Raspberry Pi Green Medic (Smart Disease Detection and Healing for Healthy Plants)

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ABSTRACT :

Green plants are very much important to the human environment; they form the basis for the sustainability and long term health of environmental systems. Thus it is very important to grow healthy plants. The plant disease could be cured if it is known in the earlier stage. In this project, we have proposed a system using raspberry pi to detect healthy and unhealthy plants and alerts the farmer by sending email. It can be used in an controlled environment farms such that it detects the signs of disease whenever they appear on the leaves of the plant. A system for detecting and stopping the spread of plant diseases was discussed. For image analysis, the Open CV algorithm was employed. It may be used in large harvest ranches since it has a variety of target locations, and it does this by naturally identifying disease symptoms on plant leaves. Because it has the benefits of monitoring crops in the field in the form and therefore automatically detecting disease signs by image processing using an algorithm

INTRODUCTION

Agriculture plays a pivotal role in sustaining human life, providing nourishment, and supporting economies worldwide. However, plant diseases pose a significant threat to crop yields and food security. Detecting and managing these diseases in a timely manner is crucial to ensure a stable food supply. Advances in technology have opened up new possibilities for addressing this challenge, and one promising solution is the use of the Raspberry Pi, a versatile and affordable single-board computer. This project aims to harness the power of Raspberry Pi for the early detection of plant diseases, revolutionizing the way we monitor and protect our crops.

Plant diseases can be caused by various factors, including fungi, bacteria, viruses, and environmental stressors. Detecting these diseases early is essential because it allows for prompt intervention, reducing the spread of the disease and minimizing crop damage. Traditional methods of

disease detection often rely on visual inspection, which can be time-consuming and prone to human error. Moreover, in large agricultural fields, monitoring every plant manually is impractical.

LITERATURE REVIEW

The proposed system utilizes a Raspberry Pi to effectively detect the health status of plants, distinguishing between healthy and unhealthy ones. This is achieved through the integration of TensorFlow, a powerful tool for numerical computation and machine learning. TensorFlow enables the system to process large amounts of data efficiently, extracting relevant features indicative of plant health. By analyzing various parameters such as leaf color, texture, and overall vitality, the system can accurately classify plants into healthy or unhealthy categories. Upon detection of unhealthy plants, the system triggers an alert mechanism, promptly notifying the farmer via email. This proactive approach allows farmers to take timely action, such as implementing targeted interventions or adjusting cultivation practices, to mitigate potential crop losses and optimize yield. Overall, the integration of Raspberry Pi and TensorFlow offers a cost-effective and scalable solution for precision agriculture, empowering farmers with actionable insights to enhance crop management and productivity.

The project employs the Raspberry Pi Pico microcontroller to facilitate plant health monitoring, leveraging the Convolutional Neural Network (CNN) algorithm for image analysis. Given the challenges associated with the extensive range of colors in RGB images, the system adopts a grayscale conversion approach to simplify processing. By focusing on the primary colors—red, green, and blue—the complexity of the image analysis task is reduced, enhancing efficiency and accuracy. This method enables the system to effectively detect plant diseases at early stages, mitigating the need for labor-intensive monitoring in large crop farms. The automatic detection technique not only streamlines the monitoring process but also enables timely intervention, helping farmers address the side effects of illnesses promptly. Overall, this approach offers a practical solution for enhancing crop health management and optimizing agricultural productivity.

The proposed Raspberry Pi-based system offers automated identification of plant diseases, addressing the delays typically associated with manual visual inspection or laboratory examination. The process involves several sequential steps to streamline disease identification. Initially, pre-processing techniques are applied to enhance the quality of leaf imagery, followed by segmentation to isolate the diseased areas for analysis. Subsequently, features are extracted from the segmented regions, leveraging the Gray-Level Co-occurrence Matrix (GLCM) to capture textural information and color-based features.

Feature selection techniques are then employed to identify the most discriminative features for classification. Finally, a classifier is trained using the selected features to categorize the plant leaves into healthy or diseased classes. By automating this process, the system significantly reduces the time required for disease identification, enabling farmers to take prompt corrective measures and minimize yield losses due to disease outbreaks. Overall, the integration of Raspberry Pi facilitates a cost-effective and efficient solution for plant disease management, enhancing agricultural productivity and sustainability.

At last Here we have planned to provide intimation and fertigation suggestion for resisting further disease growth in plants through mails/SMS to farmers.

DISEASES

The Raspberry Pi Green Medic disease features refer to specific attributes extracted from plant leaves to identify the presence of disease, particularly Green Medic disease. These features capture both color and texture characteristics of the leaf, allowing for accurate classification between healthy and diseased plants. Color features may include variations in green hues associated with the disease, while texture features encompass patterns or irregularities present on the leaf surface. By analyzing these features, the system can effectively detect the presence of Green Medic disease, enabling farmers to take timely actions to mitigate its impact and prevent further spread.

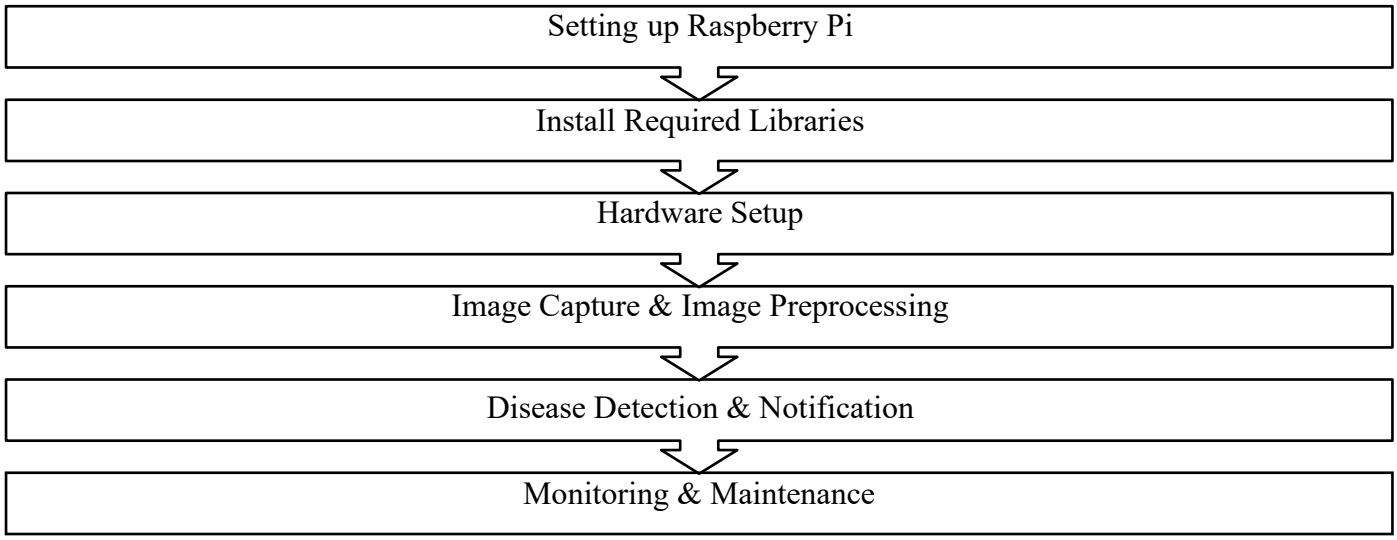
Potato Early Blight

Potato Healthy

Potato early blight disease detection involves the identification of symptoms associated with the fungal pathogen Alternaria solani. Early blight typically manifests as dark lesions with concentric rings on potato leaves, leading to reduced yield and quality. Detection methods often rely on visual inspection or image analysis techniques to identify these characteristic symptoms. Automated systems, such as those utilizing machine learning algorithms, can analyze leaf images for features indicative of early blight, such as lesion size, shape, and color variations. Early detection enables farmers to implement timely management strategies, such as fungicide application or crop rotation, to mitigate the disease's impact and preserve potato crop health and yield.

All things considered, our observations on the illness are solely employed to make health decisions. An obvious change in the plant is a symptom of a disease. Depending on how the plant reacts to infections, insects, etc., signs may alter the shading, form, or ability of the plant. The leaf's ability to contract is a characteristic. Verticilium symptoms of withering Infectious plant pathogens V. dahliae and Verticillium alboatrum are responsible for its realisation. Basic indicators of bacterial infection are often dull-colored, necrotic skin.wounds included by a magnificent light yellow brilliance onthe edge of the plant leaf or inside the leaf on the bean plants.You don't see the pathogen of the illness, yet are action achieved by the pathogen

METHODOLOGY



TECHNOLOGIES

1. **OpenCV:** OpenCV represents Computer Vision Open Source. It contains the library of programming capacities for AI programming. OpenCV is required for picture handling applications continuously. OpenCV is created generally in C, C++ and its guideline interface is in C++ language, yet regardless of all that it hold sales no matter how you look at It yet wide C language interface.
2. **Python:**Is modest Python, simple to learn. It is required for raspberry Pi - related code programming. Python is a language that supports both as packages and modules. Besides the standard library, it also has a python interpreter. They are available to all platforms free of charge in both source and binary form, and can be unreservedly disseminated to everyone. Python is a language scripting that empowers line-by-line execution of the code

CONCLUSION

In conclusion, the implementation of Raspberry Pi in Green Medic disease detection offers a promising solution for efficient and cost-effective plant health monitoring. By leveraging the capabilities of Raspberry Pi and appropriate sensors, the system can accurately detect the presence of Green Medic disease in plants. Through the extraction and analysis of relevant features such as color variations and textural irregularities in plant leaves, the system enables early and reliable detection of the disease. This timely identification empowers farmers to take proactive measures to manage and mitigate the spread of Green Medic disease, thereby safeguarding crop health and optimizing agricultural productivity.

The integration of Raspberry Pi technology into Green Medic disease detection represents a significant advancement in precision agriculture. By leveraging the computational capabilities of Raspberry Pi, along with image processing techniques and disease-specific algorithms, this system enables rapid and accurate identification of Green Medic disease in plants. The ability to detect the disease early allows farmers to implement timely interventions, such as targeted pesticide application or crop management practices, to mitigate its impact and prevent further spread. Moreover, the accessibility and affordability of Raspberry Pi make this solution practical for farmers across various scales of agriculture, from smallholders to large commercial operations.

The utilization of Raspberry Pi technology in Green Medic disease detection offers a myriad of benefits for agricultural practices. Firstly, its affordability and accessibility make it a practical solution for farmers of all scales, from smallholder operations to larger commercial farms. This democratization of technology

ensures that even resource-constrained farmers can access advanced tools for disease monitoring. Additionally, the integration of Raspberry Pi facilitates real-time monitoring, enabling farmers to swiftly identify the presence of Green Medic disease and take immediate action to mitigate its spread. By providing early detection, the system helps minimize crop damage and yield losses, ultimately safeguarding farmers' livelihoods. Furthermore, the automated nature of the Raspberry Pi-based detection system reduces the need for manual labor and extensive monitoring, freeing up valuable time and resources for other farm management activities. Overall, Raspberry Pi-based Green Medic disease detection enhances agricultural efficiency, productivity, and sustainability, contributing to the long-term resilience of farming communities.

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