AGRISEN Precise irrigation System and Smart health monitoring system

Muhammed Saalim O.S
Department of Computer Science and Engineering
Albertian Institute of Science and Technology
Cochin University P.O, , Ernakulam, 682002, Kerala, India.
muhammedsaalimos@gmail.com;

Fathima Parvin M.A
Department of Computer Science and Engineering
Albertian Institute of Science and Technology
Cochin University P.O, , Ernakulam, 682002, Kerala, India
fathimaparvinma16@gmail.com

Albiya Hameed
Department of Computer Science and Engineering
Albertian Institute of Science and Technology
Cochin University P.O, , Ernakulam, 682002, Kerala, India.
albiyahameed@gmail.com

Hiba Fathima T.S
Department of Computer Science and Engineering
Albertian Institute of Science and Technology
Cochin University P.O, , Ernakulam, 682002, Kerala, India.
hibafathima04ts@gmail.com

Amritha Soloman
Department of Computer Science and Engineering
Albertian Institute of Science and Technology
Cochin University P.O, , Ernakulam, 682002, Kerala, India.
amrithasoloman@aisat.ac.in;

***Abstract*—The Smart Gardening System utilizing IoT is a transformative approach that integrates technology with gardening practices. By employing IoT sensors, real-time data is collected on crucial factors like soil moisture, temperature and humidity. This data is processed to offer actionable insights and personalized recommendations for optimal plant care. With automated irrigation control, water usage is optimized based on accurate soil moisture readings, promoting efficient resource management. The system empowers users to remotely monitor and manage theirgardens using smartphones or computers, simplifying gardening tasks and making them accessible to all. The system also integrates detection of plant diseases which empowers plant growth and health. The Smart Gardening System emphasizes a harmonious blend of modern technology and nature, catering to the needs of both seasoned gardeners and those new to the endeavour.**

***Index Terms*—Smart Irrigation, Water Level, Sensor, Type of plant, Plant disease detection.**

I. Introduction

The Smart Irrigation System is a revolutionary innovation in agriculture that uses advanced data analytics and sensors to improve water efficiency, safety, and crop protection. The system, which is user-friendly and powered by a web app, combines cutting-edge technologies to create an intelligent ecosystem that empowers farmers with actionable insights and precise control over their irrigation processes. It uses IoT sensors, real-time data collection to optimize water utilization, monitor soil moisture levels, and consider weather forecasts. It also uses machine learning algorithms to analyse and classify healthy and diseased plants based on the information gathered from diverse dataset .This innovative approach aims to transform agricultural practices, ensuring food security and sustainability for future generations. The system also offers farmers actionable insights, contributing to sustainability efforts in agriculture by addressing water scarcity, safeguarding crop health, and promoting environmentally conscious practices.

Identify applicable funding agency here. If none, delete this.

II. Literature Survey

The UNESCO World Water Assessment Program report highlights the growing demand for Smart Agriculture Systems (SAS) in developing nations. These systems use IoT and AI technologies to monitor crop productivity, resource management, and environmental conditions, providing farmers with valuable insights. These systems integrate hardware and software components, allowing for remote field monitoring and AI-based predictive models for informed decision-making. Traditional methods, such as visual inspections, are time-consuming, subjective, and prone to errors, leading to environmental harm and financial losses. To address these chal-

IJERA 24, Volume 04, Issue 01
DOI: 10.5281/zenodo.12516563

lenges, research has shifted towards using image processing techniques for disease identification, which has shown high accuracy in traditional methods but faces complexities and subjectivity in diverse environments.

A. An overview of methods of plant disease detection based on convolutional network.

[2] Another essential requirement for farmers in the agricultural sector is the development of an efficient loT-based smart irrigation system. This study creates a weather-based, low-cost intelligent irrigation system. The first step is to design an efficient drip irrigation system .The system also has sensors for temperature, humidity, and raindrops; these have been modified to enable online remote monitoring of these parameters. These field weather variables are current as of now.

B. Sensor parameter based automated smart irrigation system with internet of things.

[3] India is a nation where agriculture is extremely important. Therefore, it's essential to water the plants sensibly to maximize production per unit space and produce highquality results. The practice of giving plants a certain amount of water at a specific time is known as irrigation. This project aims to provide smart drip irrigation for the plants . The open source platform serves as the system's primary controller in order to do this. Many sensors have been used to continuously provide the current characteristics of elements that affect the healthiness of plants. Plants receive water on a regular basis based on the operation of a solenoid valve.

C. Smart Irrigation System.

[4] It is true that watering plants is important, especially in agricultural contexts, and that it frequently takes a lot of time and effort from farmers. Conventional irrigation techniques can be labor-intensive and inefficient, wasting water or providing insufficient water, which can cause crop loss. Moreover, unpredictable water availability creates extra issues for irrigation management in scenarios where farmers depend on rainfall, canals, or groundwater. By automating the process of watering plants, smart irrigation systems provide a solution to these problems, lessening the strain on farmers and guaranteeing the best possible water supply for crops. Utilizing automation technology, these systems provide plants with exact watering schedules depending on a variety of parameters, including soil moisture content, plant requirements, and weather projections.In agricultural environments, intelligent

III. Related Works

A. WSN-Based Water system

Many developments in the field of agriculture have been made possible by the advancement of WSNs, making cultivation activities more accurate and precise in real time. It is suggested to use WSNs in a programmed water system architecture for Jew's ear planting. ZigBee is used to connect the climate station, actuators, and remote sensor hub directly to the flexible controller. To put their findings in context, the researchers took measurements of the experimental field's ambient temperature and humidity. There are two ways to evaluate the state of the water system: manually and automatically.

B. IOT-Based Water System

The modernization of rural water systems involves incorporating Internet of Things (IoT) technology. One key element of this system is the integration of GSM for seamless communication between the director and the central unit. Additionally, the utilization of IP-enabled Wi-Fi enables a direct and efficient connection between the central unit and the sensor hub. In case of any water shortages in the primary water supply, the chairman is promptly notified through SMS alerts, demonstrating the system's proactive nature. To optimize water distribution within agricultural fields, the framework incorporates thermal imaging technology to accurately determine the temperature requirements for effective irrigation planning. Overall, the integration of these advanced technologies aims to enhance the efficiency and effectiveness of rural water management systems.

IV. Proposed System

The integration of smart irrigation systems with plant disease detection represents a modern and efficient solution for managing agricultural or garden irrigation while simultaneously monitoring the health of plants. This synergistic approach utilizes IoT technology to create personalized water schedules for each plant, ensuring optimal hydration levels without waste.This can be acheived by sensors,weather forecast and data analytics to optimize water usage in agricultural fields.Based on the information from the sensors and weather forecast it autonomously controls irrigation schedules Concurrently, machine learning techniques are employed to detectand quantify plant diseases, leveraging extensive datasets to train models that recognize disease patterns and provide guidance for remedial action. By combining these technologies, farmers and gardeners can enhance crop health, conserve water resources, and optimize agricultural productivity.

A. Smart irrigation system

A Smart irrigation system using IoT is a personalized water butler for plants, monitoring their thirst based on a detailed schedule. The system delivers the right amount of water to each plant, ensuring they are neither parched nor flooded. This approach saves water, boosts plant health, and is easily managed through web app. Farmers are increasingly interested in smart agriculture due to affordable IoT sensors, which help monitor fields and crops, save water, and reduce pesticide use. AI technology can also predict and prevent crop problems.

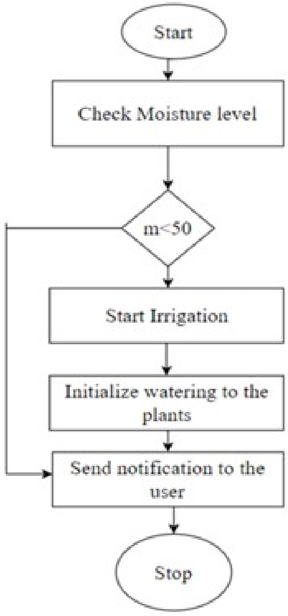

fig 1:Smart irrigation Overview

The paper explores the use of IoT and AI in smart agriculture, highlighting challenges and future prospects, focusing on wireless sensor technologies for crop growth measurement.

The proposed IoT-based water system framework uses sensors like pH, temperature, and humidity to improve crop health and yield. It uses an ESP8266 microcontroller and sensors for rain, temperature, stickiness, and soil dampness. The app allows real-time monitoring of natural conditions and control of water system management. It also includes a machine learning-powered disease detection module for early plant identification and prevention.

B. Plant Disease Detection: Overview

Machine learning-based plant disease detection uses large datasets of healthy and sick plants to train algorithms to identify patterns, lesions, discolorations, or irregularities linked to different diseases. This technology is crucial in agriculture, reducing crop losses, ensuring food security, and fostering sustainable ecosystems. The development of cutting-edge technologies has revolutionized plant disease detection techniques, increasing precision, speed, and accessibility.

This proactive approach also plays a critical role in reducing the economic losses associated with diminished crop yield and quality, thereby safeguarding farmers' livelihoods. Moreover, implementing effective disease management strategies aids in lessening the dependency on chemical pesticides, aligning with the goals of sustainable agricultural practices. Traditionally, disease detection has relied heavily on visual inspection, where experts examine plants to identify disease symptoms.

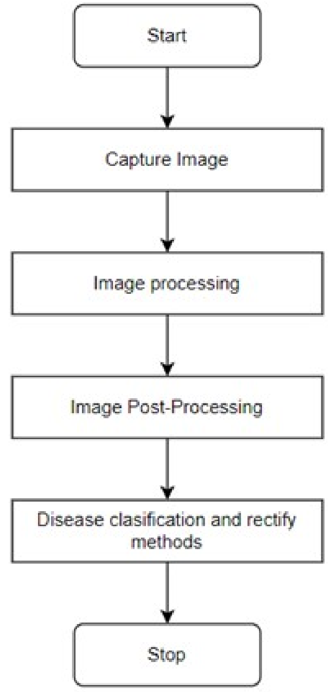

fig 2:Disease Detection Overview

C. System Architecture

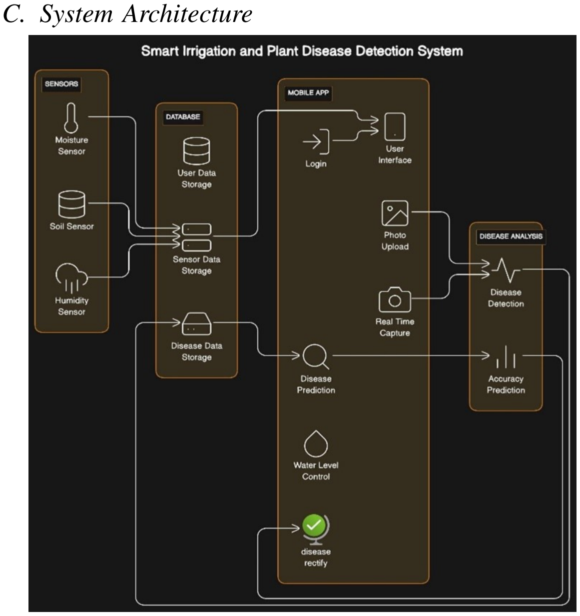

fig 3:System Architecture

The technology detects plant diseases and uses intelligent irrigation. This system is equipped with a number of sensors, such as a humidity, soil, and moisture sensor.Information about any plant illnesses that the system detects can also be included in the database. One web application that offers a user interface for engaging with the system is part of the system. Users can submit photos, examine sensor data, and capture in real time by logging into the smartphone app. Plant illnesses are identified and forecasted using the system's disease analysis component. When a plant disease is identified, the system can offer suggestions for fixing the problem and enhancing the health of the plant.The water level control feature of the system allows users to manage the amount of water that their plants receive.

V. Results and Discussion

A smart irrigation system uses technology to automatically adjust watering schedules based on the specific needs of plants. Each plant is equipped with soil moisture, temperature, and humidity to determine the optimal watering schedule for each plant. Watering of each plant is based on the growth level and it is shown below

Crop	Seed	Young Plant	Adult Plant
Tomato	10-20S, 2X	20-30S, D	30-40S, 3X W
Grape	10-20S, 2X	20-30S, D	30-40S, 3X W
Lettuce	5-10S, 2X	15-20S, D	20-30S, 3X W
Rose	10-20S, 2X	20-30S, D	30-40S, 3X W
Carrot	5-10S, 2X	15-20S, D	30-40S, 3X W
Pepper	10-20S, 2X	20-30S, D	30-40S, 3X W
Basil	5-10S, 2X	15-20S, D	30-40S, 3X W

Along with this, the system contains plant disease detection which uses machine learning algorithm.The system classify the diseased plants based on the information from the trained dataset.Dataset contain more than 2000 images of helathy and diseased plant which results in high percentage of accuracy.

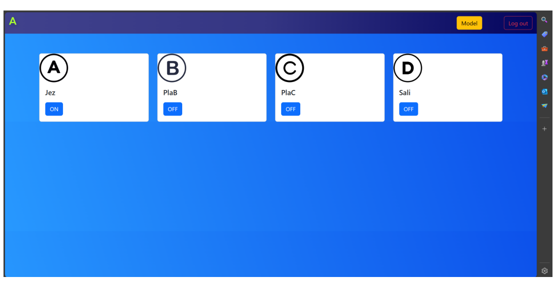

fig 4:Differentiating each plants and monitoring the irrigation separately

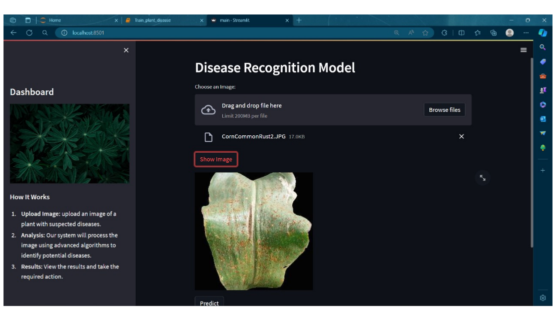

fig 5:Uploading the image of the plant for detecting the disease

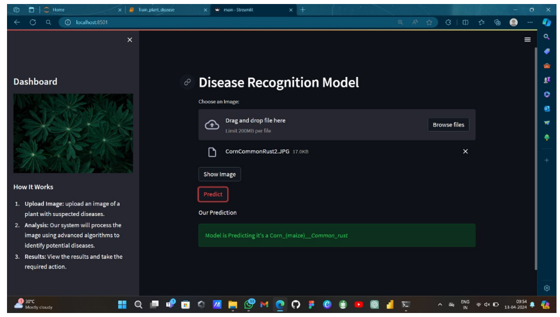

Fig 6: Detecting the disease of the plant

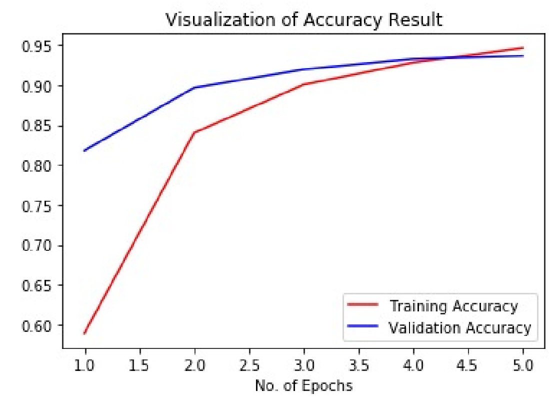

Fig 7: Graph which shows the visualisation of Accuracy Result

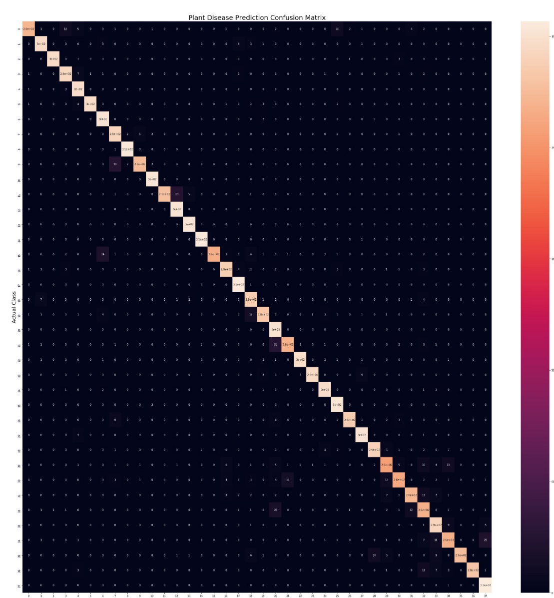

Fig 8: Plant disease detection confusion matrix

VI. Future Scope

The future scope of the smart irrigation system project holds significant promise across multiple fronts. Advancements in technology, such as artificial intelligence and big data analytics, can further optimize irrigation schedules and enhance crop management practices. Integration with precision agriculture frameworks will enable site-specific management of inputs, while remote monitoring capabilities will offer flexibility and accessibility to farmers worldwide. Environmental sustainability will remain a key focus, with efforts directed towards reducing water waste and promoting eco-friendly practices. Scalability and accessibility will drive the development of affordable solutions for smallholder farmers and resource-constrained regions. Collaboration among stakeholders will foster knowledge sharing and accelerate the adoption of smart irrigation systems, ultimately contributing to a more sustainable and resilient food system.

VII. Conclusion

The Smart Gardening System uses the Internet of Things to transform gardening techniques by providing individualized advice and real-time monitoring for the best plant care. It encourages effective resource management and gives consumers the ability to remotely manage their gardens by combining sensors and automatic watering control. This technologically advanced solution makes gardening easier and guarantees healthier plant growth and higher yields for novice and experienced gardeners alike. All things considered, the Smart Gardening System is a harmonious fusion of contemporary technology and the natural world, increasing everyone's access to and efficiency from gardening.

References

[1] [1]Barsha Biswas; Rajesh Kumar Yadav,A Review of Convolutional Neural Networkbased Approaches for Disease Detection in Plants, 2023.

[2] [2]Diksha Tandekar; Snehlata Dongre,A Review on Various Plant Disease Detection Using Image Processing, 2023.

[3] [3]M. Benedict Tephila; R. Aarthi Sri; R. Abinaya; J. Aiswarya Lakshmi; V. Divya,Automated Smart Irrigation System using IoT with Sensor Parameter,2022.

[4] [4]Bharanikapula Yaswanth Sri Sai Murthy; Chinnaankannagari Bharath Kumar Reddy; Shaik Jilani; Manoj Sindhwani,Smart Irrigation System,2022.

[5] [5]M. Ayaz, M. Ammad-Uddin, Z. Sharif, A. Mansour, and E. M. Aggoune, "Internetof-Things ,2019.

[6] [6]O. Elijah, T. A. Rahman, I. Orikumhi, C. Y. Leow, and M. N. Hindia, "An overview of Internet of Things,2018.

[7] [7]O. Elijah, T. A. Rahman, I. Orikumhi, C. Y. Leow, and M. N. Hindia,An overview of Internet of Things (IoT) and data analytics in agriculture,2018

[8] [8]M. Mahbub,A smart farming concept based on smart embedded electronics, Inter- net of Things and wireless sensor network,2020..

[9] [9] M. Bhatia and S. K. Sood,Quantum computing-inspired network optimization for IoT applications,2020..

[10] [10] A. P. Kale and S. P. Sonavane,IoT based smart farming : Feature subset selection for optimized high-dimensional data using improved GA based approach for EL,2019. .

[11] [11] S. K. Roy, S. Misra, and N. S. Raghuwanshi,SensPnP: Seamless integration of heterogeneous sensors with IoT devices,2019..

[12] [12] Y. Kim, R. G. Evans, and W. M. Iversen,Remote sensing and control of an irri- gation system using a distributed wireless sensor network,2008..

[13] [13] Y. Zhou, X. Yang, L. Wang, and Y. Ying,A wireless design of low-cost irrigation system using ZigBee technology,2009. 12