BHARATI VIDHYAPEETH INSTITUTE OF TECHNOLOGY

KHARGHAR, NAVI MUMBAI.

A PROJECT REPORT

ON

‘‘TALKING PLANT BASED ON ESP 32’’

SUBMITTTED TO

MAHARASHTRA STATE BOARD OF TECHINCAL EDUCATION, MUMBAI.

SUBMITTED BY

MANASVI MENGADE (272308)

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AKASH GITE (9705)

DEEP YENDARKAR (9704)

UNDER THE GIUDANCE OF

Mrs. Wrushali Deshmukh

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

2022- 2023

APPENDIX-A

CERTIFICATE

This is to certify that **MANASVI MENGADE (272308), SAHIL CHAVAN (9706), AKASH GITE (9705), DEEP YENDARKAR (9704)** from **Bharati Vidyapeeth Institute of Technology, Navi Mumbai** having **Enrollment No.** 2000270190, 2100270340, 2100270341, 2000270182 have completed project of final year **TALKING PLANT BASED ON ESP 32** during the academic year **2022-2023**. The project is completed in a group consisting of four candidates under the guidance of the faculty guide.

Name & Signature of Guide: ……

……..

Name & Signature of HOD: ……

……...

CERTIFICATE

This is to certify that the following students of third year diploma Electronics and Telecommunication have satisfactorily carried out their project work entitled –

"**TALKING PLANT BASED ON ESP 32**"

As partial fulfilment of their diploma engineering during the academic year of 2022 -2023.

Name of students	Roll No.
1. MANASVI MENGADE	(272308)
2. SAHIL CHAVAN	(9706)
3. AKASH GITE	(9705)
4. DEEP YENDARKAR	(9704)

Mrs. Wrushali Deshmukh
(GUIDE)

HOD

INTERNAL EXAMINER

EXTERNAL EXAMINER

PROF. P.N. TANDON

ACKNOWLEDGEMENT

It gives us a tremendous pleasure to present our project which is named as –

“TALKING PLANT BASED ON ESP 32”.

We would like to express our sincere gratitude towards our guide Prof. for their help, guidance and encouragement, they provided during the project development. This work would have not been possible without their valuable time, patience and motivation.

We thank them for making our stint thoroughly pleasant and enriching. It was great learning and an honour being their student. We are deeply thankful to **Mrs. MADHUMITA UKIL (H.O.D Electronics and Telecommunications Department)** and entire team in the Electronics and Telecommunications Department.

They supported us with scientific guidance, advice and encouragement, they were always helpful and enthusiastic and this inspired us in our work. We take the privilege to express our sincere thanks **PROF. P.N. TANDON** to our **Principal** for providing the encouragement and much support throughout our work.

ABSTRACT

The Automation System for Indoor and Outdoor Plant watering using IoT project aims to create a unique platform that enables humans to communicate with plants in a more meaningful way. This innovative project uses the ESP32 microcontroller to interpret and translate the plant's behaviour into audible language that people can understand. By doing so, individuals can gain a better understanding of the plant's mental and physical state and provide appropriate care accordingly. Additionally, this project aims to promote the significance of plants in our environment and the ways in which we can protect them.

To achieve this goal, the system will be equipped with multiple sensors that will monitor various environmental factors affecting the plant's growth, such as temperature, humidity, moisture, and light intensity. The sensors will detect the plant's behaviour and relay the data to the ESP32 microcontroller for processing. The system's machine learning algorithms will then interpret the data and analyse the plant's emotional and physical state. The output will be in the form of audible language that people can understand, making it easier for them to identify the plant's needs.

The Automation System for Indoor and Outdoor Plant watering using IoT project is significant because it has the potential to transform the way people interact with nature and promote sustainable living. This technology can help individuals gain a better understanding of their plants and provide them with the necessary care to thrive. The project's scope includes designing and developing the hardware and software components of the system, testing and validating the system's accuracy and reliability in interpreting plant behaviour.

The Automation System for Indoor and Outdoor Plant watering using IoT project has the potential to benefit a wide range of industries, including agriculture, horticulture, and environmental conservation. Furthermore, this technology can be integrated into smart home systems to create a more natural and sustainable living environment.

KEYWORDS: Smart plant, IoT, Sensors, ESP32, DHT11.

CONTENT

CHAPTER: 1

1.1 INTRODUCTION

INTRODUCTION

This IoT project describes how to build a project that monitors the plant health status by keeping contact with the owner. As a result, the project wants to check some environment parameters like temperature, humidity and light intensity that have effects on the plant. In addition, the project wants to retrieve the soil moisture and at the end of it, tells the owner what it feels by producing a sound produced by a voice enabled device attached to a computer. In addition, a mobile application is possible for the plant to be able to produce test messages, tweets or Facebook posts that tell its owner how thirsty it is by just sending a tweet and of course sending the owner a thank you reply after watering it or removing it from the heat of the sun. More on building an IoT project that monitors plant health status Future plans will be an attached webcam for further monitoring Especially relevant in an IoT project is the IoT cloud platforms that store data arrived from dev boards like Arduino, Raspberry and so on. Using this data, IoT cloud platforms construct charts and they have a built-in system to make some business rules on this information. In the first part of this IoT project, we will search how to use sensors to collect environment information using Arduino and how to send this information to the cloud. In addition, in the second part of IoT project, we will search how to enable triggers on the sensor values stored. Moreover, we will send alert to user smartphone when some parameter value is out of the range. This project is useful in several frameworks whenever we have to monitor the soil

and plant status. We can expand this project adding new features so that we can easily combine it with other systems. For example, we can implement a notification system using Firebase so that we can send an alert when some parameters are out of the specified range. Additionally, we could add an Arduino API interface so that we can read the plant status parameters using external systems. Finally, at the end of this IoT project tutorial, you gained, hopefully, the knowledge about reading data sensors and sending the values to the server. This project describes how to build a smart plant monitoring system that controls the plant health status. This IoT monitoring system checks some environment parameters such as:

1. Temperature
2. Light Intensity
3. Soil Moisture

All these parameters have effects on plant health. This Smart plant monitoring system based on IoT can be accessed remotely using a browser so that it is attainable to verify the plant health remotely.

CHAPTER: 2

(To finalise and define the Problem Statement)

1.1 PROBLEM STATEMENT

1. In many of the cases in agriculture we are unable to provide plant with basic need like water, a good soil moisture level as well as a good temperature condition and this results a plant to be unable to survive.
2. Many times, we forget to water plant and indeed many people are in search solution for it.
   - **What could be done?**
     1. The implementation of automation technology techniques and process improve the efficiency, reliability and speed of task which are been previously performed by humans.
     2. The integration of sensors to enable remote monitoring, status, manipulation and evolution of strains of such devices.
   - **Motive**

     Motive of this project is to water the plant when needed maintaining the soil moisture and alert the users for the various parameters the sensors will read.
   - **What does talking plant exactly means**
     1. As we described that it will have sensors such as soil moisture humidity and temperature, gas sensor to detect the various environmental parameters. So, when the sensors detect the parameter, these parameters are

accessed by the microcontroller and the mc will process the data which is obtained by the sensors and with the available data it will predict the conditions whether the plan is in good condition or not.

2. When the final op is been processed there are two ways in which op is been accessed that is audio and visual
3. In audio section we are using a speaker compatible with microcontroller.
4. In visual section we are using graphical/alpha numeric display.
5. So, a user can access the data from this both o/p.

2.2 Objectives

- The main objective of this project is giving a user feedback in form of audio.
- To monitor the health status of the plant.
- To provide an accurate data of environment to the user.
- To make the irrigation system easier.

2.3 Specifications of the system

- The system uses 32-bit microcontroller (ESP32)
- The working voltage is 5V to 9V.
- It measures 4 environment parameters gas, temperature, humidity and soil moisture.
- It has audio amplifier(5W) and speaker of 8 ohms It has OLED display (128x32**).**

CHAPTER: 3

LITERATURE SURVEY

LITERATURE SURVEY

In this chapter we will discuss about literature survey of our project. Literature survey provides information about previous work regarding this subject and helps to develop new project by overcoming the limitations.

In the modern world Scarcity of food and water mainly occurs due to the increase in population in order to avoid this there is a need to promote the agriculture sector. There are a lot of wastage water and other resources in the crop field. In order to avoid this problem, we are using an automated plant monitoring system using Arduino. This system senses the moisture content of the soil and provides adequate water according to the need. This system also includes the monitoring of crop growth and to detect the water level in the tank. So, when the soil is dry the pump will automatically water the fields and when the soil is wet the pump automatically stops, there by eradicate the need of manpower and conserve the time. Irrigation is that the artificial manner of watering crops in fields. In the present era, water inadequacy because of over exploitation have resulted the urge of developing a brand-new technology that would save water from being wasted and since, agriculture is that the most water intense occupation, thus creating irrigation system sensible would be a better manner of checking water loss. Sensible irrigation system is economical and efficient way of watering fields. It monitors weather, soil conditions, evaporation and plant water use and mechanically adjusts watering schedule. Hence approaching sensible irrigation system has become a primary concern to relinquish farmer a wise tool which would support them in yielding

quality crops. Since India is Associate in Nursing ago primarily based country and around sixty-one of the population. India occupies second rank in rice export and as rice crop need vast quantity of water for irrigation purpose, hence sensible irrigation project we tend to use differing kinds of detector to make a farmer up to this point regarding the sector. This system will be developed, if there's a massive agricultural land. we should always use variety of wet detector to the system and may embody temperature detector in order that it'll work in line with the weather conditions. The potency of this method is a smaller amount as a result of most of the elements utilized in this method square measure product of plastic. The direct sun rays from the sun towards the agricultural fields can destroy the system, since it's product of plastic. So, these circuits are place in a very specially build rooms or on special coverings to stop the direct sun rays falling thereon. thus, the lifetime of the system is raised. This water delivered by knowing what proportion water a crop must grow healthy. This IoT project describes how to build a project that monitors the plant health status by keeping contact with the owner. As a result, the project wants to check some environment parameters like temperature, humidity and soil moisture that have effects on the plant.

CHAPTER: 4

(Block diagram, Circuit diagram)

In this chapter we will be discussing about the block diagram, schematic diagram, algorithm, flowchart which help to know the design and methodology

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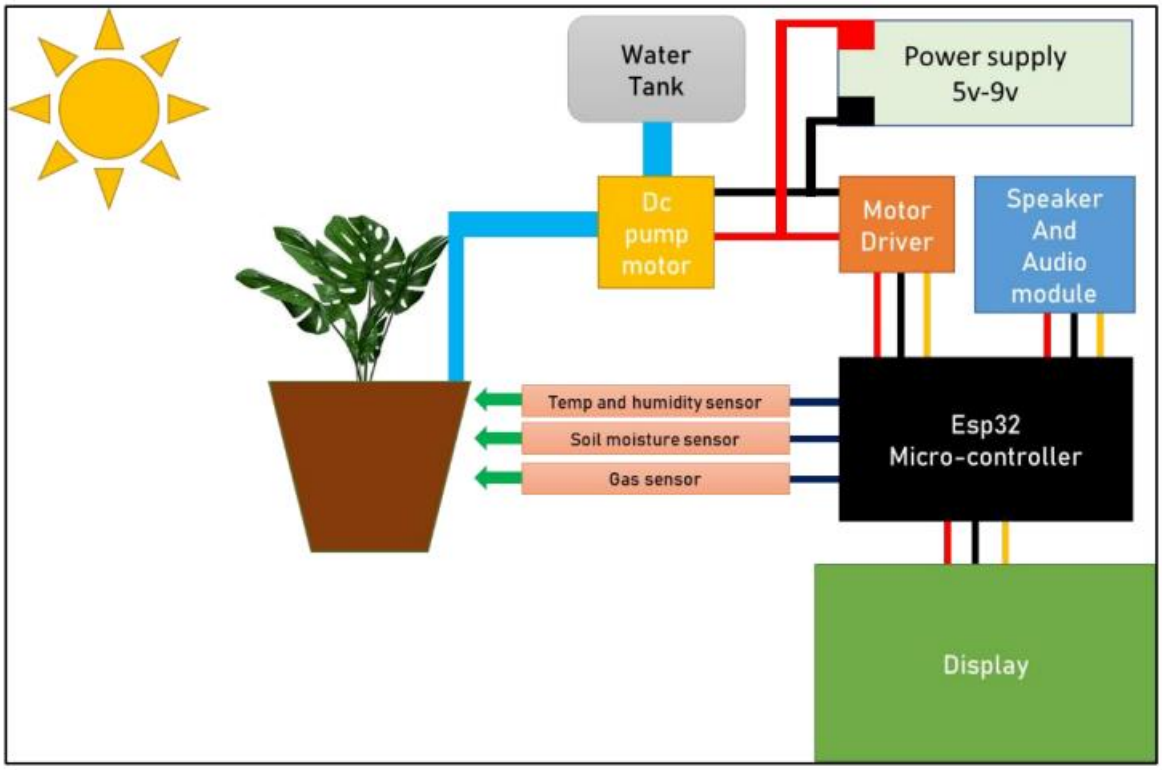
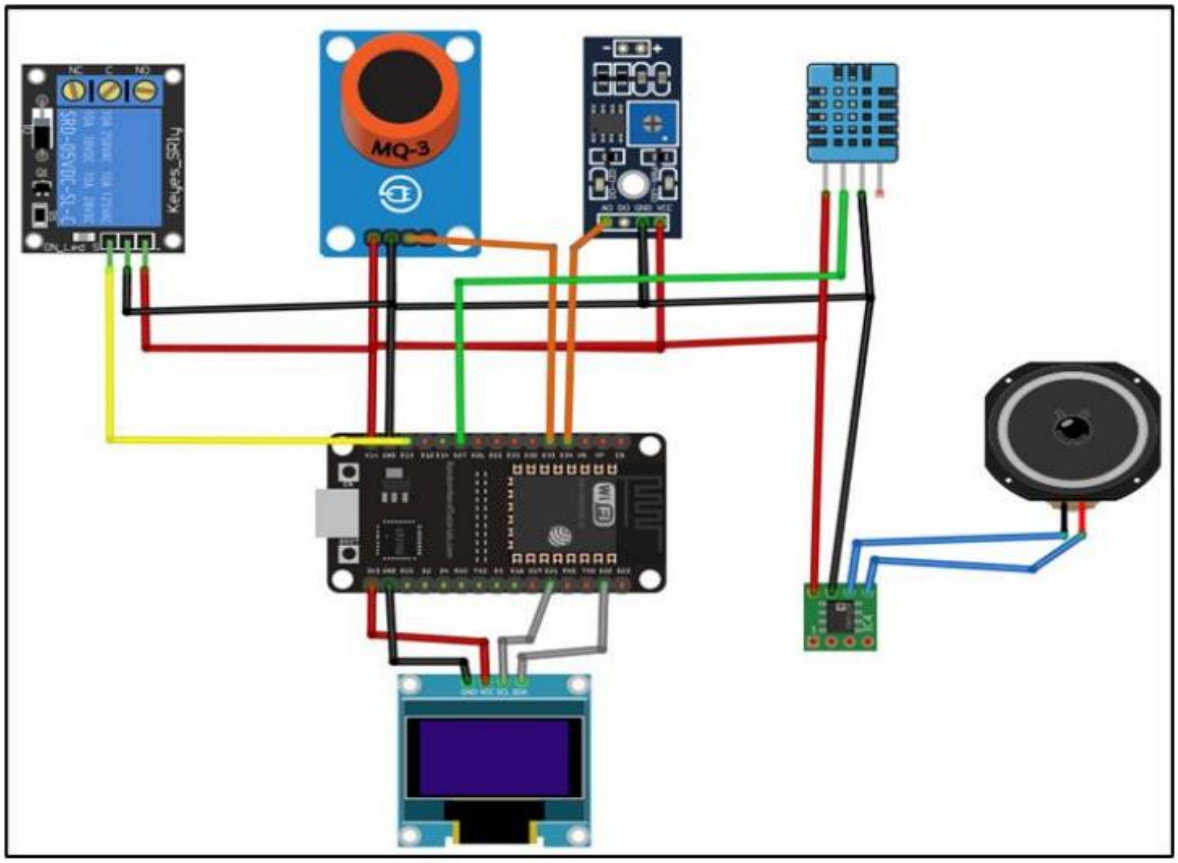
1.2 BLOCK DIAGRAM



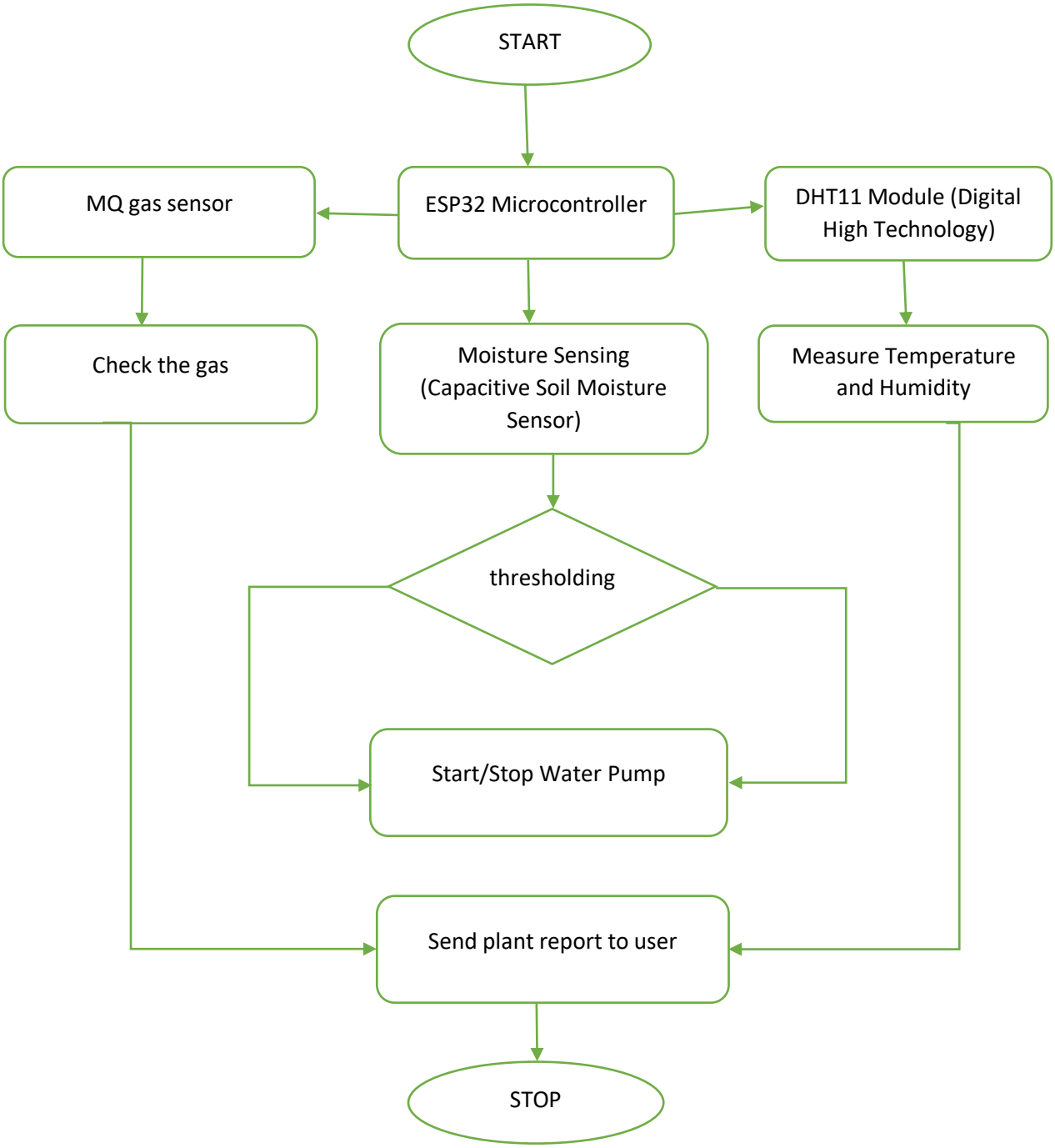
4.2 CIRCUIT DIAGRAM:

CONNECTIONS:



4.3 FLOWCHART AND ALGORITHM:

1] FLOWCHART



2] ALGORITHM

1. System will be powered on

2. Initially the pump motor will be turned off.

3. Sensors (Soil moisture, gas sensor, temp & humidity) will sense the parameters.

4. Sensor's data will be fed to ESP32 micro-controller as input data.

5. Data will be processed, based on current data prediction will be made on certain condition whether to water the plant or not.

6. Each and every data as well as decision made by the micro-controller can be displayed and simultaneously can be listened through speaker

3] Code

```
#include "DHT.h"
#define Gas_analog  34    // used for ESP32
#define DHTPIN 27
# define sensorPin 35
int trigger = 300; // set the level
//
#define DHTTYPE DHT11   // DHT 21 (AM2301)
DHT dht(DHTPIN, DHTTYPE);
void setup() {
  Serial.begin(115200);
  dht.begin();
}
void loop() {
gas();
dht11();
soilmoisture();
}
void gas()
{
  Serial.print("\n");
  Serial.print("-------------------GAS SENSOR DATA-----------------
");
  Serial.print("\n");
```

```
  int gassensorAnalog = analogRead(Gas_analog);
  Serial.print("Gas Sensor: ");
  Serial.print(gassensorAnalog);
  Serial.print("\t");
  if (gassensorAnalog > 1000) {
    Serial.println("Gas");
  }
  else {
    Serial.println("No Gas");
  }
  delay(100);
  Serial.print("\n");
  Serial.print("-----------------------------------");
}
void dht11(){
  Serial.print("\n");
  Serial.print("------------------DHT11 SENSOR DATA-----------------
-");
  Serial.print("\n");
  float h = dht.readHumidity();
  float t = dht.readTemperature();
  // Check if any reads failed and exit early (to try again).
  if (isnan(h) || isnan(t)) {
    Serial.println(F("Failed to read from DHT sensor!"));
```

```
    return;
  }
  Serial.print(F("Humidity: "));
  Serial.print(h);
  Serial.print(F("%  Temperature: "));
  Serial.print(t);
  Serial.print(F("°C "));
  Serial.print("\n");
  Serial.print("-----------------------------------");
}
void soilmoisture()
{
Serial.print("\n");
Serial.print("------------------SOIL SENSOR DATA------------------
");
Serial.print("\n");
Serial.print("Moisture Sensor Value:");
Serial.print(analogRead(sensorPin)); // read the value from the sensor
if (analogRead(sensorPin) == trigger)
{
   Serial.print("  Wet");
}
else
{
```

```
    Serial.print("  Dry");
}
Serial.print("\n");
Serial.print("-----------------------------------");
delay(500);
}
```

CHAPTER: 5

(Hardware and Software)

5.1. Hardware Components

1. **Esp32**

ESP32 is a low-cost System on Chip (SoC) Microcontroller from Espresso Systems, the developers of the famous ESP8266 SoC. It is a successor to ESP8266 SoC and comes in both single-core and dual-core variations of the Tensilica's 32- bit Xtensa LX6 Microprocessor with integrated Wi-Fi and Bluetooth.

2. **MQ2 Gas sensor**

MQ2 is a Gas sensor Module that can be used to sense gases like LPG (Cooking Gas), Smoke, Alcohol, Hydrogen, Methane, and Carbon Monoxide concentrations in air. This type of sensor is suitable in making projects like Air Quality monitoring systems, fire alarms, Gas Leakage detection, Alcohol detection-based Ignition system

3. Soil sensor

Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.

4. DHt11 temperature humidity sensor

The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers.

5. 1Ch relay

A relay is an electrically operated device. It has a control system and (also called input circuit or input contactor) and controlled system (also called output circuit or output

cont. actor). It is frequently used in automatic control circuit. To put it simply, it is an automatic switch to controlling a high-current circuit with a low current signal.

6. OLED Display

128×64 display module is an oled monochrome 128×64dot matrix display module with grove 4pin i2c interface. Comparing to lcd, oled screens are way more competitive, which has a number of advantages such as high brightness, self-emission, high contrast ratio, slim / thin outline, wide viewing angle, wide temperature range, and low power.

5.2 Software Components

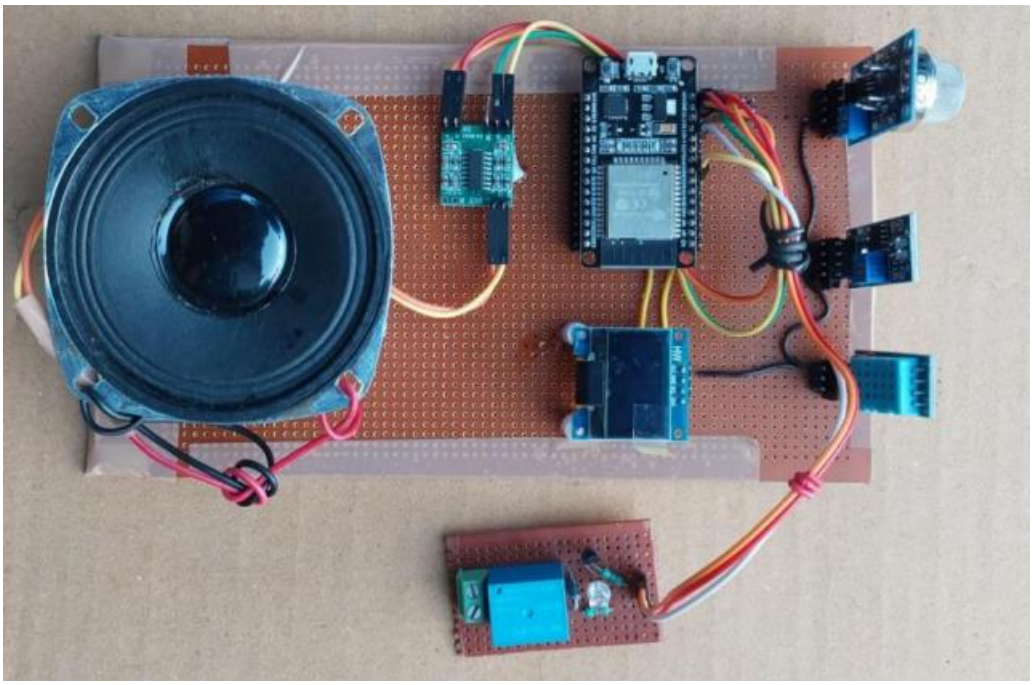
1. Arduino IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

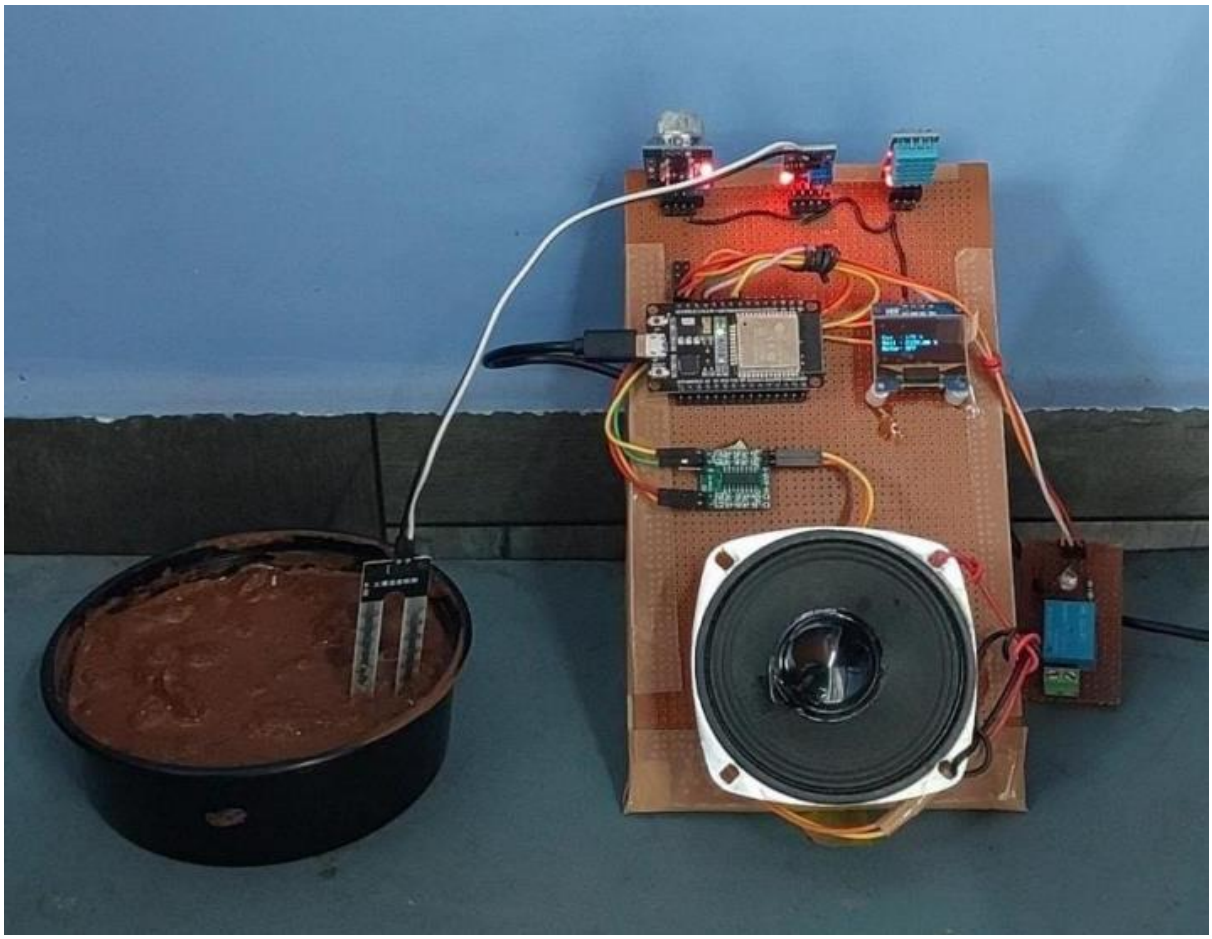
CHAPTER: 6

Results

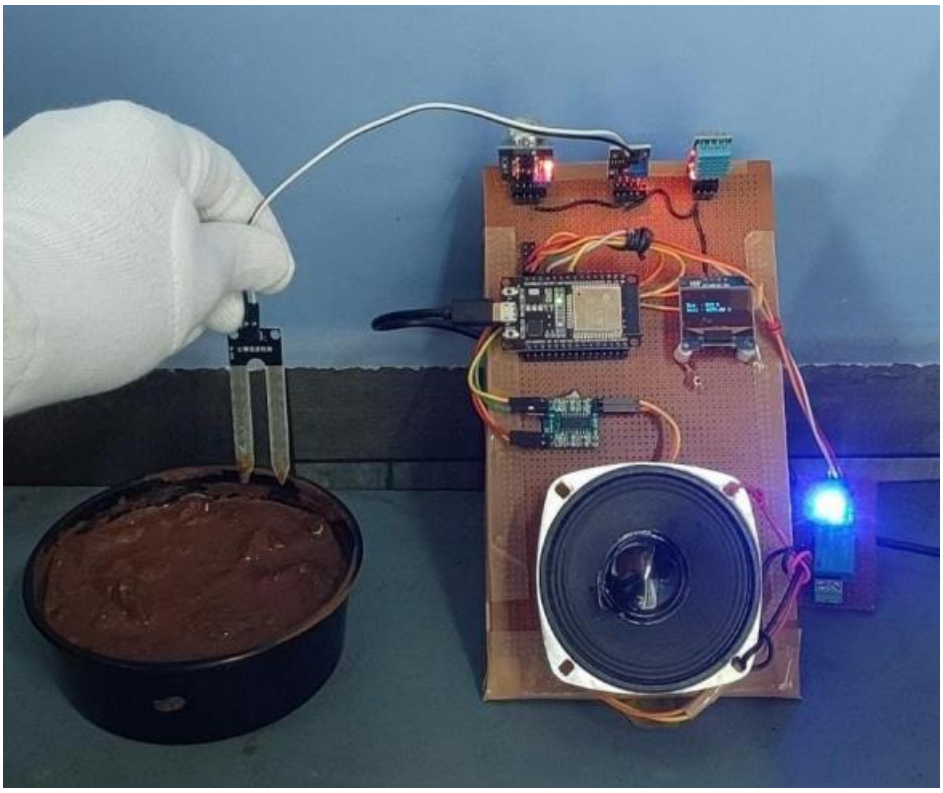
6.1 Actual Hardware



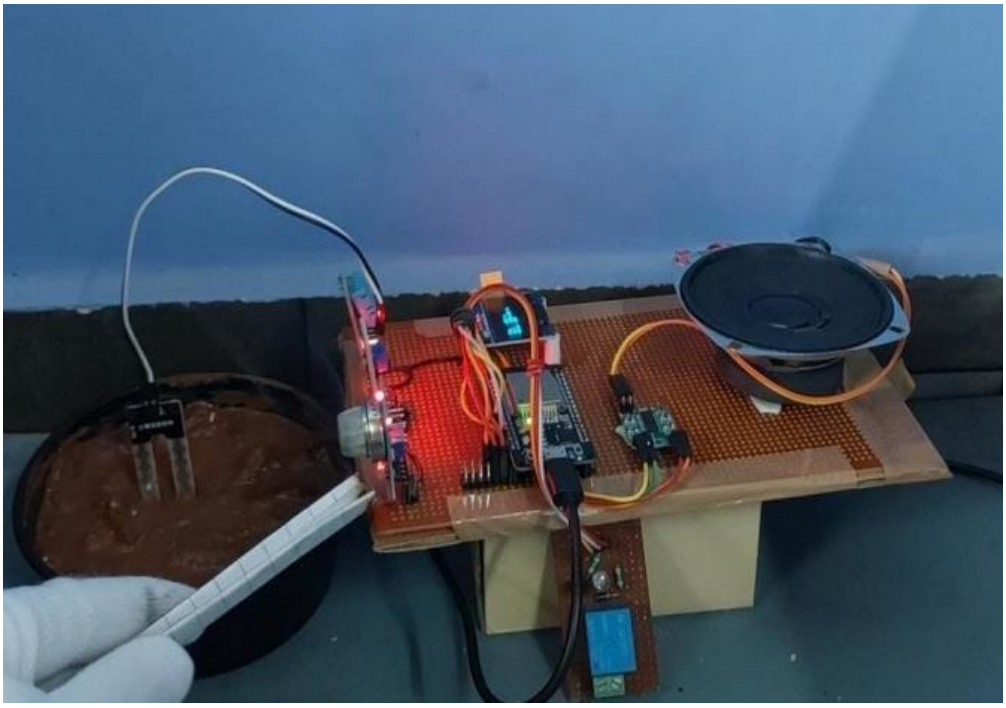
6.2 Circuit Output 1 (Soil Moisture detected)



6.3 Circuit Output 2 (Soil Moisture Not detected)



6.4 Circuit Output 3 (Gas detected)



CHAPTER: 7

Conclusion and Future Scope

7.1 Conclusion

The implementation of audio system was successful. The sensor properly detects the input and microcontroller process the output. The talking plant project gave successful outputs based on its conditions we programmed. The project concluded that, with the vast development in technology this kind of technology can take the agricultural system on large scale as well as it will make it safer.

7.2 Future Scope

- Actual Pump motor can be implemented with motor driver to pump the water in the soil.
- With the closed enclosure the circuit can be protected with dust and other substances that can disturb the sensor data.
- Sensors like barometric can be interfaced to get more details about the environment conditions.

CHAPTER: 8

References

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