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Department of Robotics and Artificial Intelligence Engineering

Farm-Watch: Intelligent Robotic System for Comprehensive Plant Health and Soil Monitoring

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The primary problem identified is the inefficiency and inaccuracy in traditional plant health monitoring, which relies heavily on manual inspection and basic tools, often resulting in delayed or missed detection of plant diseases and suboptimal soil conditions. Addressing this issue is crucial for optimizing crop yield and reducing agricultural losses, especially for small-scale farmers with limited resources. The impact of undetected plant health problems can lead to significant economic losses, food security concerns, and increased use of chemical treatments. The proposed project aims to develop a cost-effective robot for plant monitoring, capable of measuring soil moisture, temperature, and pH, while assessing plant health through leaf image analysis using machine learning (ML) and deep learning (DL). Existing solutions include manual inspections, standalone soil sensors, and basic image recognition apps, but they often lack integration, real-time feedback, and comprehensive analysis.

This project integrates these components into a single robotic system that provides real-time, precise, and actionable insights through a mobile app, enabling farmers to make informed decisions and promptly address plant health issues. The motivation behind this solution is to empower farmers with a reliable, cost-effective tool that enhances productivity and sustainability by minimizing crop losses and optimizing resource usage.

- Develop a robotic system equipped with sensors to measure soil moisture, temperature, and pH, ensuring real-time and accurate monitoring of soil conditions.

- Implement machine learning and deep learning algorithms for analyzing leaf images, enabling precise detection and diagnosis of plant diseases.

- Create a mobile application that receives data from the robot, providing farmers with timely alerts and actionable insights regarding the health of their plants.

To achieve the defined objectives, the project will follow a systematic work plan. First, the

robotic system will be designed and built, integrating sensors for soil moisture, temperature, and pH measurement. Next, machine learning and deep learning models will be trained using a diverse dataset of leaf images to accurately identify and diagnose plant diseases. Finally, a mobile application will be developed to receive and display data from the robot, providing real-time alerts and insights to farmers. The entire system will be tested and refined through iterative cycles to ensure reliability and effectiveness in various agricultural settings.

The expected outcome of the project is a functional prototype of the robotic plant monitoring system, capable of accurately measuring soil conditions and diagnosing plant health through image analysis. The prototype will demonstrate successful integration of sensors, ML and DL algorithms, and a user-friendly mobile application for real-time data transmission and alerts. By successfully executing this project, farmers will benefit from increased crop yield, reduced losses, and optimized use of resources, leading to enhanced agricultural productivity and sustainability

Signature of the Guide