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AI- Based Autonomous Robot for Leaf Disease Detection IoT Base

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Abstract: *The increasing demand for sustainable agriculture and food security has driven the development of innovative technologies for early plant disease detection. This paper presents an autonomous robotics-based plant (leaf) disease detection system that integrates artificial intelligence (AI) and embedded hardware for real-time monitoring and diagnosis. The system employs a Raspberry Pi 3B+ as the central control unit, interfacing with a USB camera module for image acquisition and executing lightweight convolutional neural network (CNN) models for disease classification. Additional hardware components such as DC motors, L298N motor driver, relay modules, water pump, PCB, and power supply modules enable autonomous navigation, actuation, and automated disease management. Image processing techniques including noise reduction, segmentation, and feature extraction enhance detection accuracy under varying environmental conditions. Field testing demonstrates that the proposed system can effectively identify diseases such as blight, rust, and mildew, providing timely interventions and reducing dependency on manual inspections. This integrated approach offers a scalable, cost-effective, and environmentally friendly solution for precision agriculture.*

Keywords: Autonomous Robotics, Plant Disease Detection, Raspberry Pi, Convolutional Neural Networks, Precision Agriculture.

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