# MILESTONE #1

## Automatic Irrigation System

### Abstract

This project document contains idea, requirements, block diagram and preliminary bill of components for the given project idea.

Abhisha Ashvinbhai Bhesaniya

8684795

# Table of Contents

# 1. PURPOSE OF THE PROJECT

This purpose of Automatic irrigation is to help farmers and individuals to maintain irrigation of their crop and lone when they are not there. Farmers have to hire one or more person to keep eye on crop's irrigation need. By using this product there is no need to hire person for that. As temperature sensor will sense the temperature of soil and when temperature will go high then desired level the DC water pump which is pump arrangement on DC motor will start.

There are two Academic Purpose of this project.

1. **To design and manufacture Printed Circuit Board (PCB)**

   PCB is integral part of the world of electronics. PCB is a board that connect different electronic components using conductive tracks. In this project we are going to do 2-layer PCB design out of three types of method of construction of PCB. Once your PCB design is complete, we can send the design for the manufacturing. Meanwhile our PCD is in manufacturing process we have to purchase the components required so that we can start working on PCB once it is in our hand. Once the Manufactured PCB is in our hand, we are going to assemble our component on PCB by shouldering. Then the final step is to test the PCB.

2. **To Develop Skill to use PCB layout software (Altium)**

   There are no of tools available in market which can help us in designing of PCB. But one of powerful software is Altium. The Altium software is widely use because of its accuracy and speed. We can also design in 3D using this software.

# 3. SCOPE OF THE PROJECT

Right now, we are only focusing irrigation only so we are only controlling DC motor but, as we are using STM32 for the project we can add more feature to this project afterwards. Like we can use humidity sensor instead of temperature sensor and we send the humidity sensor's data on internet by making IoT soil humidity sensor. Along with this we can also add NPK sensor so that we can measure amount of Nitrogen, Potassium, and phosphorus and based on the sensed data we can decide the quality of soil.

# 3. INTENDED AUDIENCE
- Instructor
- PCB Designer

# 4. DESCRIPTION OF PROJECT

This project is going use temperature sensor to sense the temperature. When the temperature is beyond our set limit, we will run DC water pump to pump the water from water tank to irrigate the crop. And once the temperature is below our set limit then DC water pump will turn off and water will stop flowing.

The Description of the components we going to use in this project is given below.

## Temperature Sensor:

I am going to use mcp9700 temperature sensor for this project. This is an analog sensor. Range of this temperature is -40 to 125 C. The temperature range of this sensor is large, so I am going to use this for my project. Moreover, STM32F303 has ADC on board so this is also one advantage as there is no need to have external setup for it.
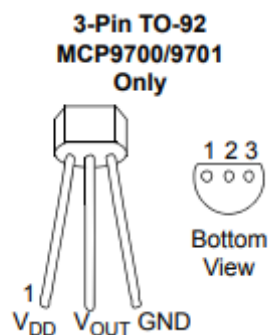


Figure 4.1 mcp9700 Temperature Sensor

## Speaker:

I will use this speaker when temperature is beyond our set limit. This will ring for 3 time and after that it will stop. This speaker has impedance of 8 ohm. frequency response is 300 Hz to 15,000 Hz.



Figure 4.2 Speaker

## LCD Display:

I will use 16X2 LCD display to display message for the user. I will display temperature on this display. This display works on 5V DC.



Figure 4.3 16X2 LCD Display

## PWM constant current micro stepping driver:

IC L293D is H- Bridge DC motor Driver IC. This is 16 pin IC with wide supply range 4.5 to 36 V. it will perfectly work in temperature range starting with 0 to 70 degree Celsius. I am going to use this IC to control DC Motor.



Figure 4.4 IC L293D

## DC Motor:

This DC motor with few arrangements will work as a water pump for this project. DC water pump will pump the water from tank. This will work on 6-12 V DC. Maximum speed of this motor is 175 RPM at 12 V and minimum speed is 90 RPM at 6 V.

Figure 4.5 DC Motor

## STM32F303:

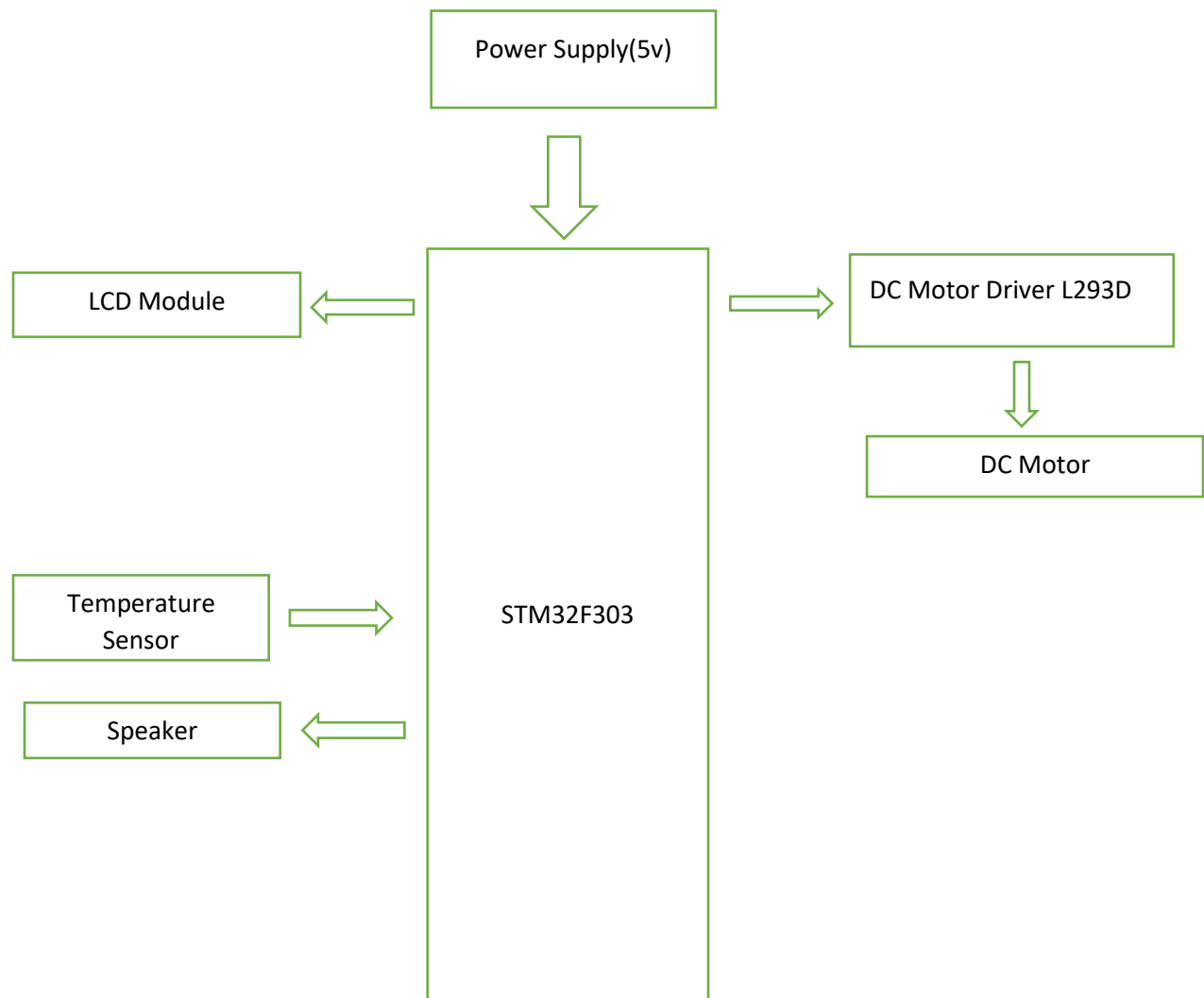STM32F303 is going to be brain of my project. This board is having large no of GPIOs so that I can connect more sensors in future. Moreover, this board has in built ADC module so that there is no need of external hardware for to covert temperature sensor's data as mcp9700 is analog sensor. Furthermore, this board is also compatible with DC motor Driver which is hart of this project.

Figure 4.6 STM32303 board

# 5. BLOCK DIAGRAM

```
                        ┌─────────────────────┐
                        │   Power Supply(5v)  │
                        └─────────────────────┘
                                  │
                                  ▼
┌──────────────┐          ┌──────────────┐          ┌──────────────────────┐
│  LCD Module  │◄─────────│              │─────────►│ DC Motor Driver L293D │
└──────────────┘          │              │          └──────────────────────┘
                          │              │                    │
                          │              │                    ▼
                          │              │          ┌──────────────────────┐
                          │   STM32F303  │          │       DC Motor        │
┌──────────────┐          │              │          └──────────────────────┘
│ Temperature  │─────────►│              │
│   Sensor     │          │              │
└──────────────┘          │              │
┌──────────────┐          │              │
│   Speaker    │◄─────────│              │
└──────────────┘          └──────────────┘
```

# 6. ESTIMATED COST BREAKDOWN

| Sr. No | Components | Cost of single unit | Number of units | Final cost |
|---|---|---|---|---|
| 1 | PCB Board | 1 | 50 | 50 |
| 2 | 16X2 LCD | 1 | 16.98 | 16.98 |
| 3 | Temperature Sensor | 1 | 0.40 | 0.40 |
| 4 | DC Motor | 1 | 19.31 | 19.31 |
| 5 | DC Motor Driver L293D | 1 | 2.04 | 2.04 |
| 6 | Speaker | 1 | 3.91 | 3.91 |
| 7 | STM32F303 Board | 1 | 16.39 | 16.39 |
| 8 | Resistor | 5 | 0.16 | 0.8 |
| 9 | Capacitor | 4 | 0.98 | 3.92 |
| 10 | Diode | 4 | 0.39 | 1.56 |
| | Total Cost | | | 115.31 |

# 7. TEAM MEMBER

**Abhisha Bhesaniya**

# 8. BACKGROUND INFORMATION

After doing background research I came to know that many people are working on the same idea, but their controller or processor is different from me. They are using either Raspberry Pi, Arduino, and instead of arm they are using water pump. many others while I am going to use STM32 for the same automatic irrigation arm. Moreover, my product is better because I am using high quality parts so that life span of the product will increase.

# 9. REFERENCES

- https://circuitdigest.com/microcontroller-projects/iot-based-smart-irrigation-system-using-esp8266-and-soil-moisture-senso
- https://www.microchip.com/wwwproducts/en/en022289
- https://media.digikey.com/pdf/Data%20Sheets/Sparkfun%20PDFs/ROB-12205_Web.pdf
- https://www.youtube.com/watch?v=OdTW0bT7sjg