



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 5, May 2025

Crops Monitoring System using Raspberry pi

Anushya M¹, Guru Balaji U¹, Jijo S D¹, Salman A¹, R. Chandra Prakash²

U.G. Students, Department of Robotics & Automation, Dhaanish Ahmed Institute of Technology, Coimbatore,
Tamil Nadu, India¹

Assistant Professor, Department of Robotics & Automation, Dhaanish Ahmed Institute of Technology, Coimbatore,
Tamil Nadu, India²

ABSTRACT: In today's digital era, smart agricultural monitoring system offers significant advantages in various farming practices, including crops growth monitoring and promoting crops health. This paper presents the design and implementation of an Crops Monitoring System using Raspberry Pi as the central controller, integrated with a camera sensor for crop monitoring and, a soil moisture sensor for soil health monitoring and SMS notification capability. The system aims to detect crop disease, enhance accuracy, and provide real-time notification features. The hardware components, including the Raspberry Pi, soil moisture sensor, camera module, and Arduino for communicating with sensors, are interfaced and programmed using Python libraries such as OpenCV, Flask, HTML and Matplotlib . The workflow involves capturing images of plant leaves, which are analyzed using machine learning algorithms, such as convolutional neural networks, to detect early signs of diseases. Upon disease detection, the system alerts farmers through notifications, enabling timely intervention and targeted application of treatments. The system's architecture, hardware setup, software components, and integration strategies are discussed in detail, along with considerations for security, scalability, and reliability. Challenges encountered during development and potential solutions are also addressed. This integrated approach enhances crop yield and quality by enabling proactive disease management and efficient resource utilization.

KEYWORDS: Disease detection, Message notification, Iot

I. INTRODUCTION

Agriculture is the backbone of many economies around the world, and advancements in technology are playing a vital role in transforming traditional farming practices into more efficient, sustainable, and data-driven operations. One such innovation is the Smart Crop Monitoring System with Disease Detection, which leverages modern technologies such as the Internet of Things (IoT), and image processing to enhance crop management.

This system leverages the Internet of Things (IoT), sensors, and data analytics to monitor the health and growth conditions of crops in real-time. These systems collect vital data such as soil moisture, temperature, humidity, and light intensity, providing farmers with insights into the optimal conditions for crop growth. By continuously tracking these variables, the system can alert farmers to potential issues, helping them make timely and informed decisions about irrigation, fertilization, and crop management.

Additionally, disease detection plays a critical role in preventing crop loss and ensuring food security. By utilizing machine learning, image processing, and remote sensing technologies, these systems can identify early signs of pest infestations or plant diseases, often before they are visible to the naked eye. This early detection is crucial for minimizing the use of pesticides, reducing environmental impact, and ensuring healthier, more robust crops.

Overall, the Smart Crop Monitoring and Disease Detection System empowers farmers with actionable information, reduces labor, and promotes precision agriculture, paving the way for a smarter and more resilient agricultural future.

II. LITERATURE SURVEY

The system aimed at automating the irrigation process based on real-time soil moisture levels. This reduced water consumption and improved crop yield by ensuring that crops received water only when necessary. The system

was scalable and low-cost, making it an ideal solution for small-scale farmers [1]. They implemented sensors connected to the Raspberry Pi, which transmitted real-time data to a cloud server, where it could be analyzed and accessed by farmers via a mobile app. The study demonstrated that such systems allow farmers to monitor their fields remotely and make informed decisions regarding irrigation and crop management[2].The Raspberry Pi was used to capture images of crop leaves, which were then processed and analyzed for potential disease symptoms. The system used machine learning algorithms like Convolutional Neural Networks (CNNs) to classify diseases such as powdery mildew and leaf spot. The authors found that the system was effective for early detection and provided accurate predictions, minimizing the need for manual labor and pesticide use.[3]Crop diseases are a serious threat to productivity and sustainable development in agriculture. Agriculture is the first act that has helped humanity thrive and prosper. Today, the food and agriculture industry is a major priority in the world due to the growing number of people and, therefore, the increasing demand for food to sustain their lives. Farming is the primary source of food and fuel, contributing to the country's financial development[4]. This system highlights the increasing relevance of machine learning and image processing techniques in precision agriculture, particularly for early disease identification to minimize crop loss. They discuss existing methods that rely on traditional image processing and classification models, noting limitations in accuracy, scalability, and computational efficiency. The authors emphasize the advantages of CNNs in extracting complex features directly from raw images, outperforming older techniques like k-means clustering or support vector machines (SVMS). Their survey also covers the growing role of embedded systems in agriculture, framing the Raspberry Pi as a viable tool for deploying deep learning models in field conditions.[5]

III. METHODOLOGY

Plant disease monitoring with Raspberry Pi involves capturing images of leaves, processing them using image analysis techniques and machine learning, and then identifying the presence of disease. The system typically includes a camera connected to a Raspberry Pi, which is used to process the images and determine if a plant is diseased. An Arduino UNO is used to connect the sensors to collect the real time datas

Image Acquisition:

A camera, such as the Raspberry Pi Camera v2, captures images of plant leaves, focusing on areas where disease symptoms are visible. The resolution and quality of the camera affect the accuracy of disease detection.

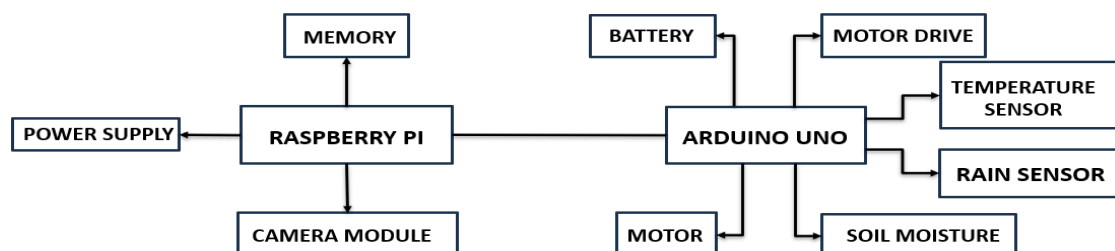
Image Preprocessing:

The captured images are preprocessed to enhance the features of the disease, such as removing noise and enhancing the contrast. Techniques like image clipping, smoothing filters, and image enhancement are used.

Alert and Notification:

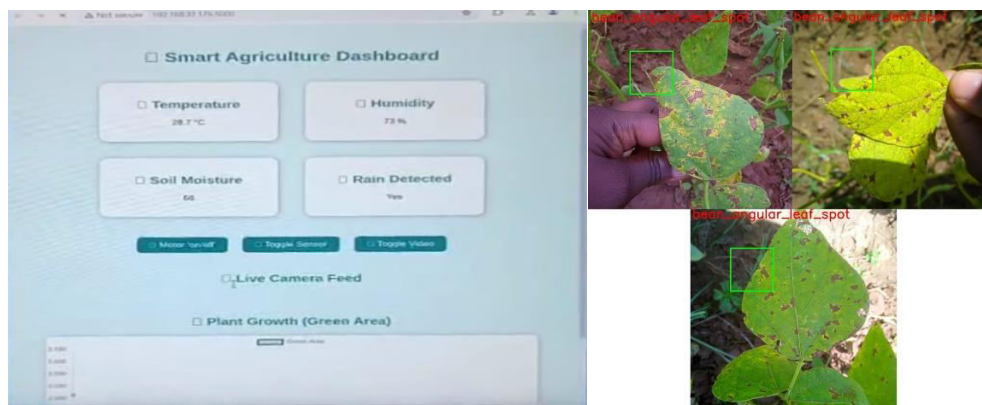
The results of the disease classification can be displayed on a screen or transmitted to the user via email or SMS. This allows the farmer to take appropriate action to treat or prevent the disease.

IV. BLOCK DIAGRAM



V. EXPERIMENTAL RESULTS

These figures shows the live monitoring of Temperature, Humidity, Soil moisture and also shows the disease detected images .



An alert message will be sent to the farmer through SMS when plant disease is detected

VI. CONCLUSION

We have implemented technologies like Raspberry Pi, Arduino UNO, image processing, and sensors allows for early detection and real-time monitoring, helping farmers respond quickly and reduce losses. These smart solutions are cost-effective and adaptable, making them especially valuable in resource-limited settings.

REFERENCES

- [1] Mohanty, S. P., Hughes, D. P., & Salathé, M. (2016). Using deep learning for image-based plant disease detection. *Frontiers in Plant Science*, 7, 1419.
- [2] Ferentinos, K. P. (2018). Deep learning models for plant disease detection and diagnosis. *Computers and Electronics in Agriculture*, 145, 311-318.
- [3] Barbedo, J. G. A. (2016). A review on the use of machine learning for plant disease detection and classification. *Computers and Electronics in Agriculture*, 127, 145-160.
- [4] Pinter, P. J., et al. (2003). Remote sensing for crop management. *Photogrammetric Engineering & Remote Sensing*, 69(6), 647-664.
- [5] Patil, S. N., & Kale, K. V. (2017). Real-time plant disease detection system using Raspberry Pi. *International Journal of Computer Applications*, 170(6), 33-38.
- [6] Kulkarni, A., & Patil, A. (2020). Plant disease detection using image processing and machine learning. *International Journal of Engineering Research & Technology (IJERT)*, 9(7), 2278-0181.
- [7] Singh, A., Bhatia, N., & Jain, S. (2018). IoT-based crop disease prediction using environmental sensors and machine learning. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology*, 3(6), 227-233.
- [8] Anusha, S., Kumar, R., & Sharma, N. (2021). IoT-based crop health monitoring and disease prediction using machine learning and cloud computing. *Materials Today: Proceedings*, 46, 6773-6777.
- [9] Jadhav, R., & More, S. (2022). Smart agriculture system using Raspberry Pi for disease prediction and environmental monitoring. *International Journal of Innovative Research in Computer and Communication Engineering*, 10(4), 892-899.
- [10] Baratov, R., & Valixanova, H. (2023). Smart system for early detection of agricultural plant diseases in the vegetation period. *E3S Web of Conferences*, 386, 01007.
- [11] Sebastian, A., Fathima, A. A., R., P., Kumar, M. S., Kannan, Y. G., & Murali, V. (2024). ViTaL: An advanced framework for automated plant disease identification in leaf images using vision transformers and linear projection for feature reduction. *arXiv preprint arXiv:2402.17424*.

- [12] Amara, J., Bouaziz, B., & Algergawy, A. (2017). A deep learning-based approach for banana leaf diseases classification. In Proceedings of the 2017 International Conference on Advanced Technologies for Signal and Image Processing (ATSIP) (pp. 1–6). IEEE.
- [13] Correa da Silva, P. E., & Almeida, J. (2024). An edge computing-based solution for real-time leaf disease classification using thermal imaging. arXiv preprint arXiv:2411.03835.
- [14] Kumar, A., Jindal, A., & Goyal, M. (2021). Leaf disease detection using convolutional neural network and Raspberry Pi. In 2021 International Conference on Emerging Trends in Engineering, Science and Sustainable Technology (ICETESST) (pp. 1–6). IEEE.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details