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DEPARTMENT OF MECHANICAL ENGINEERING

Internship Viva – Voce [MVJ21INT48]

DESIGN AND DEVELOP AND SOFTWARE INTERFACE FOR AGRICULTURAL APPLICATIONS

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OUTLINE OF THE PRESENTATION

INTRODUCTION

- Smart Environmental Monitoring: Develop a website with real-time data collection capabilities using field sensors to monitor humidity and temperature, providing farmers with crucial insights into microclimates for optimal crop management.
- Crop-Specific Database: Create a comprehensive crop database containing information on various crops, their nutritional requirements, and interactions with soil properties to serve as the foundation for intelligent fertilizer recommendations.
- Personalized Recommendations: Enable farmers to input specific details such as crop type, growth stage, soil characteristics, and environmental conditions, which will be processed using analytical algorithms to generate personalized fertilizer recommendations.
- Simplified Decision-Making: Streamline the complex task of determining fertilizer composition and application rates, empowering farmers to make informed decisions about crop nutrition easily.
- Enhanced Crop Yields: By integrating real-time environmental monitoring and intelligent fertilizer recommendations, the website revolutionizes farming techniques, optimizing crop growth, and ultimately enhancing agricultural practices to improve yields and sustainability.

LITERATURE SURVEY

SL no.	Author (Year) or Name of Company/Product (Year)	Description	Remarks
1.	Mohamed Rawidean Mohd Kassim	IOT technologies are transforming agriculture globally. With a 30% increase in population by 2050, automated solutions are needed to meet the rising food demand. This paper examines IOT trends in agriculture and the challenges in network infrastructure and open-source software for smart farming..	Pros: 1.Increase in productivity 2.Promotes a Sustainable Environment Cons: 1.Its cost efficient 2.its very complex.

LITERATURE SURVEY

2.	Qusay Hassan	IOT is transforming agriculture through precision agriculture (PA) techniques. PA uses data-driven systems for optimized planting, fertilization, and crop management. Cloud-based IOT control centers collect real-time data to enhance agricultural production in terms of quality, quantity, and cost It provides ambient humidity and temperature sensing, automatically adjusting atmospheric conditions in greenhouses. The solution offers real-time alerts on varying soil humidity levels, allowing for precise irrigation management. Features include soil moisture monitoring, water consumption tracking, date/time of irrigations, and water usage analysis. It helps optimize water usage, reduces costs, and improves environmental sustainability	Pros • Efficient Water Management • Cost Savings • Environmental Sustainability • Real-Time Monitoring Cons • Initial Investment • Maintenance and Upkeep • Technical Expertise: • Connectivity Dependence
3.	Ji-chun Zhao	The paper focuses on integrating IOT technology into greenhouse agriculture, emphasizing automation and information technology. It proposes a remote monitoring system that combines internet and wireless communications for efficient control and data collection. Additionally, an information management system is designed to support agricultural research facilities..	Pros: • Increases efficiency • Provides real time monitoring management of various parameters. Cons: • Technical challenges such as maintenance etc occur. • High initial investment costs

LITERATURE SURVEY

4.	Hengko humidity sensor	Temperature and humidity sensors play a vital role in IOT agricultural systems, particularly in greenhouse environments. They enable real-time monitoring of temperature and humidity levels, allowing operators to optimize plant growth and reduce energy costs. These sensors are essential components of intelligent greenhouse monitoring systems, providing data for controlling heating and ventilation equipment. Alarm values can be set to alert operators of any deviations from desired conditions. Overall, temperature and humidity sensors contribute to maintaining an optimal greenhouse environment, enhancing agricultural productivity, and promoting sustainability.	Pros • Optimal plant growth • Energy efficiency • Automation and remote monitoring • Early warning system • Data-driven decision making Cons • Initial investment • Calibration and maintenance • Data interpretation and expertise • Sensor reliability • Integration challenges
5.	Deep Sea Developments	Humidity sensors play a significant role in agriculture by analyzing the moisture content of the soil. By measuring humidity, these sensors enable optimization of irrigation processes, leading to improved crop yields. Farmers can ensure that their crops receive the appropriate amount of water based on the soil's moisture levels, promoting efficient water usage and preventing over or under-watering. This application of humidity sensors in agriculture contributes to sustainable farming practices and helps maximize agricultural productivity watering. This application of humidity sensors in agriculture contributes to sustainable farming practices and helps maximize agricultural productivity	Pros • Improved crop yields • Water conservation • Cost savings • Time-saving • Prevents water stress and crop diseases Cons • Initial investment • Sensor calibration and maintenance • Environmental factors • Limitations in sensor coverage

LITERATURE SURVEY

6.	TEKSUN	Teksun's Smart Humidity Sensor for Agriculture Industry is an IOT-based solution that enables farmers to control and monitor climatic data in farms, nurseries, and fields It provides ambient humidity and temperature sensing, automatically adjusting atmospheric conditions in greenhouses. The solution offers real-time alerts on varying soil humidity levels, allowing for precise irrigation management. Features include soil moisture monitoring, water consumption tracking, date/time of irrigations, and water usage analysis. It helps optimize water usage, reduces costs, and improves environmental sustainability. The solution is easy to install, works autonomously, and offers long battery life. Contact Teksun for a demo and to learn more about its features, benefits, and usage	Pros • Efficient Water Management • Cost Savings Cons • Initial Investment • Maintenance and Upkeep • Technical Expertise: • Connectivity Dependence
7.	MANX TECH GROUP	Smart Agriculture, powered by IOT technology, is revolutionizing the farming and agricultural sectors by utilizing sensors, data collection, wireless networks, cloud platforms, and data analysis. The primary benefits include increased production, lower production costs, operational efficiencies, real-time and intelligent cost management, and reduced environmental impact. s	Pros • Increased Production • Lower Production Costs • Operational Efficiencies • Environmental Sustainability • Improved Decision-Making Cons • Initial Investment • Technical Expertise Connectivity Challenges • Data Security and Privacy • Compatibility and Integration

LITERATURE SURVEY

8.	EASTERN PEAK	IOT in agriculture enables: Climate monitoring through weather stations and sensors. Greenhouse automation for precise control of environmental conditions. Crop management with real-time data on temperature, precipitation, and crop health Cattle monitoring and management for tracking health and location of livestock. Precision farming using sensors to optimize water, fertilizers, and pesticides. Agricultural drones for tasks like crop monitoring and spraying. Predictive analytics to make data-driven decisions and predict crop outcomes. End-to-end farm management systems for remote monitoring and streamlined operations. Robots and autonomous machines for labour-intensive tasks like planting and harvesting. IOT technology enhances productivity, reduces costs, and improves decision-making in agriculture	Pros • Increased productivity • Cost savings • Precision and efficiency • Sustainability and environmental impact Cons • Cost of implementation • Technical complexity • Data privacy and security risks • Reliance on connectivity
9.	Francisco Javier Fernandez Pastor	Precision Agriculture optimises production efficiency, increases quality, minimises environmental impact and reduces the use of resources (energy, water). Nowadays, new technological development in embedded devices (hardware and communication protocols), the evolution of Internet technologies (Internet of Things) and ubiquitous computing (Ubiquitous Sensor Networks) allow developing less expensive systems, easier to control, install and maintain, using standard protocols with low-power consumption. This work develops and test a low-cost sensor/actuator network platform, based in Internet of Things, integrating machine-to-machine and human-machine-interface protocols. Edge computing uses this multi-protocol approach to develop control processes on Precision Agriculture scenarios. A greenhouse with hydroponic crop production was developed and tested using Ubiquitous Sensor Network monitoring and edge control on Internet of Things paradigm. The experimental results showed that the Internet technologies and Smart Object Communication Patterns can be combined to encourage development of Precision Agriculture	Pros • Low-cost deployment: sensors/actuators (temperature, moisture, PH, EC, Luminosity, electro-valves, pumps, lamps) technology used are not expensive. • Easy access and maintenance: sensors/actuators and devices are easy to identify, connect and maintain Cons • Continuous Internet supply is mandatory. • USN networks use WIFI, Bluetooth Low Energy (BLE) and serial bus protocols as support to develop communication services

LITERATURE SURVEY

10.	Jean-Baptiste Lefevre	Drones have become increasingly popular in agriculture due to their versatile applications. They offer significant benefits to farmers by providing real-time aerial imagery for crop monitoring, enabling precision agriculture practices, and facilitating targeted interventions for disease and pest control. Drones also aid in irrigation management, crop mapping, yield estimation, and livestock monitoring. Their ability to survey large areas quickly and safely enhances efficiency and reduces labour-intensive tasks. Moreover, drones assist in environmental monitoring and support sustainable farming practices. Although challenges such as regulatory compliance and initial costs exist, the accessibility and affordability of drone technology continue to make it an invaluable tool for farmers seeking increased productivity, efficiency, and environmental sustainability	Pros • Efficiency and time savings: Drones can quickly survey large areas, replacing manual labour-intensive tasks and saving time and effort for farmers. • Cost-effectiveness: The use of drones in agriculture reduces the need for extensive manual labour, resulting in potential cost savings for farmers. Cons • Limited payload capacity: Drones have payload limitations, which may restrict their ability to carry certain equipment or sensors for more extensive data collection. • Weather conditions: Adverse weather conditions such as strong winds or rain can affect the ability of drones to operate safely or collect reliable data
11.	Elsayed Said Mohamed	The implementation of 5G network technology in smart farming holds tremendous potential to revolutionize the agricultural industry. With its high-speed, low-latency connectivity, 5G enables seamless and real-time data transmission, unlocking numerous benefits for smart farming systems. Firstly, 5G enhances the connectivity of various agricultural devices, such as sensors, drones, and autonomous mach inery, allowing them to communicate and share data instantaneously.	Pros Low latency: 5G's low latency ensures minimal delay in data transmission, facilitating immediate response. Cons Limited coverage: While 5G networks are expanding rapidly, coverage may still be limited in certain regions,

LITERATURE SURVEY

12.	Dr .Marcell Vollmer	Computer imaging in agriculture has revolutionized the industry in numerous ways. It enables farmers to monitor crop health, detect diseases, pests, and weeds, and optimize irrigation and fertilization. Computer vision systems aid in sorting and quality control, automate harvesting processes, and improve livestock management. Additionally, it assists in soil analysis, environmental monitoring, and yield prediction. By harnessing the power of computer imaging, farmers can make informed decisions, increase productivity, reduce resource waste, and implement sustainable practices. Soil analysis: Computer imaging techniques, such as hyper spectral imaging, provide detailed information about soil composition, aiding in soil mapping, nutrient analysis, and precision agriculture practices. Livestock management: Computer vision technologies assist in monitoring the health and behaviour of livestock, facilitating early disease detection, optimizing feeding patterns, and improving overall animal welfare	Pros • Computer imaging provides precise and accurate data, allowing farmers to make informed decisions regarding crop management, irrigation, and pest control. Cons • Implementing computer imaging technologies can be initially expensive, requiring investment in equipment, software, and training.
13.	Helen Yu	Remote sensing in agriculture revolutionizes farming practices by utilizing satellite or aerial imagery to provide valuable insights. It enables farmers to monitor crop health, detect diseases, estimate yield potential, optimize irrigation and nutrient management, and identify and control weeds. Remote sensing also aids in land mapping, environmental monitoring, and precision agriculture. With its ability to assess crop health, guide resource allocation, and support risk assessment, remote sensing enhances productivity and sustainability in agriculture. By leveraging remote sensing technology, farmers can make informed decisions, minimize input waste, and optimize resource usage for improved agricultural outcomes.	Pros • Comprehensive data • Efficiency Cons • Cost • Technical expertise

LITERATURE SURVEY

14.	Linda Grasso	Precision farming, also known as precision agriculture, is a modern agricultural approach that utilizes advanced technologies and data-driven methods to optimize farming practices and maximize crop productivity while minimizing resource wastage and environmental impact. It involves the integration of various technologies such as remote sensing, global positioning systems (GPS), geographic information systems (GIS), and sensors to collect and analyze data related to soil conditions, weather patterns, crop growth, and pest infestations. The collected data and analysis enable farmers to create detailed field maps and generate prescriptions for optimized planting, irrigation, and harvesting. This information helps farmers improve yield, enhance crop quality, and increase overall efficiency in resource utilization. Additionally, precision farming practices support sustainability by reducing the use of chemicals, improving soil health, and minimizing environmental pollution.	Pros • Increased Crop Yield: • Resource Efficiency: Cons • High Initial Investment:
15.	Ronald van Loon	Livestock monitoring refers to the use of technology and data-driven methods to track and manage the health, behaviour, and overall well-being of livestock animals. It involves the integration of various monitoring devices, such as wearable sensors, GPS trackers, and video surveillance systems, to collect real-time data on factors such as animal location, activity levels, feeding patterns, and vital signs.	Pros • Improved Animal Welfare Cons • Technical Complexity

METHODOLOGY

Front-endis a client-side of an app. This part consists of visible elements that users interact with. Such as the login page for example.

Backend: We used html language to code the website pages and also to link them together for the website to be responsive with the users and it is linked with link server extension available in visual code.

METHODOLOGY

Flowchart Explanation:-

This flowchart represents a process flow for an agricultural field monitoring system. Here's a brief explanation of the flow:

- The process starts with the user accessing the login page [Login Page.html].
- The user enters their login details.
- The login form is submitted.
- If the login is successful, the user is directed to [Temperature Setting.html] to set the temperature.
- The user provides the temperature input, and it is displayed.

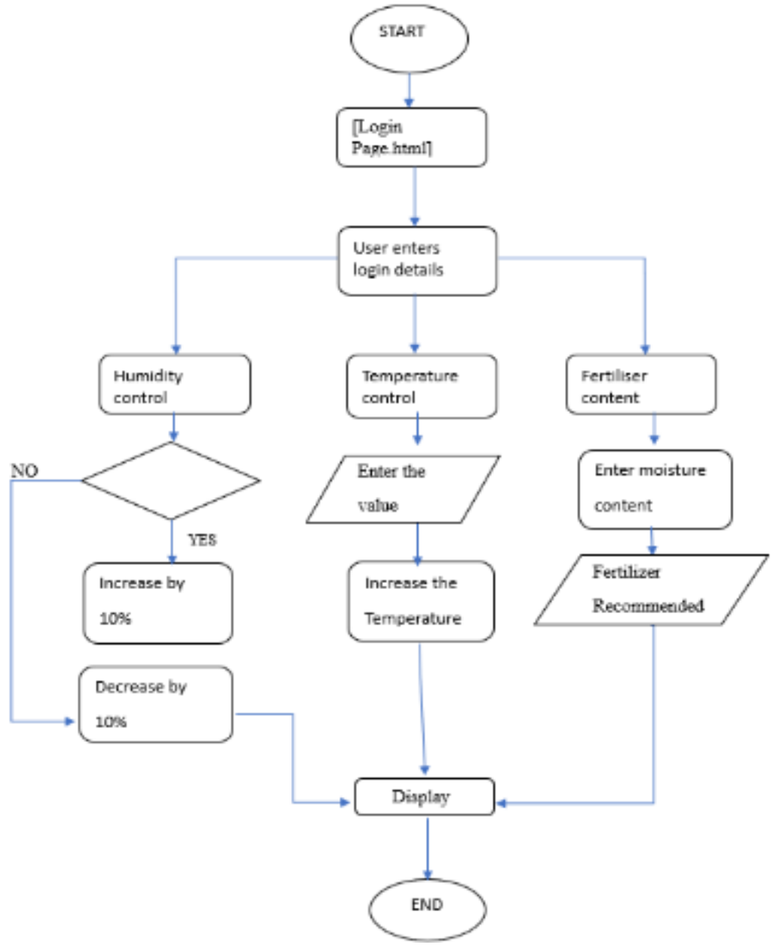


Fig:-Flowchart representation of a program.

METHODOLOGY

- The user is then redirected to the [Agricultural Field Dashboard.html].
- In the dashboard, the user selects a sensor.
- If the user selects the temperature sensor, they are redirected to [Temperature.html].
- The user provides the temperature input, and it is displayed.
- The user is then directed back to the [Agricultural Field Dashboard.html].
- If the user selects the moisture sensor, they are redirected to [Moisture.html].
- The user provides the moisture content input.
- The system detects the fertilizer recommendation based on the moisture content.
- The recommended fertilizer is displayed.
- The user is directed back to the [Agricultural Field Dashboard.html].
- If the user selects the fertilizer sensor, they are redirected to [Fertilizer.html].
- The user provides the moisture content input.

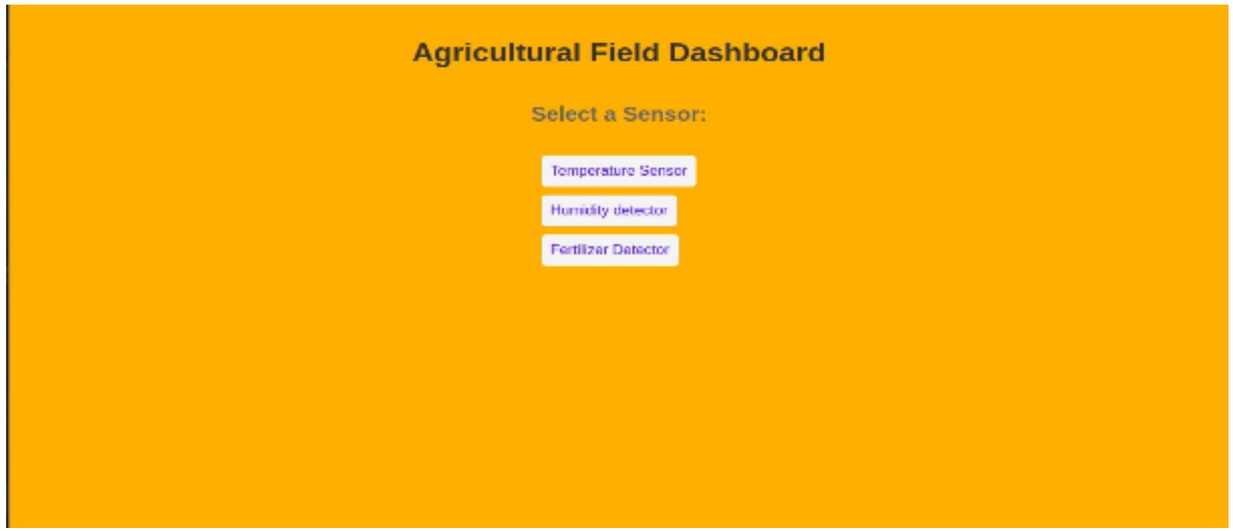
METHODOLOGY

- The system detects the fertilizer recommendation based on the moisture content.
- The recommended fertilizer is displayed.
- The user is directed back to the [Agricultural Field Dashboard.html].
- The process continues similarly, allowing the user to select different sensors and perform corresponding actions.
- Finally, the process ends.

RESULTS

Login page

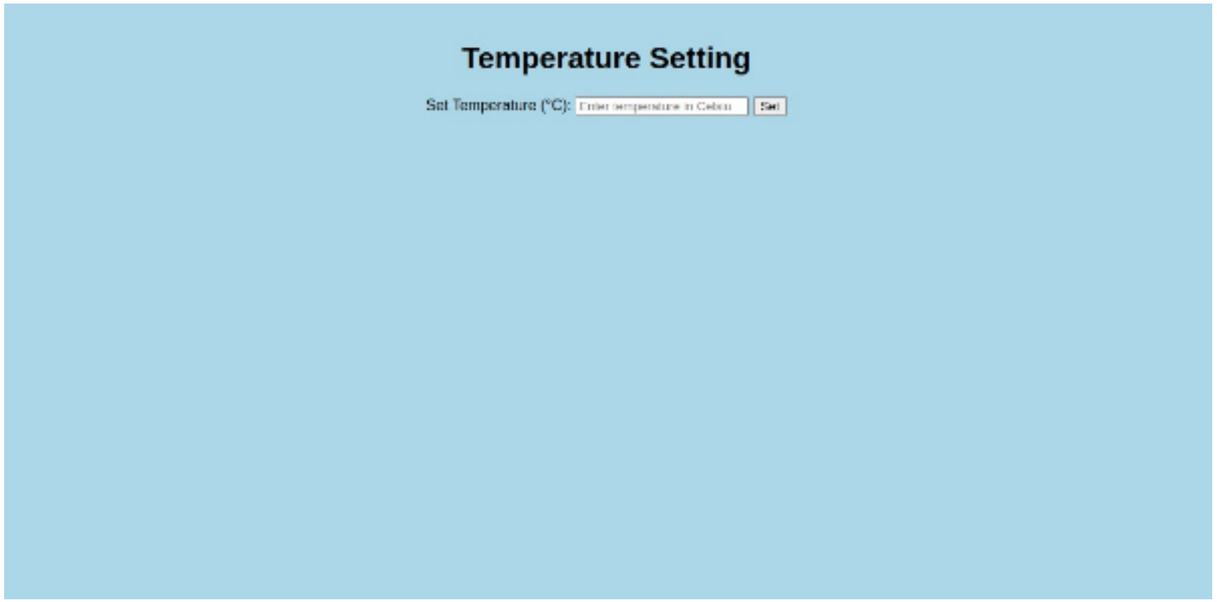
To access the login page we use Vs code to execute our code using live server it displays the login page and subsequent pages for temperature, humidity and fertiliser content.



RESULTS

TEMPERATURE SENSOR

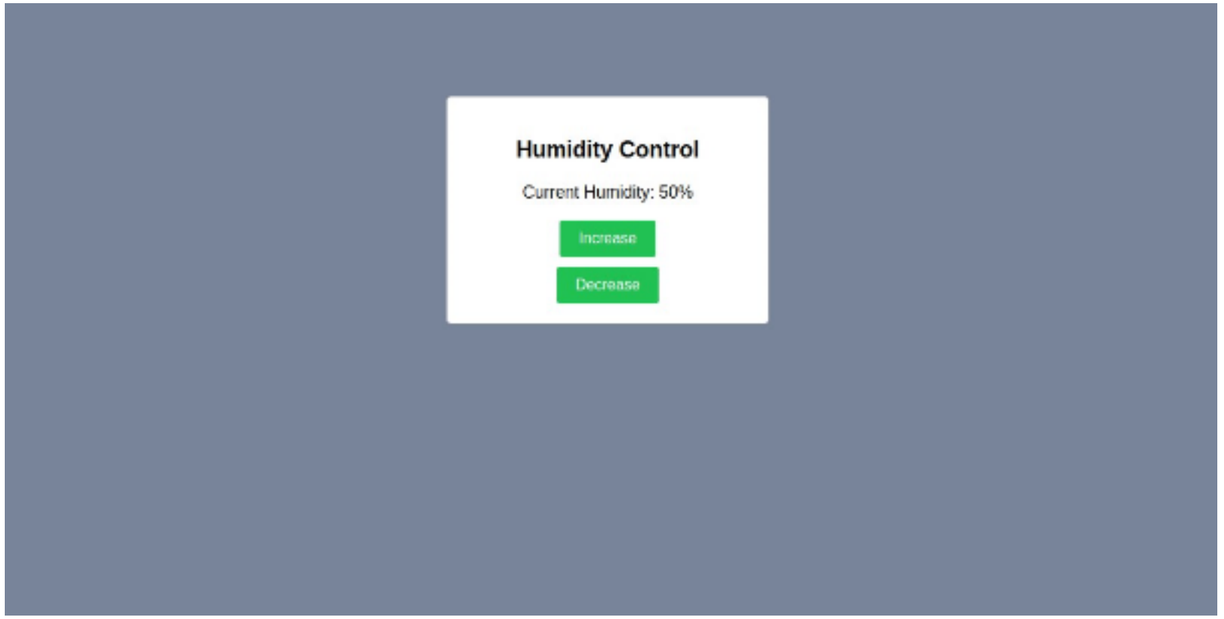
After the user clicks on the temperature sensor it allows the user to input and set a temperature value(in degree Celsius) as and when required



RESULTS

HUMIDITY DETECTOR

The humidity sensor can be used to increase or decrease humidity by 10%.The minimum threshold for humidity is set to 50 and can be increased or decreased according to need.



RESULTS

FERTILIZER DETECTOR

The fertiliser sensor takes the input from the user the current moisture content from the crop monitoring through IOT and gives an appropriate fertiliser to be employed like potassium or nfl according to the percentage of moisture present

CONCLUSION

Login Page Layout:

1.HTML and CSS create a centered container for the login page.
2.Input fields for username and password are included with consistent styling and the "required" attribute for data validation.
3.JavaScript functions increaseHumidity() and decreaseHumidity() update displayed humidity.
4.Clicking "Increase" or "Decrease" buttons adjusts humidity by 10, with real-time HTML reflection.

Fertilizer Recommendation Form:

1.HTML form collects moisture content, with JavaScript determining recommended fertilizer based on predefined ranges.
2.The recommendation dynamically updates in the HTML using innerHTML.
3.Recommendations are categorized by moisture content ranges (Nitrogen-based, Phosphorus-based, Potassium-based, or Balanced NPK).
4.A form collects temperature input in Celsius, managed by JavaScript functions for user-friendly interaction.

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VIDEO OF THE PROJECT

Thank You

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