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Real-time Plant Disease Detection and Pesticide Application System Using IoT and CNN

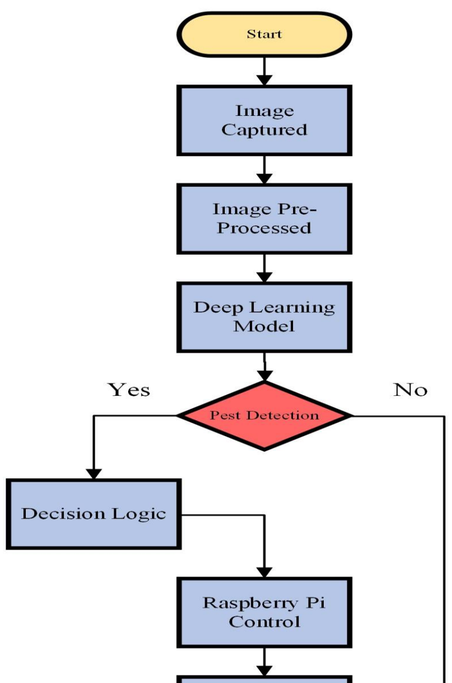
Abstract: This project presents the development of a Real-time Plant Disease Detection and Pesticide Application System utilizing Internet of Things (IoT) technology and Convolutional Neural Networks (CNN). The system is designed to capture real-time images of plants using a Raspberry Pi 2 and a camera module, detect diseases through a pre-trained CNN model, and automatically apply pesticides if a disease is detected. The integration of these technologies aims to provide an efficient and automated solution for early plant disease detection, thereby reducing crop loss and optimizing pesticide usage.

Introduction: Agriculture faces significant challenges from plant diseases, which can cause major crop losses. Traditional methods of disease detection involve manual inspection, which is time-consuming and error-prone.

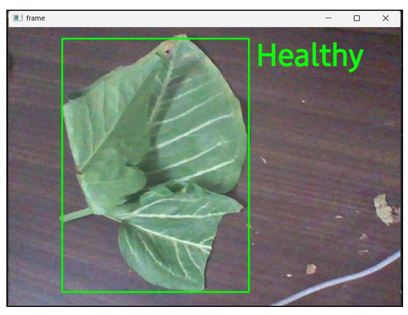
This project leverages IoT and Convolutional Neural Networks (CNN) to create a real-time plant disease detection and pesticide application system. Using a Raspberry Pi 2 with a camera module, the system captures plant images and processes them with a trained CNN model to detect diseases. If a disease is detected, the system automatically activates to apply pesticides precisely.

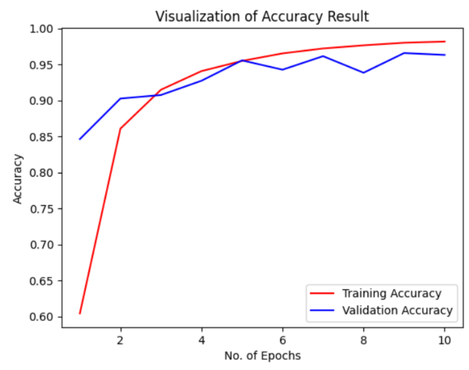
This integration aims to enhance the efficiency and accuracy of plant disease management, reducing pesticide usage and promoting sustainable agriculture. The project demonstrates how advanced technologies can transform traditional farming practices, leading to higher crop yields and improved sustainability.

Methodology:



Results and Discussion:





Limitations:

- Limited availability of diverse and high-quality datasets for training the CNN model may constrain its ability to generalize to different crops, regions, and disease types accurately.
- Factors like lighting conditions and variations in plant appearance could lead to false positives or negatives in disease detection, impacting the system's reliability in diverse settings.

Conclusion and Future Scope:

The Real-time Plant Disease Detection and Pesticide Application System presented here represents a significant advancement in agricultural technology. By seamlessly integrating IoT and CNN technology, this system offers a practical solution to combat the challenges posed by plant diseases in agriculture. Through real-time monitoring and automated intervention, it enhances crop protection and contributes to sustainable farming practices.

The future scope of this project includes several promising avenues for development. First, exploring advanced CNN architectures and machine learning techniques can significantly enhance the accuracy and versatility of disease detection, enabling the system to identify multiple diseases and their stages more effectively. Integrating environmental sensors to collect data on temperature, humidity, and soil moisture will provide a more comprehensive view of plant health and growth conditions. Additionally, implementing cloud-based solutions for model training, data storage, and remote monitoring will facilitate scalability and make the system more accessible to farmers across different regions.

Project Team