A Mini Project Report on

Agro – Assistance (KISAAN DOST)

T.E. - I.T Engineering

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CERTIFICATE

This to certify that the Mini Project report on Aggro-Assistance (KISAAN DOST) has been submitted by Adarsh Singh (20104080), Kanan Sananse (20104125) and Sania Mane (21204014) who are a Bonafede students of A. P. Shah Institute of Technology, Thane, Mumbai, as a partial fulfilment of the requirement for the degree in **Information Technology**, during the academic year **2022-2023** in the satisfactory manner as per the curriculum laid down by University of Mumbai.

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ABSTRACT

In the agriculture sector, the farmers and Agro-businesses make many decisions which include factors influencing them. The main intention for agricultural planning is the accurate yield estimation for various crops.Environmental conditions like temperature, humidity and soil moisture have made it all more relevant for farmers to use the data and acquire help to create critical farming decisions. Proposed project focuses on the analysis of the agriculture data and finding optimal parameters to maximize crop production using Machine Learning. Also focus is on getting the correct information regarding the factors affecting plant growth. The main motive of the project is to assist the farmer in maximizing yield of their crops. and supporting quality production.

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Chapter 1

Introduction

1.1 Purpose:

Agriculture is considered to be one of the major sectors in the Indian economy as it contributes 20.19% in India's total GDP, and approximately more than 60% of the Indian population is engaged in agricultureand other allied activities like animal husbandry for their living.

Thus, the prime intention is to develop an integrated system which will be able to address different on-field problems in the agricultural sector such as inefficiencies in proper management and controlled growth of crops.

Proposed system can be considered as a scientific research based project which is based on a training and testing model which will on its execution be able to promote the effectiveness in high yield and good-quality crop production.

Proposed system is basically an IOT based farming automation system, which is embedded with different tech devices used for the purpose of climatic condition monitoring and other additional factors which may affect plant/crop growth on field. The system is enabled with different Actuators which is responsible for action to be taken in response to climatic conditions.

The system is also enabled with its database to store datasets and analysis of datasets will also be performed by our system to analyze and visualize the patterns which will in future be used to enhance the monitoring procedure for effective development of crops.

1.2 Problem Statement:

To design, develop and implement IOT based Agro-Assistance System using Linear Regression Algorithm.

Solution Proposed:-

Proposed system is an integrated system based on IOT which is embedded with various climatic factor detecting sensors and certain actuators responsible to execute various operations on the basis of inputs received from sensors. Proposed system will be powered by a Nodemcu ESP-32 microcontroller.

1.3 Objectives:

- To manage/control the crop growth and improvise farm yield.
- To help farmers to grow plants under controlled climatic conditions for optimum produce.
- To know about the factors affecting the plant growth i.e temperature, humidity, and the soil moisture.
- To improvise a proposed system according to geo-specific location so as to meet the suitable climatic conditions needed for efficient and productive crop growth.

1.4 Scope:

The system will perform as a farming assistance which will consider the climate, soil, water availability, and crop selection of a specific location. The farmers can make informed decisions about what crops to grow and how to optimize their farming practices to increase yield and reduce the risk of crop failure. Also the system is used to control and monitor various types of plant's growth. System is also used to generate logs on the basis of received outputs.

Chapter 2

Literature Review

Sr.no	Title	Author(s)	Year	Algorithms	Limitations	Result
1.	Agro Farming Using Machine Learning	Suwarna Gothane	2021	-Linear Regression -Decision Tree	Operation of the actuator was based on manual interference.	Pre-process the data and apply the algorithm and produce the predicted crop for us. Knowing the fertilizers required for the crop that is displayed.
2.	Smart plant monitoring system	Sreeram Sadashiva, Vishwnath Vadhari, Supradha Ramesh	2019	-Cloud Based server. -Monitoring **Hardware:** .Net Gadgeteer	System accuracy is not being improved over time	Primarily the interaction between the monitoring device and the user enabled mobile device happens as a publisher-subscriber system.
3.	IOT based plant monitoring system.	Likesh Kolhe, Prachi Kamble, Sudhanshu Bagwat	2018	Hardware components-Sensors(Moisture, DHT22, Ultrasonic) -ESP8266 Wi-Fi module -Arduino Uno -Water pump.	Patterns are not being visualized from data which is extracted.	The proposed system uses IOT which enables farmers to remotely monitor the status of the motor by approximate information from sensors, making the farmers' work much easier.

Chapter 3

Proposed System

3.1 Features and Functionalities

1. **Data Sensing/ Extraction:**
   - Data sensing refers to the process of collecting data from various sensors that are placed in different locations throughout the agricultural field. These sensors can collect data on soil moisture, temperature, humidity, and other factors that affect plant growth.
   - Hardware components**:**
   1. Sensors(Moisture, DHT11)
   2. ESP32 Wi-Fi module
   3. Water pump
   4. CPU Fan
   5. Light Bulb
   - Data extraction involves the process of collecting data from various sources, such as soil sensors. These technologies can capture accurate data of agricultural fields, which can be used to identify crop health, plant density, and other factors that affect crop growth.
2. **Monitoring and Data Analysis**:
   - Agro Assistance system may involve the use of sensors and other technologies to collect data on soil moisture, plant health, and other factors that affect crop growth. This data can be analyzed to inform decision-making and improve farming practices.
3. **Sustainable Practices:**
   - Agro Assistance IOT systems often prioritize sustainable practices that minimize environmental impact and promote long-term soil health and crop productivity.

Chapter 4

Requirement Analysis

1. Usability:-

Smart Irrigation Control System

An intelligent irrigation system is a way to deal with all of the issues in a conventional approach. This method regulates the water by sensing the soil quality and moisture and providing adequate moisture needed using motor pumps. The IoT technique here transfers the data to a network with little human communication.

Smart Crop Growth Control System

Smart crop growth control systems use technology to provide and manage light and water, monitor nutrients, and control weeds. These devices can connect to your smart home systems and your phone. With home garden automation, you can save energy and effort while producing food or decorative plants.

2. Technical Feasibility :-

Proposed system is basically an IOT based farming automation system, which is embedded with different tech devices used for the purpose of climatic condition monitoring and other additional factors which may affect plant/crop growth on field. Proposed system is enabled with different actuators which are responsible for action to be taken in response to climatic conditions.

The system is also enabled with its database to store datasets and analysis of datasets will also be performed by our system to analyze and visualize the patterns which will in future be used to enhance the monitoring procedure for effective development of crops.

3. Hardware Components Used :-

Table 4.1 Hardware Components

Hardware Required	**Description**
Microcontroller (powered by wroome module)	ESP32 chip microcontroller with integrated Wi-Fi and dual-mode Bluetooth.
Sensor	DHT11 (Temperature and Humidity) Sensor, Resistive Soil Moisture Sensor
Relay	4 Channel Relay Module
Breadboard and Jumper wire (for circuit construction)	Jumper wires- M-F, F-F, M-M
Water Pump	DC water pump
Fan, Light Bulb	DC fan, AC light bulb

Chapter 5

Project Design

5.1 Use Case Diagram:

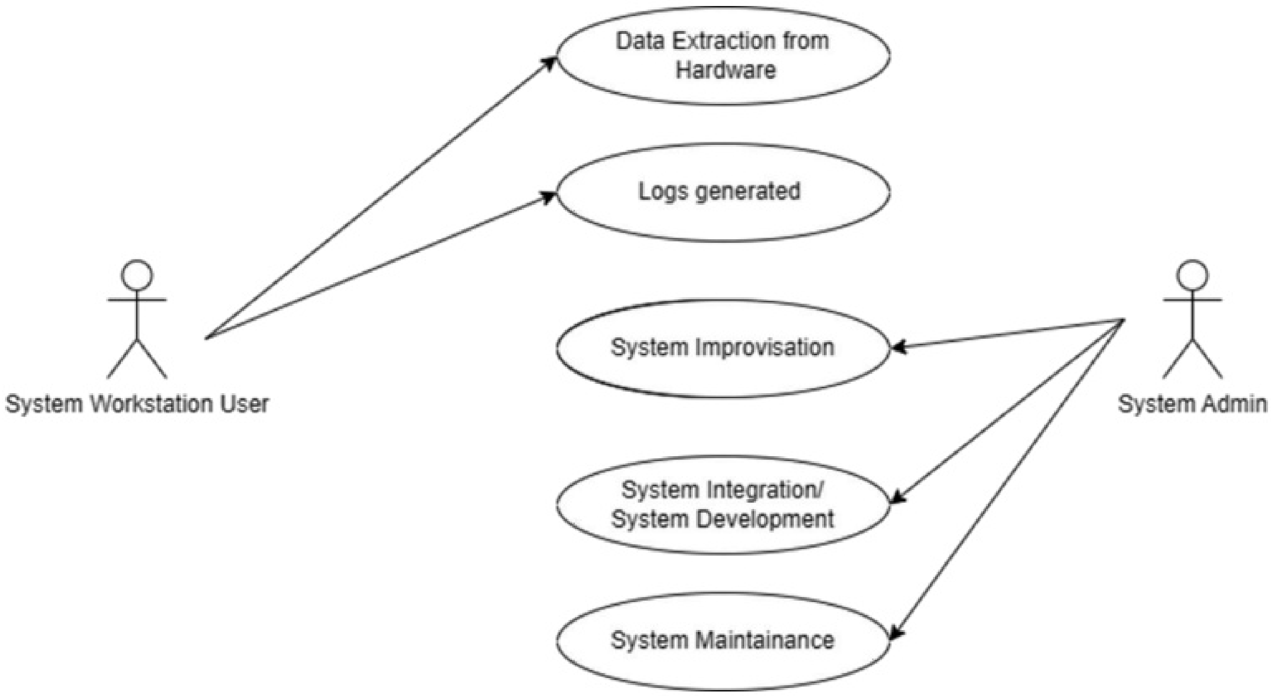

Fig. 5.1 Use case diagram

- In the use case diagram shown above, there are two actors i.e. System Workstation User and System Admin.
- Firstly, the system workstation user is able to see the logs generated from the inputs sensed from the sensors working on field.
- The logs generated are visible to the user on web application (GUI) developed.
- Secondly, the System Improvisation, Integration, Maintenance is done by the second actor that is the System Admin.

5.2 DFD (Data Flow Diagram):

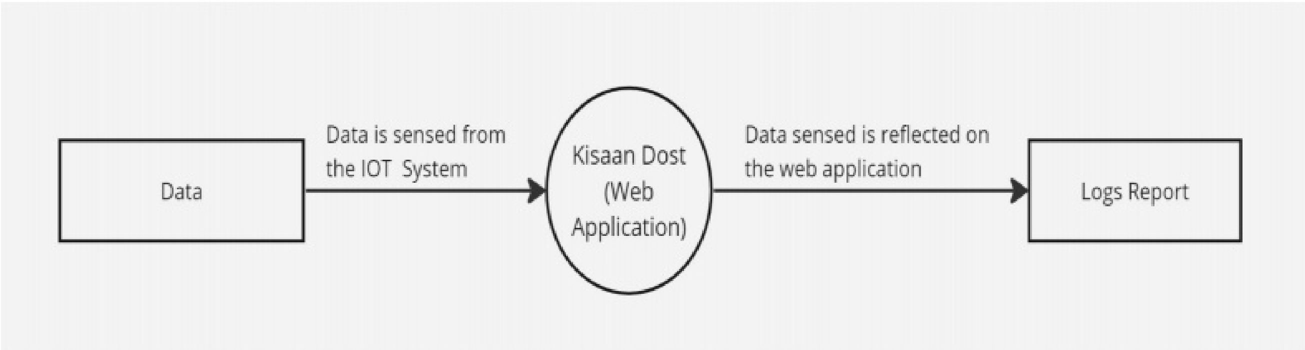

Figure 5.2.1 DFD Level 0

- A Level 0 Data Flow Diagram (DFD) shows the overall flow of information and processes involved in the system.
- At Level 0, the Plant Monitoring System is shown as a single process that receives input and produces output.
- The input to the system is data from the plant's sensors, which are used to measure various parameters such as temperature, humidity and soil moisture.
- The output from the system is reflected on the web application which is visible to the user.

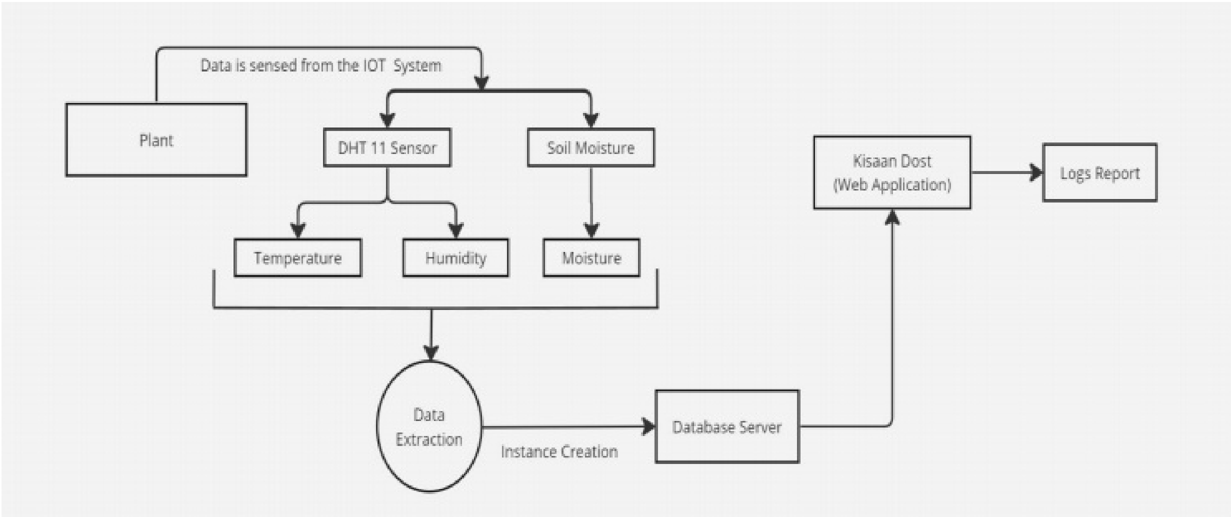

Figure 5.2.2 DFD Level 1

- At Level 1 of the Data Flow Diagram (DFD) for the Plant Monitoring System, the high-level process from Level 0 is decomposed into more detailed sub-processes, providing a more detailed view of the system.
- This Level 1 DFD shows the main process of the System and how they interact with each other.
- The data sensed or extracted from the system from the implanted sensors i.e. DHT 11 and Soil Moisture. That data is further posted on the server and stored in database.
- The data stored is on realtime basis and reflected on the web application i.e. Kisaan Dost (GUI).
- The Logs are generated and reflected on the application i.e. Kisaan Dost.

5.3 System Architecture:

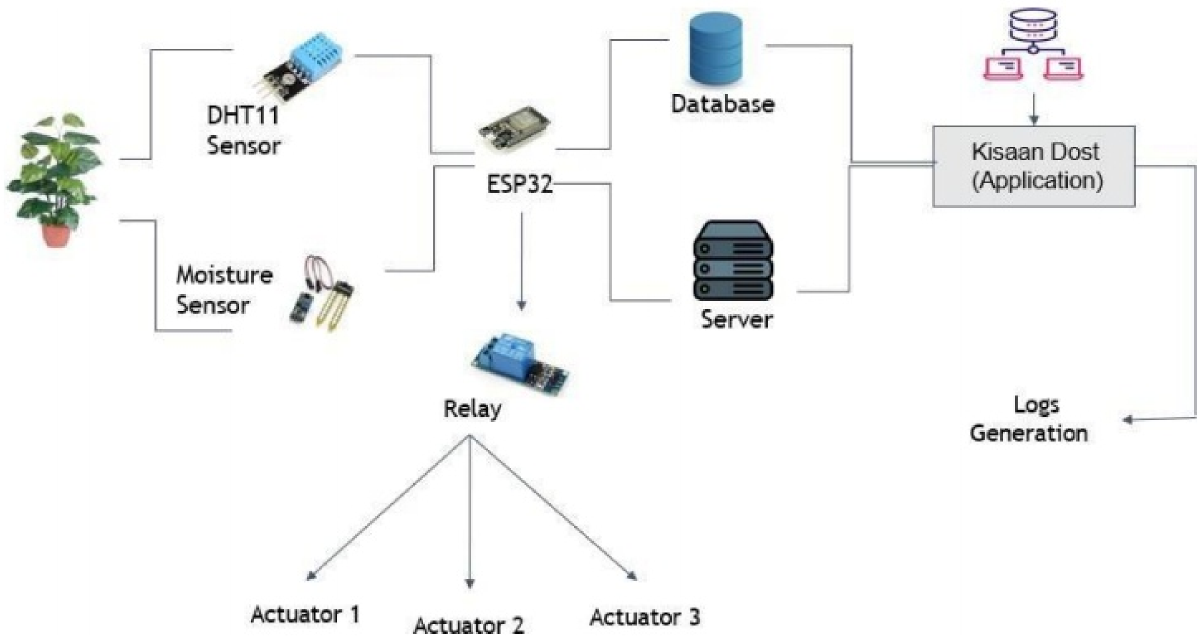

Figure 5.3: System Architecture Diagram

Figure 5.3 shows the system architecture for this system. Proposed system consists of different stages:

- Stage 1: The system includes the IOT System which includes 2 sensors, microcontroller, 4-Channel Relay, and 3 actuators. The temperature and humidity values are sensed using DHT11 sensor and and soil moisture level is sensed by moisture sensor.
- Stage 2: The sensors and 4- channel relay is connected to microcontroller, when system is powered , sensors starts collecting environmental inputs and based on those inputs and logic defined in programme present in microcontroller memory, certain actuators such as DC FAN, AC LIGHT BULB , DC WATER PUMP starts working and thus a plant specific virtual environment is maintained through coordination of sensors and actuators.
- Stage 3: Sensor modules implanted of hardware system is used as a variable (feature) to update database server on realtime basis. The updated instances of database are reflected on respective web pages in the form of logs of the Kisaan Dost web application.

Chapter 6

Technical Specification

- **FRONT-END :-** HTML , CSS , JavaScript
- **BACKEND:-** PHP(XAMPP)
- **DATABASE :-** MySQL SERVER
- **HARDWARE :-**

1. DHT 11
2. Resistive Soil Moisture Sensor
3. 4-Channel Relay
4. ESP-32 Microcontroller (powered by wroome module)
5. Breadboard and Jumper Wire (for circuit construction)
6. DC Water Pump
7. DC Fan , AC Light Bulb

- **SERVER :-** XAMPP Server

Chapter 7

Project Scheduling

Table 7.1 Project Scheduling

Sr.No.	Group Members	Time Duration	Work Done
1.	Adarsh Singh Kanan Sananse Sania Mane	1^{st} week of January	Implementing 1^{st} module/ functionality: Hardware System circuit design, Sketch board code setup.
		2^{nd} week of January	Testing 1^{st} module: Hardware System functionality testing.
2.	Adarsh Singh Kanan Sananse Sania Mane	3^{rd} week of January	Implementing 2^{nd} module/functionality: Static Web design, Hardware IOT system coordination with Microcontroller, XAMPP Server setup, Database setup.
3.	Adarsh Singh Kanan Sananse Sania Mane	By the end of March Month	Implementing 3^{rd} module/functionality: Integration of Hardware System with server, database - GUI - microcontroller connection/integration setup establishment, overall system testing in a real time environment.

Chapter 8

Implementation

Working of hardware system:-

1. Agro-Assistance is an integrated IOT based plant monitoring system. It is based upon the Simple-reflex agent AI model, its main motive is to automate various on-field farming processes. The sensors used in the proposed system are DHT11 and Soil Moisture.

2. Algorithm Used: Linear Regression

- Linear regression analysis is used to predict the value of a variable based on the value of anothervariable.
- This method is used to create a model that includes temperature, humidity, and soil moisture as independent variables.
- The goal is to identify which of these environmental factors have the greatest impact on plant growth.
- Linear Regression is used to predict various plant- related variables based on environmental factors such as soil moisture, temperature, humidity.
- To control the actuations of various actuators resulting in control of climatic conditions.
- On performing regression task, regression models are used for predicting the outcome of an event based on the relationship between variables obtained from the dataset.

3. Certain logics regarding specific sensors are created and based on those logic states, action for actuators are decided.

4. Sketchbooks containing logics are uploaded on ESP-32 and through input, output, Data pins, coordinated interaction is enabled between sensors, microcontroller and actuators.

5. Module Wise Explanation:

   <u>Module 1:-</u>

- In Arduino IDE on DOIT devkit v1 board a sketchboard is created in C++ wherein we've defineda programme based on working logic of our iot system .
- The sketch board created is transferred in microcontroller memory through USB interface.
- Based on programme in memory of ESP32 functionality of IOT system in controlled.

Module 2 :-

- Circuit is established between created hardware system and microcontroller: when system is powered, sensors starts collecting environmental inputs and based on those inputs and logic defined in programme present in microcontroller memory, certain actuators such as DC FAN, AC LIGHT BULB, DC WATER PUMP starts working and thus a plant specific virtual environment is maintained through coordination of sensors and actuators.
- The Static Web Application / design is created (GUI) as a frontend: The web application consists of the 6 interlinked webpages i.e. Home page, about page, logs page and respective 3 pages specifically for particular constraints. i.e temperature, humidity, soil moisture. This web application is used for reflecting the collected sensed values from the hardware system.
- Then the XAMPP server and MYSQL database is set up so that the values sensed can be stored in the backend.

Module 3:-

- The 3rd module consists of the integration of the hardware system with the server, database and web application(GUI) i.e. Kisaan Dost.
- The connection is established between backend and frontend i.e database and GUI. After the successful connection the data collected on realtime basis is reflected on web application.
- The real time environmental inputs which are sensed through various sensor modules implanted of hardware system is used as a variable (feature) to update database server on realtime basis using http post method and PHP.
- The updated instances of database are reflected on respective web pages through http GET method using PHP.
- The instances reflected on the web application i.e. Kisaan Dost (GUI) are in the form of logs that are generated.
- There is one common log page as shown below in figure 9.3, which shows logs of all the constraints i.e temperature, humidity, soil moisture along with the timestamp.
- Also there are respective web pages for respective constraints i.e. temperature, humidity and soil moisture as shown below in figure 9.4, 9.5, 9.6 respectively.

Chapter 9

Result and Discussion

1. Software (GUI):

Figure 9.1 Home Page of Agro-Assistance

Figure 9.2 About Page of Agro-Assistance

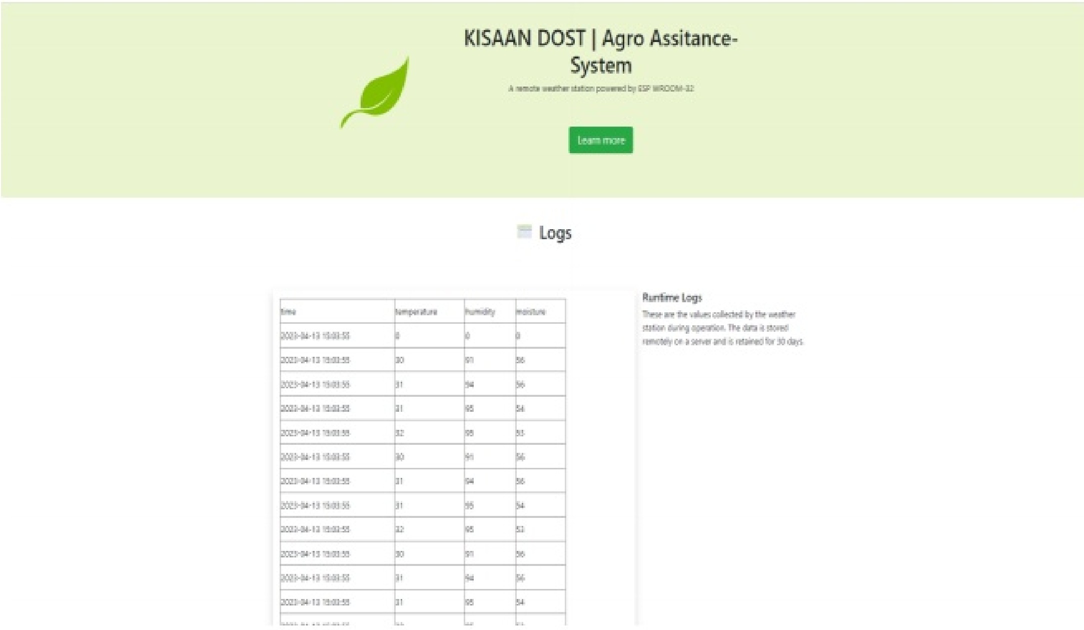

Figure 9.3 Log Page of Agro-Assistance

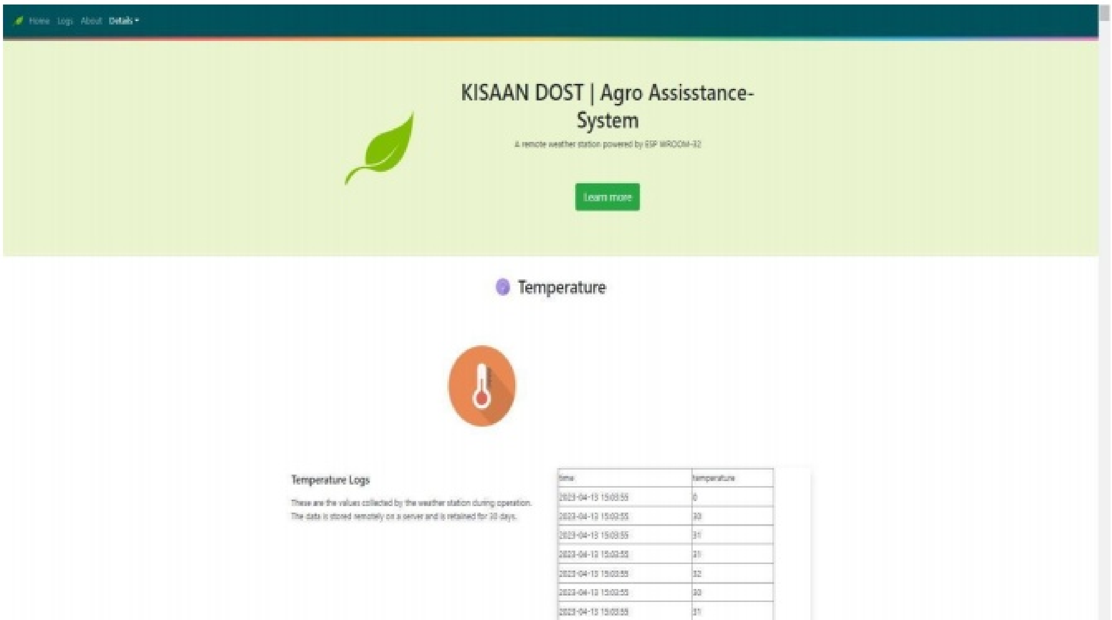

Figure 9.4 Log Page of Agro-Assistance

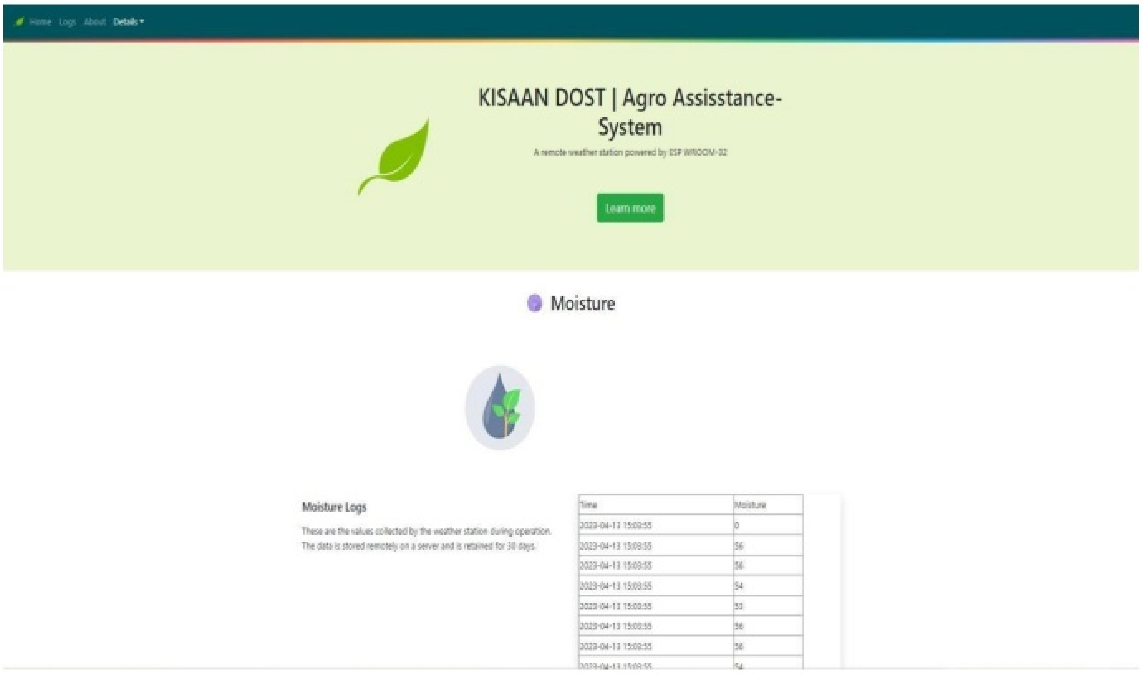

Figure 9.5 Soil Moisture Log Page of Agro-Assistance

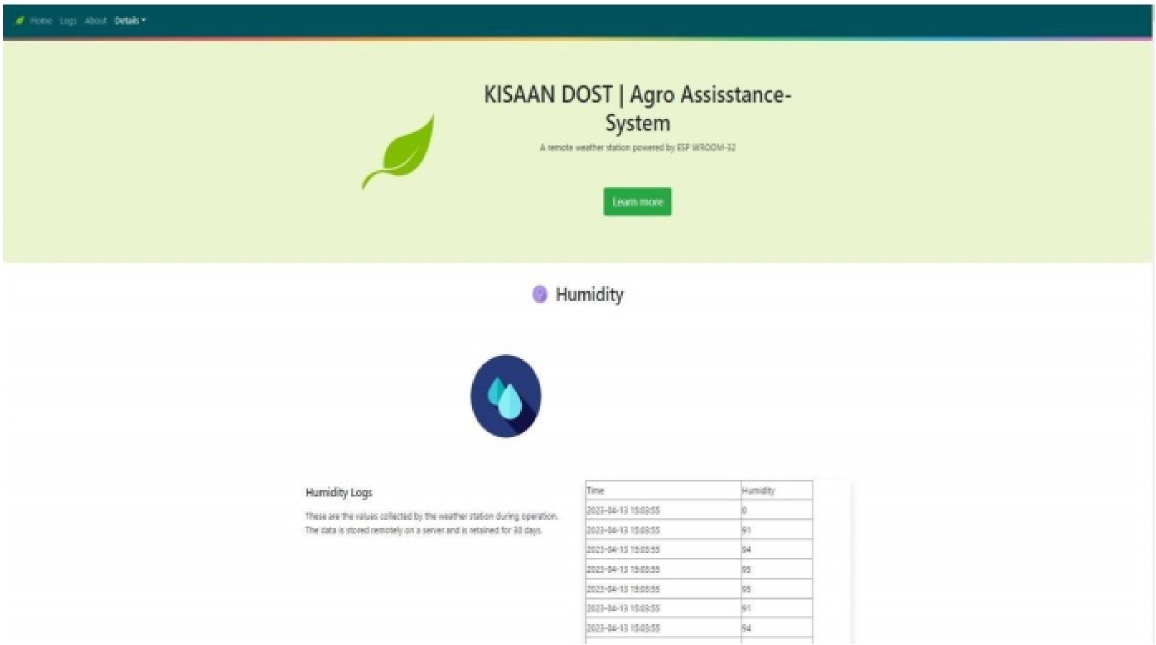

Figure 9.6 Humidity Log Page of Agro-Assistance

2. Hardware (IOT)

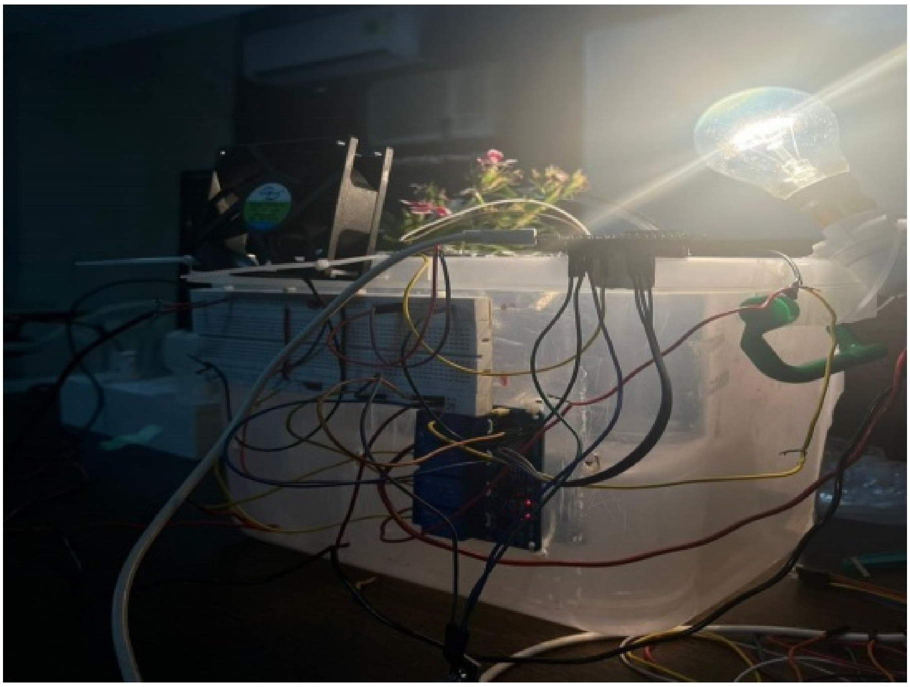

Figure 9.7 IOT System

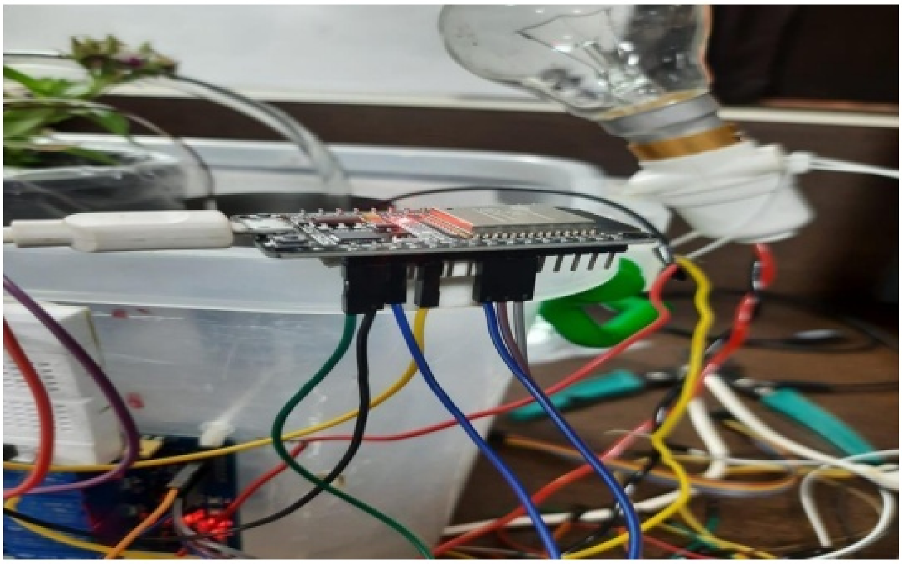

Figure 9.8 Connection with Microcontroller

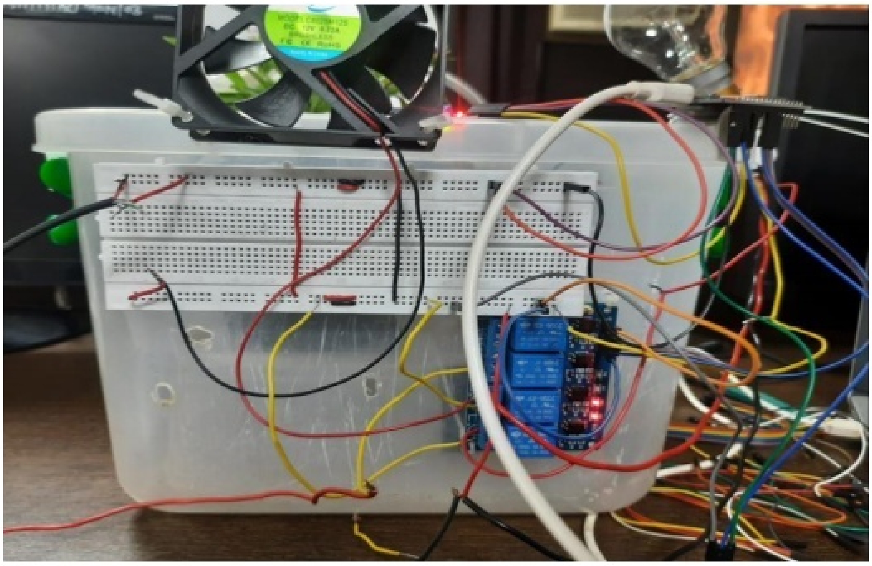

Figure 9.9 Connection of actuators with 4-Channel Relay

Chapter 10

Conclusion and Future Scope

Conclusion:

Proposed IOT based Agro-Assistance System is able to automate the certain farming procedure making use of implanted actuators and sensor variables which are sensed through various integrated sensor modules. Making a system to operate in the form of AI based simple-reflex agent.

The sensor variables sensed are posted on the database server on a real time basis to update database instances, considering microcontroller (esp32) as http client and database server as http server. The updated instances are then used to update logs value on the web page using http get method, this log value generated can further be used to support decision making process of system operation to optimize system accuracy.

Future Scope:

- The future scope of Agro-Assistance systems is likely to involve continued integration of technology and data-driven approaches to optimize crop yields and reduce environmental impact on crop quality and production.

- Some of the key future scopes for Agro-Assistance IOT Systems include:
    1. Climate-smart agriculture:- Climate-smart agriculture involves using techniques that are resilient to climate change, such as drought-resistant crops, improved water management, and soil conservation practices.
    2. Yield prediction system (ML model):- Crop yield prediction is one of the challenging tasks in agriculture. The prediction of crop yield is based on soil, meteorological, environmental, and crop parameters.

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