DAYANANDA SAGAR COLLEGE OF ENGINEERING

(An Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE & ISO 9001:2008 Certified)
Accredited by National Assessment & Accreditation Council (NAAC) with ‘A’ grade, Shavige Malleshwara Hills,Kumaraswamy Layout, Bengaluru-560078.

MINI PROJECT REPORT

On

Title

Submitted By:

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Guide: Guide Name

2022-2023

Department of Artificial Intelligence and Machine Learning

Dayananda Sagar College of Engineering Bangalore-78

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CERTIFICATE

This is to certify that the Mini Project work done on "**Title**" is being submitted by **Manikanta B (1DS20AI018), Guru Akhil (1DS20AI031), Nishank K S (1DS20AI036), Vineel Akash P(1DS20AI041), Shreyas K(1DS20AI052)** is the record of the Mini Project carried out by him/her under our supervision. This report is submitted towards the partial fulfilment of 2nd semester of Bachelor of Engineering in Artificial Intelligence and Machine Learning during the academic year 2022-2023. It is certified that all the suggestions or corrections indicated for internal assessment have been incorporated in the report. This Mini Project Report has been approved as it satisfies the academic requirements under the rules prescribed for the Bachelor of Engineering Degree.

Signature of HOD	Signature of Principal
Dr. Vindhya P Malagi	**Dr. B G Prasad**
(HOD, Dept. of AI & ML)	**(Principal)**
DSCE, Bengaluru	**DSCE, Bengaluru**

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DECLARATION

We, **Manikanta B, Guru Akhil, Nishank K S, Vineel Akash P and Shreyas K,** students of VI Semester **B.E in Artificial Intelligence and Machine Learning from Dayananda SagarCollege of Engineering** declare that the Mini Project entitled **Title** is a bonafide work in a partial fulfilment of academic requirement of Bachelor of Engineering during the academic year 2022- 2023.

Team Members

Manikanta B (1DS20AI018)
Guru Akhil (1DS20AI031)
Nishank K S (1DS20AI036)
Vineel Akash (1DS20AI041)
Shreyas K (1DS20AI052)

Abstract

CropFlow is based on IoT which can monitor soil moisture and climatic conditions to grow and yield a good crop. In IoT-based smart farming, a systemis built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system. The farmers can monitor the field conditions from anywhere. Smart agriculture using IoT is all about saving water, increasing efficiency and reducing the environmental impacts of ornamental plant production practices. CropFlow also called Climate-smart agriculture or Smart Farming.

Acknowledgement

We are pleased to have successfully completed the project **CropFlow**. We thoroughly enjoyed the process of working on this project and gained a lot of knowledge doing so.

We would like to take this opportunity to express our gratitude to **Dr. B G Prasad** Principal of DSCE, for permitting us to utilize all the necessary facilities of the institution.

We also thank our respected **Dr. Vindhya P Malagi,** HOD of Artificial Intelligence & Machine Learning, DSCE, Bangalore, for her support and encouragement throughoutthe process.

We are immensely grateful to our respected and learned guide, **Guide Name**, Assistant Professor, DSCE for their valuable help and guidance. We are indebted to them for their invaluable guidance throughout the process and their useful inputs at all stages of the process.

We also thank all the faculty and support staff of Department of Artificial Intelligence& Machine Learning, DSCE. Without their support over the years, this work would not have been possible.

Lastly, we would like to express our deep appreciation towards our classmates and our family for providing us with constant moral support and encouragement. They have stood by us in the most difficult of times.

Team Members

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Table of Contents

Chapter 1

Introduction

1.1 Overview

Connecting physical devices through sensors and connectivity, the Internet of Things (IoT) is a revolutionary concept that has transformed numerous industries. Among others, this technology has led to significant advancements in the manufacturing, agricultural, smart city, and residential sectors. In numerous applications, IoT has improved productivity, efficiency, and comfort by facilitating real-time communication and automation.

IoT has given birth to the concept of intelligent factories or Industry 4.0 in the manufacturing sector. Manufacturers can optimise production processes, monitor equipment performance, and expedite supplychain operations by integrating IoT devices and sensors. Collecting and analysing data in real-time enables predictive maintenance, which reduces disruption and maximises resource utilisation.

IoT has made precision farming feasible in the agricultural sector. Using IoT-enabled sensors, farmers can monitor soil conditions, precipitation levels, and weather patterns. This data-driven strategy enables precise irrigation and fertilisation, which promotes optimal crop growth while conserving water and reducing environmental impacts. Livestock monitoring systems employ IoT technology to monitor animal health,feeding patterns, and behaviour, thereby assuring the animals' well-being and improving farm productivity.

Smart cities leverage the Internet of Things to improve urban living. Traffic management systems optimise traffic flow and reduce congestion by using real-time data from sensors embedded in roads, vehicles, and traffic signals. Waste management systems employ Internet of Things-enabled sensors to monitor refuse levels in containers, thereby optimising garbage collection routes and reducing operational expenses. Promoting sustainability, energy conservation initiatives use IoT to monitor and control energy usage in buildings, streetlights, and utilities.

IoT devices such as smart thermostats, lighting systems, and security cameras offer remote control and automation in residential settings, thereby augmenting comfort, convenience, and energy efficiency. Using their devices or voice assistants, homeowners can monitor and control various aspects of their homes, suchas temperature, lighting, and security, from anywhere.

1.2 Problem Statement

The problem at this point is the lack of an effective and automated solution for managing soil moisture levelsin cultivation using Internet of Things soil moisture sensors and water pump control. Current manual irrigation techniques result in inefficient water use, water waste, and possible crop injury. Due to a paucity of real-time data and automation, irrigation decisions are delayed and require more labour.

1.3 Objectives

- Develop an Internet of Things-based soil moisture sensor system that provides precise and dependable measurements of soil moisture levels in agricultural fields.
- Establish a system for real-time data monitoring that collects and transmits soil moisture data from sensors toa centralised control system for analysis and decision-making.
- Implement an automated control mechanism that regulates water pump operation based on soil moisture data, ensuring optimal irrigation and preventing over- or under-watering.
- Enable efficient water resource management by minimising water waste through intelligent irrigation control, conserving water, and promoting sustainable agricultural practises.
- Improved Crop Health and Yield:

1.4 Advantages & Applications

Advantages of IoT:

- Increased Efficiency and Productivity
- Enhanced Convenience and Control
- Cost Savings and Resource Optimization
- Improved Safety and Insights

Applications of IoT:

- Industrial Automation
- Precision Agriculture
- Healthcare and Smart Homes

1.5 Organization Of Report

The organization of a report refers to the structure and layout of the document. It involves arranging the content in a logical and easy-to-follow format that allows readers to understand the information presented and follow the argument or analysis presented in the report.

The organization of this report typically includes the following elements:

1. Title page: This includes the title of the report, the author's name, date of submission, and any other relevant information such as the organization or department for which the report was prepared.
2. Table of Contents: This outlines the main sections and subsections of the report, along with pagenumbers, allowing readers to easily navigate the document.
3. Introduction: This sets the context for the report, providing background information on the problem orissue addressed, and outlining the purpose and objectives of the report.
4. System Requirements: This section contains about the Software and Hardware prerequisites of thecurrent topic.
5. System Design: This includes the Pin Diagram of CropFlow of the Project chosen.
6. Implementation: This part is all about the implementation of Arduino IDE Code Application inNodeMCU.
7. Results: This section presents the main findings of the report, including any relevant data, analysis, or other evidence that supports the topic’s conclusions.
8. Conclusion: This summarizes the main points of the report, including the key findings and recommendations, and highlights their significance.
9. Future Enhancements: This section covers the updates and possible changes that could be implemented in the topic.
10. References: This includes a list of sources cited in the report, using a specific referencing style.

Overall, the organization of a report is important to ensure that the information presented is easy to follow and understand, and that the report effectively communicates the main findings and conclusions to its intended audience.

Chapter 2

System Requirements

2.1 Software Requirements

Application to monitor: Blynk App

Application software: Arduino IDE

2.2 Hardware Requirements

Sensor: Soil moisture sensor

Micro-Controller: NodeMCU

Power-Controller: Relay Module

Connectors: Jumper Wires, USB

CableMotor: Water Pump

Power Source: 15V Battery

Chapter 3

System Design

3.1 Pin Diagram/System Diagram

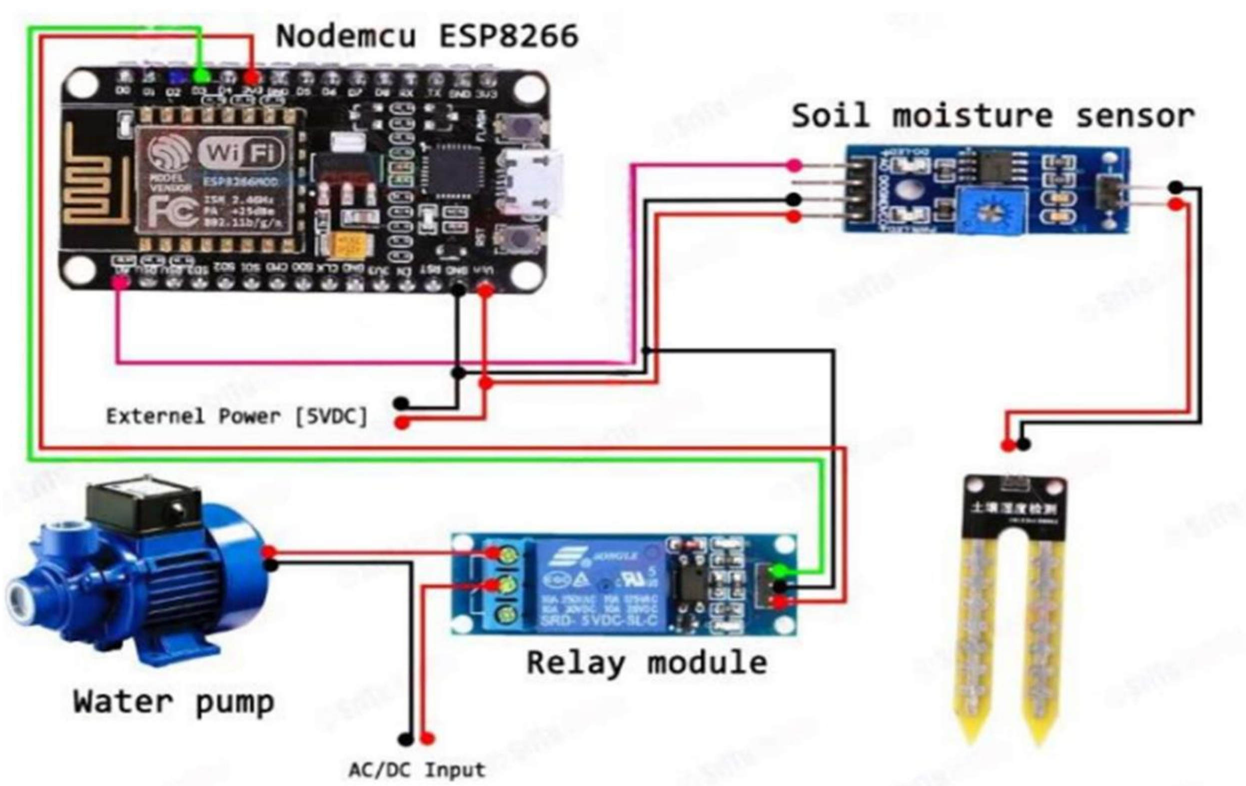

Figure 3.1 – Pin Diagram of CropFlow

Figure 3.1 – Pin Diagram of CropFlow is designed to automate the process of watering plants based on their moisture levels. It utilizes various components and a microcontroller to control the irrigation system. The circuit diagram illustrates the connections between these components. The NodeMCU is connected to the soil moisture sensor to receive moisture level readings. Based on the readings, the NodeMCU determines whether to activate the water pump relay.

3.2 Implementation

```
//Include the library files #define

BLYNK_PRINT Serial

#define BLYNK_TEMPLATE_ID "TMPL3A0W_KY-J"

#define BLYNK_TEMPLATE_NAME "SmartIrrigation"

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

#include <iostream>

using namespace std;


char auth[] = "PPZZU9hVH7JZwwKtJsaRK51mppIrrSR9";//Enter your Auth

tokenchar ssid[] = "Galaxy";//Enter your WIFI name

char pass[] = "12345678";//Enter your WIFI password


BlynkTimer timer;bool

Relay = 0;

bool eventTrigger=false;

//Define component pins

#define sensor A0 #define

waterPump D3


void setup() {

Serial.begin(9600);
```

```
//Call the function
timer.setInterval(100L, soilMoistureSensor);
}

//Get the button value
BLYNK_WRITE(V2) {
Relay = param.asInt();

if (Relay == 1) { Serial.println("Turned
on"); digitalWrite(waterPump,
HIGH);
} else { Serial.println("Turned
off");

digitalWrite(waterPump, LOW);
}
}


//delay(1000);
if (value <= 75) {
Serial.println("Turned on");
digitalWrite(waterPump, HIGH);
```

```
Blynk.virtualWrite(V5, 1);
Blynk.virtualWrite(V4, 0);
if(eventTrigger== false){
eventTrigger=true;
// Blynk.notify("Water has turned on");
Blynk.logEvent("alert","Water has turned on");
}
//Blynk.logEvent("alert","Temp above 30 degree");
} else { Serial.println("Turned
off");
// Blynk.notify("Water has turned offf");
eventTrigger=false; digitalWrite(waterPump,
LOW); Blynk.virtualWrite(V5, 0);
Blynk.virtualWrite(V4, 1);
}
Serial.println(value);
cout<<"hello";
Blynk.virtualWrite(V1, value);


}
void loop() {
//Serial.println("Running ........ ");
soilMoistureSensor();
}
```

Chapter 4

Results

4.1 Components:

Figure 4.1 – NodeMCU

NodeMCU is a versatile IoT development board that can be utilized in soil moisture detection systems by interfacing with soil moisture sensors, allowing for accurate measurement and monitoring of soil moisture levels.

Figure 4.2 – USB Cable

It is used to connect NodeMCU and Arduino IDE

Figure 4.3 – Jumper Wires

Jumper wires are essential components in electronics projects, including soil moisture detection systems. They provide a convenient and flexible means to establish connections between various components such as sensors, NodeMCU, and other electronic devices, enabling seamless data transfer and communication within the system.

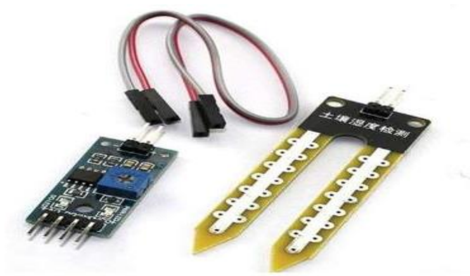

Figure 4.4 – Soil Moisture Sensor

Soil moisture sensors are vital components in soil moisture detection systems, enabling accurate measurement of soil moisture levels for optimized irrigation control in agriculture and gardening applications.

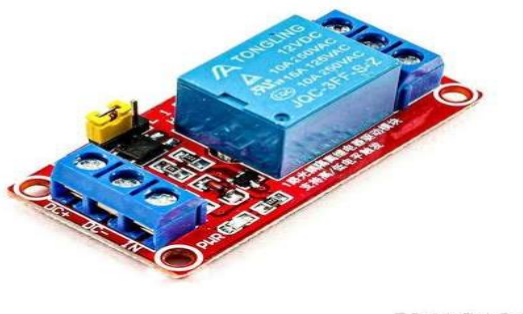

Figure 4.5 – Relay Module

Relay modules are integral to IoT projects like soil moisture detection systems, acting as switches to control high-power devices such as water pumps based on sensor inputs. They enable remote control and automation for efficient water management, ensuring optimal plant growth.

Figure 4.6 – Battery

Batteries are vital for powering IoT devices like soil moisture detection systems, providing portable and reliable energy sources for uninterrupted operation, ensuring flexibility in sensor.

4.2 Results

Figure 4.7 – Screen Capture of the Mobile Application

The mobile application screen capture of the smart irrigation system showcases a user-friendly interface displaying real-time soil moisture data, allowing users to remotely control the water pump and adjust irrigation settings.

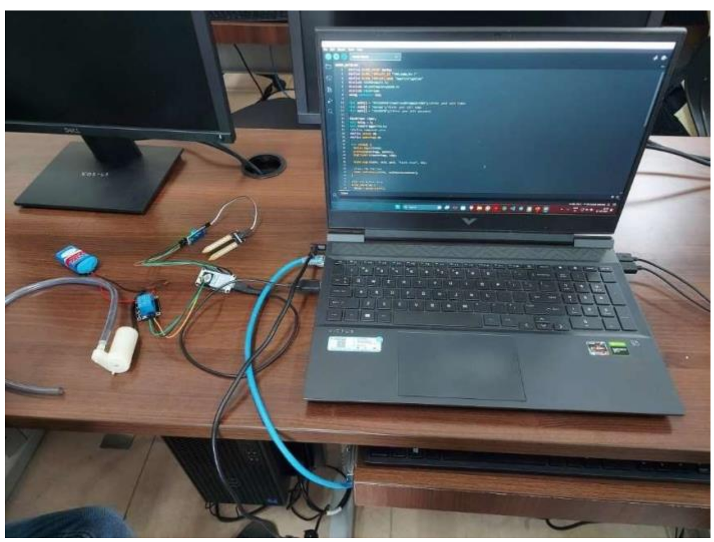

Figure 4.8 – Working Setup

The working setup diagram for a smart irrigation IoT system consists of a microcontroller (e.g., ESP8266), soil moisture sensor, water pump, relay module, and power supply. These components are connected to enable the microcontroller to monitor soil moisture, control the water pump, and communicate with the Blynk Cloud Server for remote monitoring.

Figure 4.9 – Arduino IDE Code

The provided code snippet is for an ESP8266-based IoT project using Blynk for smart irrigation. It includes the necessary libraries, defines Blynk authentication and Wi-Fi credentials, initializes a BlynkTimer, and sets up pin configurations. The setup function establishes serial communication, configures the water pump pin, and connects to the Blynk server. The soilMoistureSensor function reads the analog value from the soil moisture sensor, controls the water pump based on the moisture level, and sends data to the Blynk server. Overall, the code enables remote monitoring and control of irrigation using Blynk and the ESP8266 board.

Chapter 5

Conclusion

5.1 Conclusion

The integration of data analytics and machine learning techniques can provide valuable insights for decision-making in agriculture. Analyzing large datasets, including climate data, soil information, and crop performance data, can help predict plant growth patterns, optimize resource allocation, and improve overall farm management practices.

5.2 Future Enhancements

Integrating data analytics and machine learning techniques can yield valuable insights for agricultural decision-making.

The analysis of large datasets, such as climate data, soil information, and crop performance data, can aid in predicting plant growth patterns, optimising resource allocation, and enhancing farm management practises overall.

Predicting the likelihood of plant growth in a particular soil based on factors such as npk values, temperature, humidity, and ph.

References

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