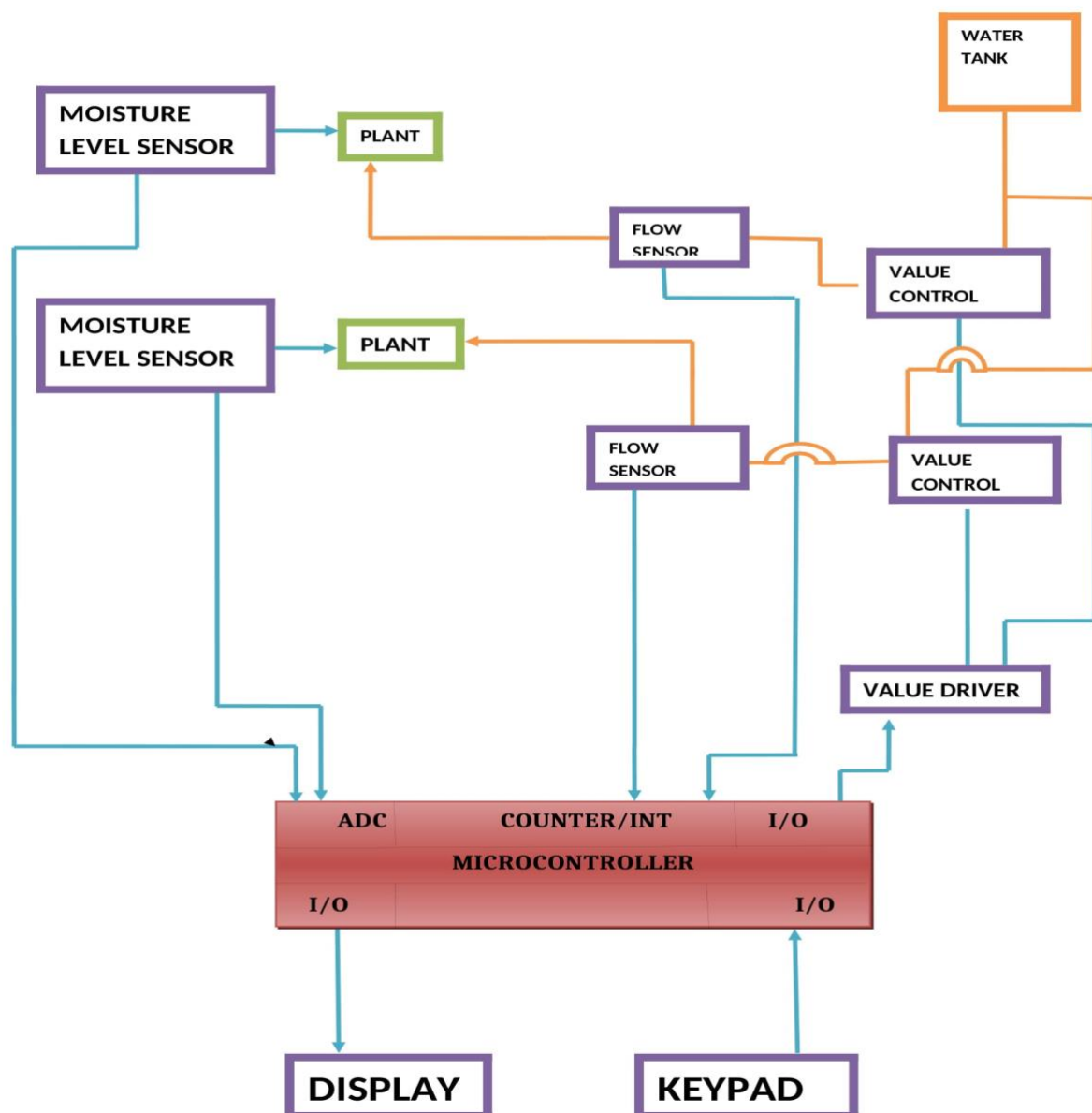


fig 4.1 CIRCUIT CONNECTION OF AUTO AGRI DRIP IRRIGATION SYSTEM.

CHAPTER-5

FLOW CHART

The circuit for the Auto agriculture drip irrigation system is simple which contains the ST Microcontroller which controls the whole system which has moisture sensor, flow sensor, solenoid valve, etc.

When the power supply switched on the microcontroller receives the power, if the select button in the keypad is pressed in configured mode we can update the values for the flow sensor and moisture sensor for both the plants these updated values are store in the non-volatile memory of the ST microcontroller. If the system comes out from the configured mode the system starts reading the preloaded values from the non-volatile memory and it also reads the values from the moisture sensor which is connected to the plant, once both the readings are taken it starts comparing if the current value is lesser than expected value then the drip irrigation starts, once the irrigation starts it again checks the flow sensor value with the expected value, if the flow sensor value is lesser than the expected value then the irrigation continues and it checks under a loop (i.e) this process is takes place again and again until the flow sensor reaches the expected value, if the flow sensor value reaches the expected value again it checks the moisture content and the process is repeated again and again under a loop and if the moisture sensor reading is greater than the expected value then no irrigation takes place.

In this system the moisture sensor measure the moisture contents of the soil if the moisture value is less than expected value the solenoid valve open, flow sensor measures the value of the water flow to the plant by using the rotating fan inside it, while the fan rotates it start measuring the amount of water flows to the plant through the flow sensor for an instance for one rotation it calculates as 0.7 ml of water so depending upon the number of rotation total amount water flow through the plant is calculated and it compares with expected value if it reaches the solenoid valve closes.

This is the overall working of the project Auto agriculture drip irrigation system.

FLOW CHART:

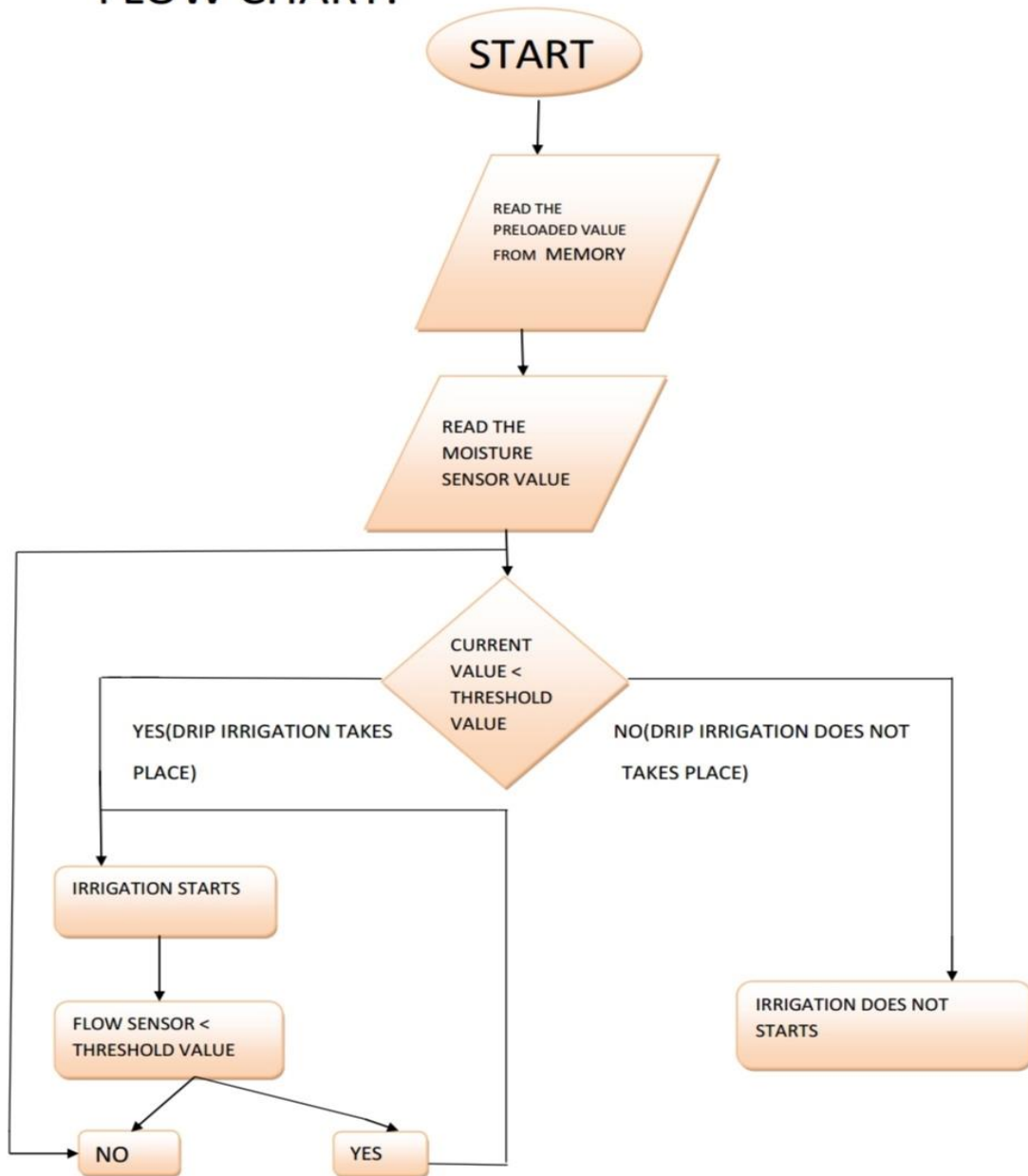


Fig 6.1 This is the working flow chart of the auto agriculture drip irrigation system.

CHAPTER-6

RESULTS

The circuit is connected as per the circuit diagram shown in fig 4.1. Then we need to upload the code in ST microcontroller. After uploading the source code in ST microcontroller we can see the output.

6.1. CIRCUIT CONNECTION:

The circuit connection is shown in fig 7.1., fig 7.2. and fig 7.3.

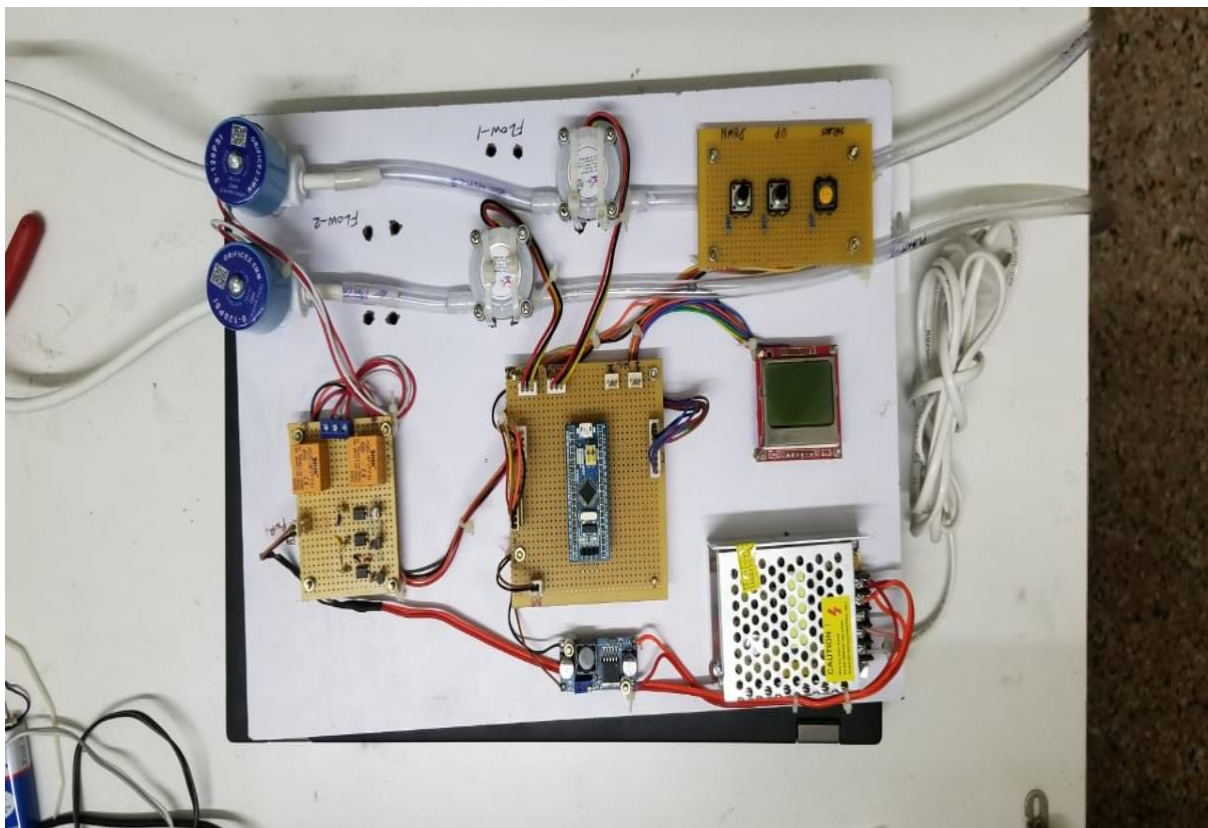


Fig 6.1 Circuit Connection – View 1

- This is the hardware setup of auto agriculture drip irrigation system by using various sensors and ST microcontroller.

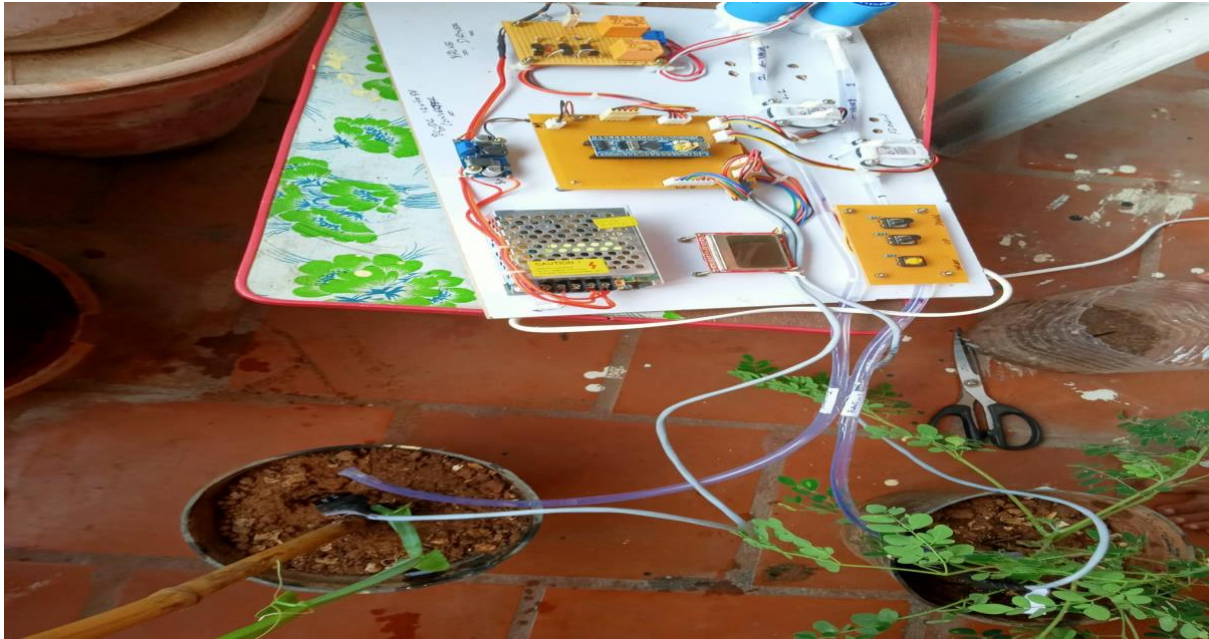


Fig 6.2 Circuit Connection – View 2

- This is the image of auto agriculture drip irrigation system in which the moisture level sensor is inserted in the plant to decide whether the drip irrigation takes place or not



Fig 6.3 Circuit Connection – View 3

- This is a whole experimental setup for the project auto agriculture drip irrigation system by using various sensors, ST microcontroller along with the plant and tank.

6.2. PROGRAM

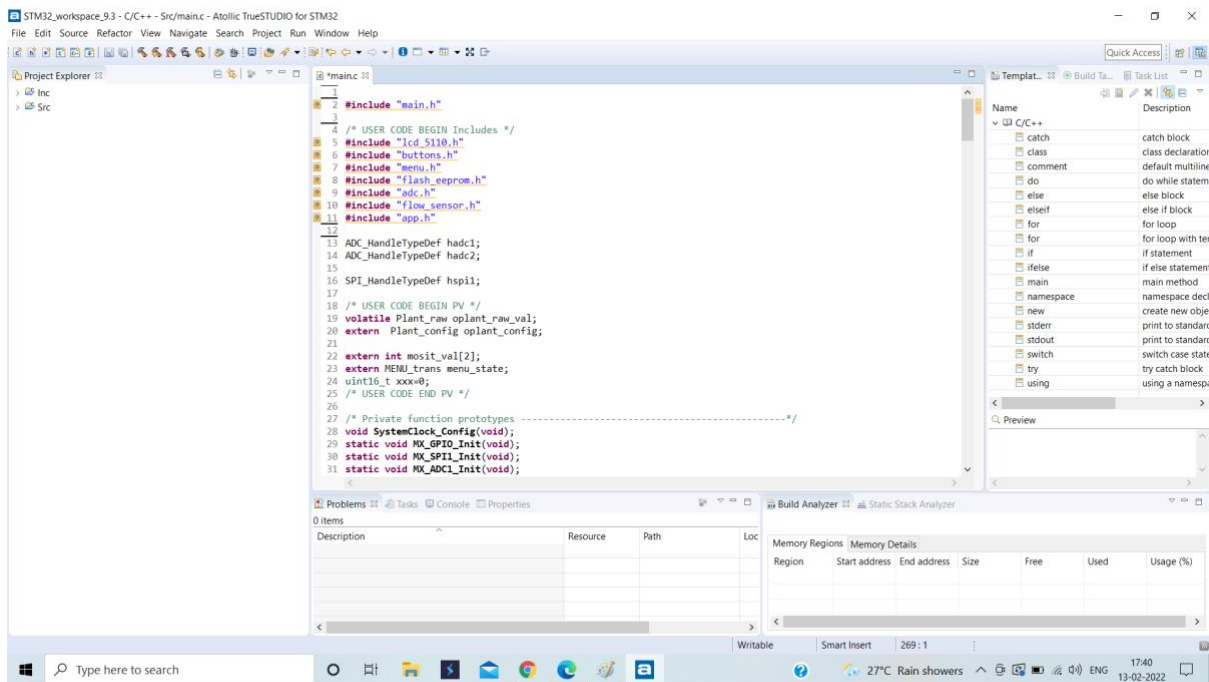


Fig 6.4. Program in the software(cont-1)

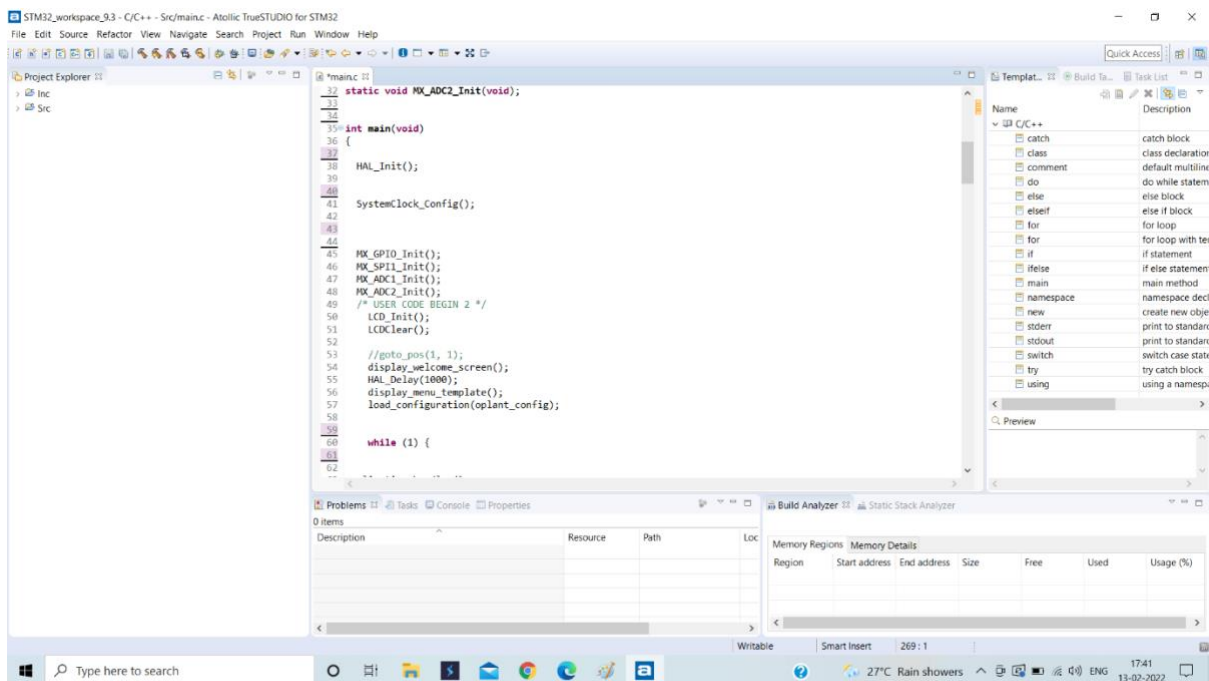


Fig 6.5. Program in the software(cont-2)

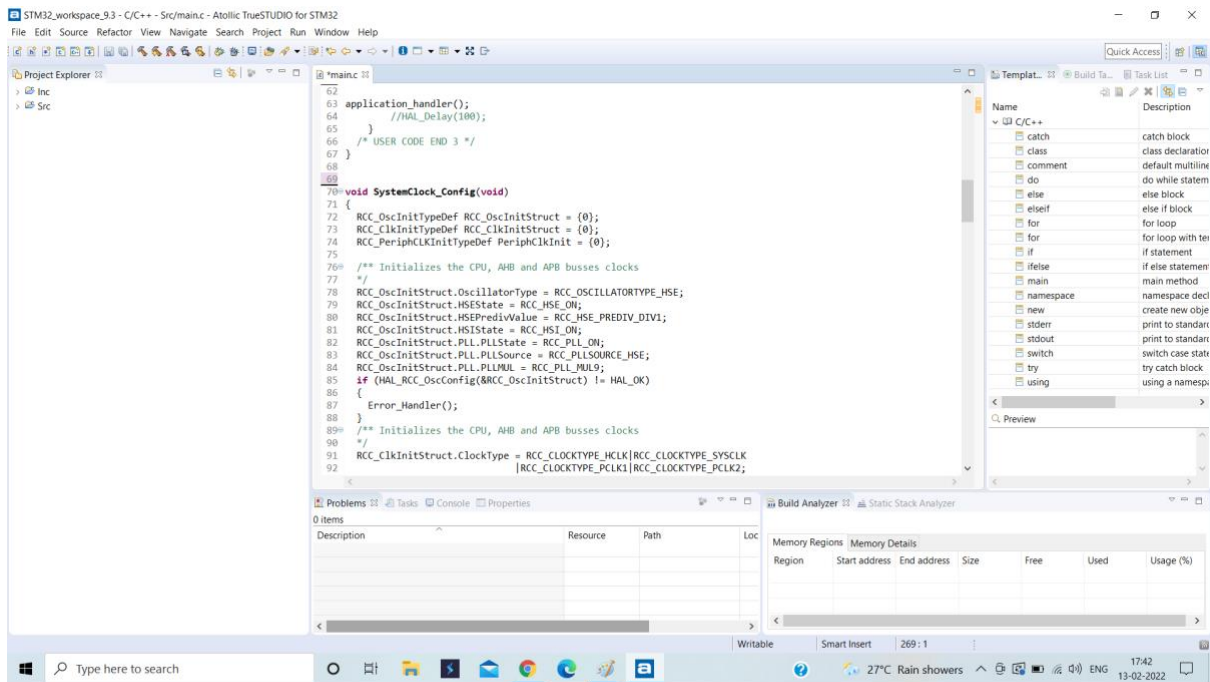


Fig 6.6. Program in the software(cont-3)

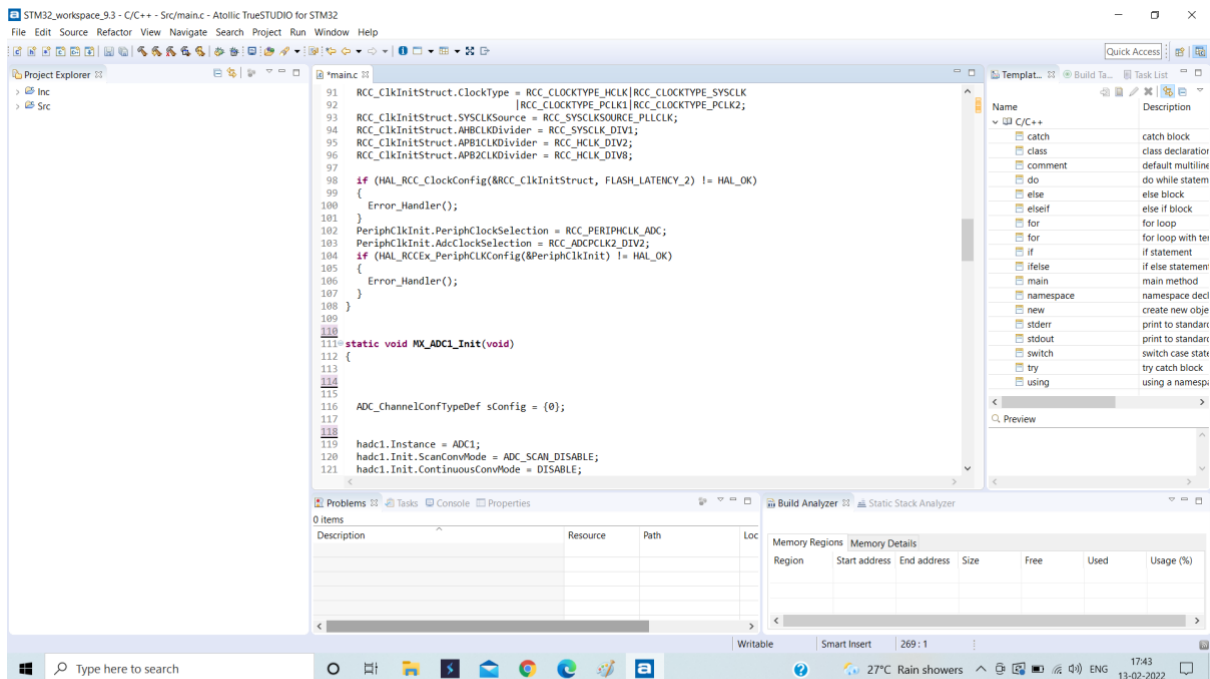


Fig 6.7. Program in the software(cont-4)

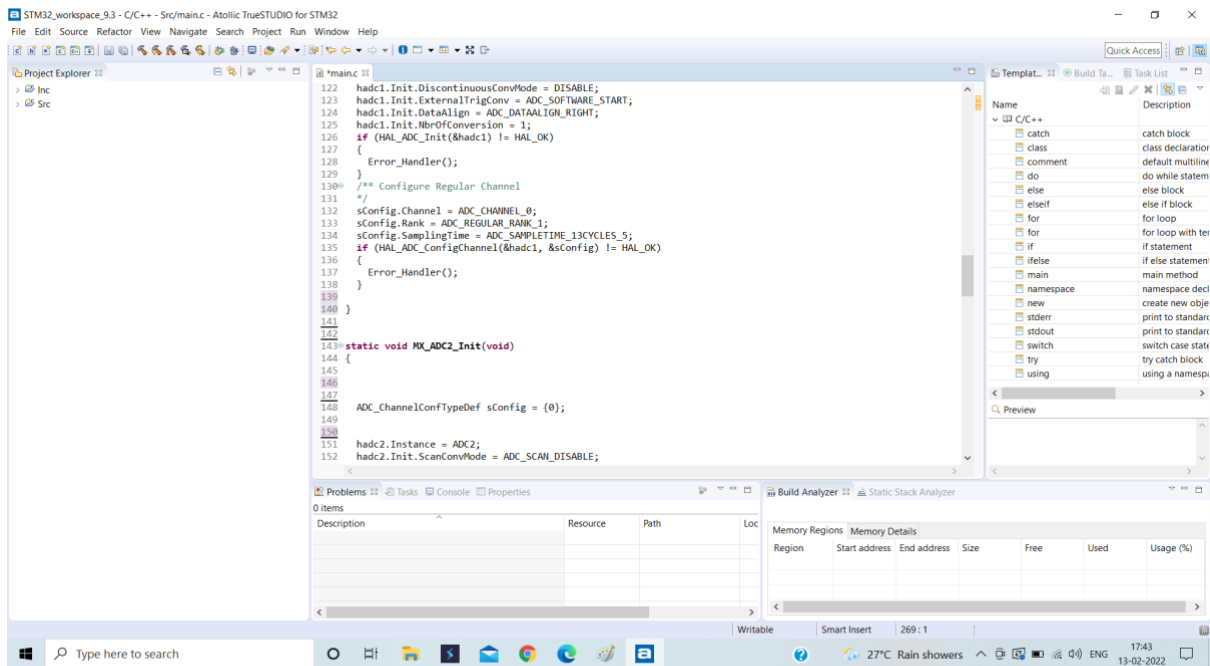


Fig 6.8. Program in the software(cont-5)

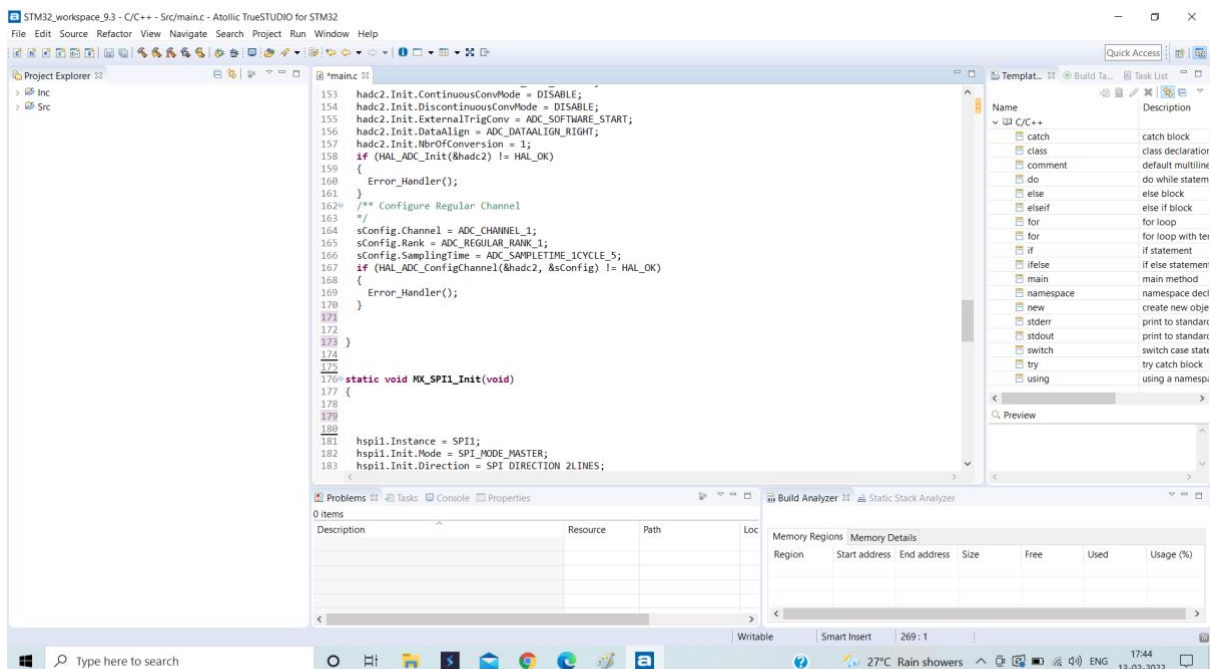


Fig 6.9. Program in the software(cont-6)

Fig 6.10. Program in the software(cont-7)

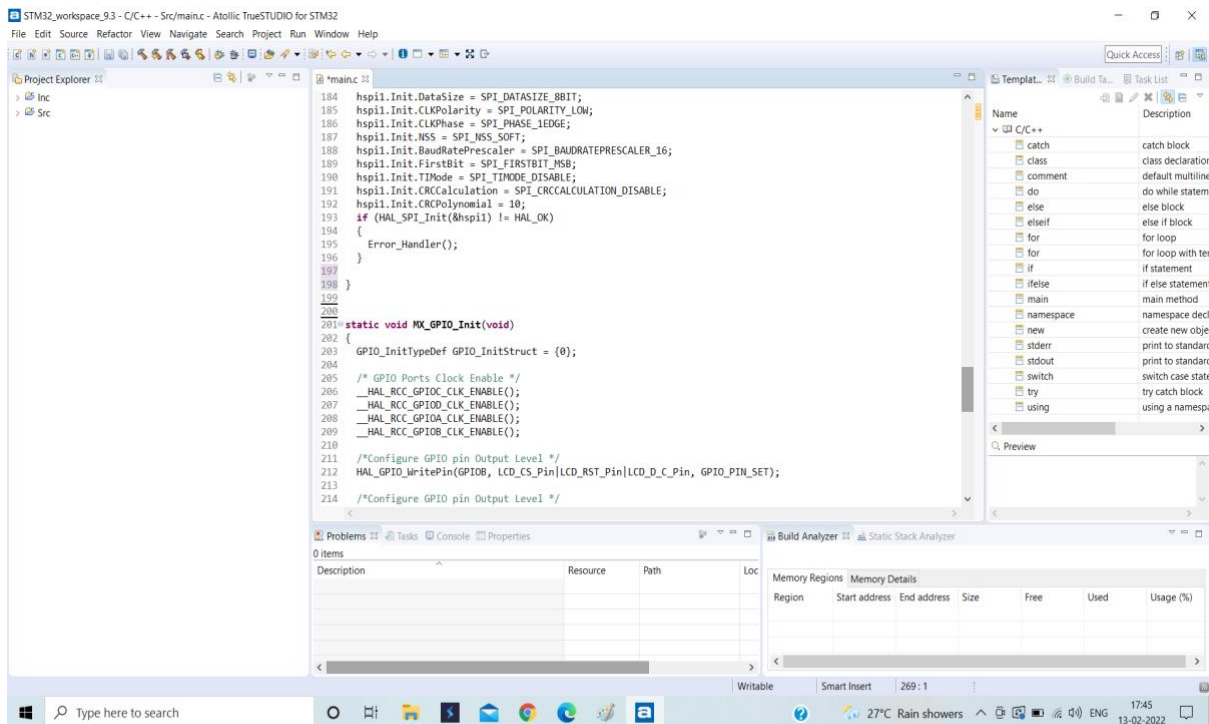


Fig 6.11. Program in the software(cont-8)

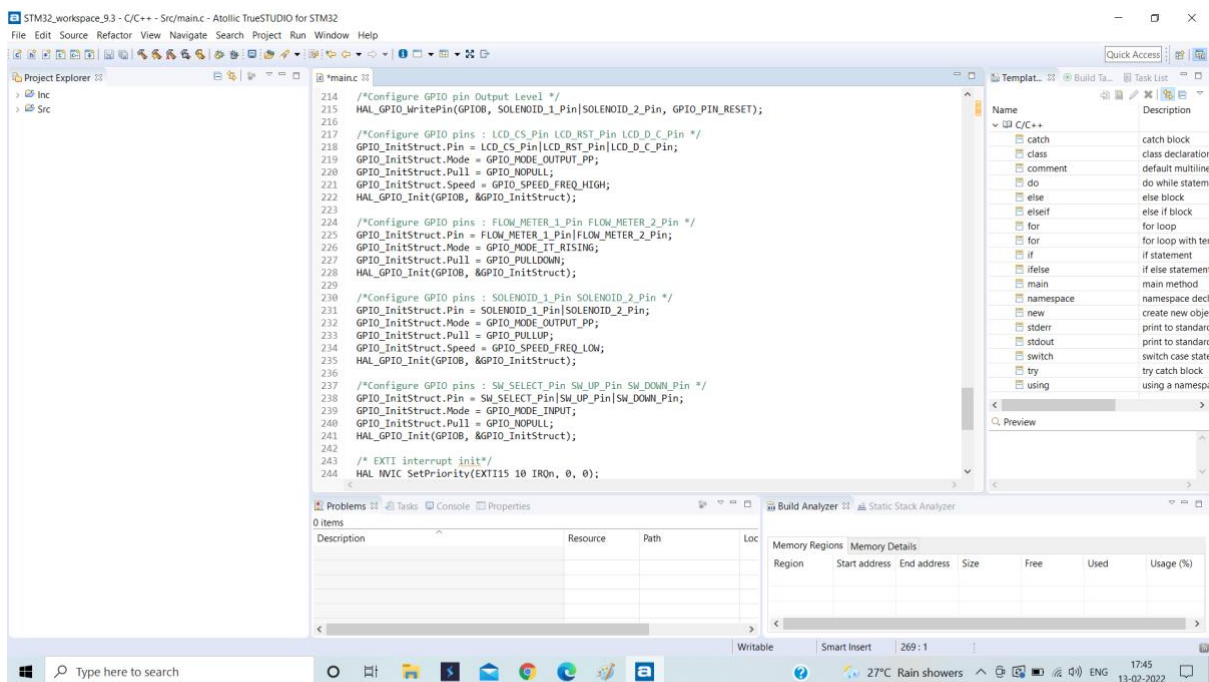
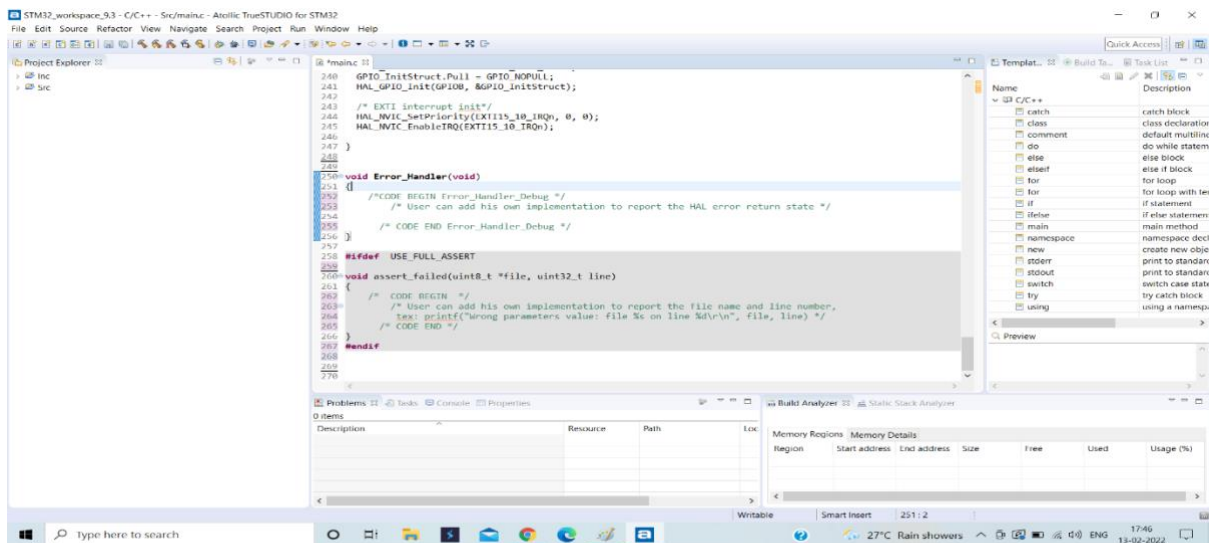


Fig 6.12. Program in the software(cont-9)



6.3. RESULTS:

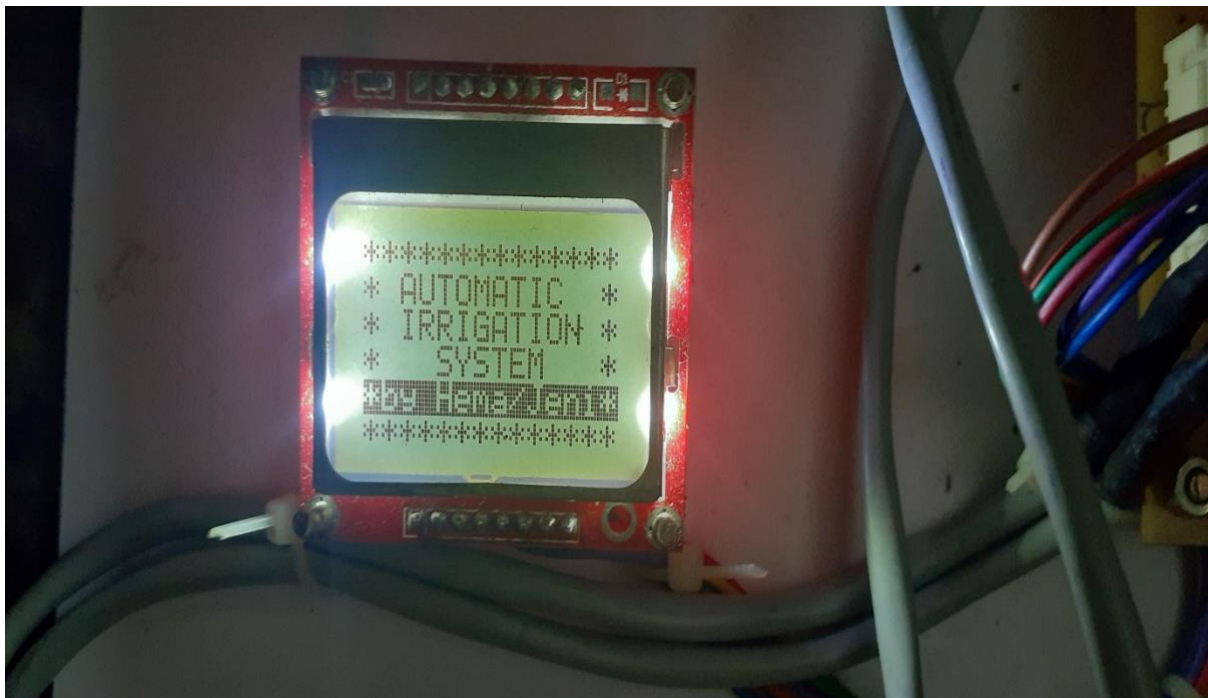


Fig 6.13. Initially the LCD displays a welcome message.

- This is the LCD display, which is used to display a welcome message once the power supply is on.



Fig 6.14. LCD displays a plant information.

- This is the LCD display in which it is used to display the plant information like solenoid valve status, moisture content of the plant and the amount of water supplied through the plant through the flow sensor.



Fig 6.15. Implemented in the Terrace.

- This is a hardware setup for the project auto agriculture drip irrigation system by using various sensors, ST microcontroller, plant and tank in which we have implemented in the terrace gardening.



Fig 6.16 Output Snapchat result 1.

- The drip irrigation takes place for both the plant because the moisture content value is lesser than the threshold value. If the moisture content value is greater than or equal to the threshold value the drip irrigation does not takes place.



Fig 6.17 Output Snapchat result 2 .

- The drip irrigation stops for plant 1 because it reaches the maximum threshold value. The drip irrigation takes place for plant 2 until it reaches the maximum threshold value.

CHAPTER-7

ADVANTAGES, LIMITATIONS AND APPLICATIONS

7.1. ADVANTAGES:

The advantages of auto agriculture drip irrigation are:

- Fertilizer and nutrient loss is minimized due to a localized application and reduced leaching.
- Water application efficiency is high .
- Time consuming for farmers.
- Fields with irregular shapes are easily accommodated.
- Recycled non-potable water can be safely used.
- Moisture within the root zone can be maintained at field capacity.
- Soil type plays a less important role in the frequency of irrigation.
- Soil erosion is lessened.
- Water distribution is highly uniform, controlled by the output of each nozzle.
- Labour cost is less than other irrigation methods.
- Variation in supply can be regulated by regulating the valves and drippers.
- Fertigation can easily be included with minimal waste of fertilizers.

7.2. LIMITATIONS:

- Initial cost can be more than overhead systems.
- The sun can affect the tubes used for drip irrigation, shortening their lifespan.

- The risks of degrading plastic affecting the soil content and food crops.
https://en.m.wikipedia.org/wiki/Drip_irrigation_-_cite_note-17
- If the water is not properly filtered and the equipment not properly maintained, it can result in clogging.
- Drip irrigation might be unsatisfactory if herbicides or top dressed fertilizers need sprinkler irrigation for activation.
- Drip tape causes extra cleanup costs after harvest. Users need to plan for drip tape winding, disposal, recycling or reuse.
- Waste of water, time and harvest, if not installed properly
- Requires careful consideration of the installation depth.
- The PVC pipes often suffer from rodent damage, requiring replacement of the entire tube and increasing expenses.
- Drip irrigation systems cannot be used for damage control by night frosts

7.3. APPLICATIONS:

1. Farms – row crops (i.e. vegetables, soft fruit)
2. Commercial greenhouses.
3. Residential gardens.
4. Agricultural fields where varieties of plants cropped
5. Organical farming.
6. Terrace gardening
7. Nurseries
8. Landscape fields.

CHAPTER-8

CONCLUSION AND FUTURESCOPE

Since prior days agriculturist should visit their horticultural land and check the dampness substance of soil physically. It is a truly a viable and financial approach to decrease the human exertion and water wastage in farming area. Irrigation becomes easy, accurate and practical with the idea above shared and can be implemented in agricultural fields in future to promote agriculture to next level. The automatic agriculture drip irrigation system using microcontroller has been experimentally proven to work satisfactorily. The drip irrigation is one of the most important methods to do the farming in which is it used to reduce the water scarcity. The drip irrigation not only increase the productivity of the farmer but it also improve the livelihood of the farmers. In auto agriculture drip irrigation system the output from moisture sensor and level system plays major role in producing the output. The drip irrigation system is used to reduce the water scarcity and thus we can reduce the natural disaster like drought. This auto agriculture drip irrigation system mainly helpful for the farmers in reducing their time, money and power of the farmer. Thus the "AUTOMATIC AGRICULTURE DRIP IRRIGATION SYSTEM" has been designed and tested successfully by using various sensors and microcontroller.

FUTURE SCOPE

In future days we want to implement our project automated drip irrigation system in a larger area and design of automated drip irrigation system will allow the nutrients to the root of plant and crop by air mixed with very less water. It is more reliable with better monitoring and processing and it also help the farmer to use water wisely in future but also the water supply to crops will be automated based on the conditions which is a win-win situation for both the farmer and the environment, leading to a good crop yield in a consistent manner. In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump on/off when required. This process sometimes consumes more water and sometimes the water supply to the land is delayed due to which the crops dry out. Water deficiency deteriorates plants growth before visible wilting occurs. This problem can be perfectly rectified if we use Automated Irrigation System in which the irrigation will take place only when there will be intense requirement of water, as suggested by the moisture in the soil.

Following are the major areas where automated drip irrigation used:

- Farms – row crops (i.e. vegetables, soft fruit)
- Commercial greenhouses.
- Residential gardens.
- Agricultural fields where varieties of plants cropped
- Organical farming, etc.
- Terrace Gardening.
- Butterfly way gardening.

CHAPTER-9

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