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AI BASED AGRI PLANT DAMAGE DIAGNOSIS WITH PESTICIDES

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ABSTRACT: Plant health plays a pivotal role in ensuring high agricultural yield. This The study suggests a Raspberry Pi and AIpowered integrated system for automated fertiliz er administration and real-time plant disease identification.

The system can identify three distinct plant diseases by using deep learning for based disea se identification. based on on the diagnosis, a corresponding fertilizer solution is automatically dispensed using three separate relays and pumps. This enabled solution offers a cost-effective, intelligent approach to precision agriculture, minimizing human intervention while optimizing crop health.

Keywords: Raspberry Pi, AI, Plant Disease Detection, Deep Learning, Fertilizer Automation, Smart Agriculture, Image Processing, Relays, Pumps

I. INTRODUCTION

The increasing demand for sustainable agricultural practices necessitates the adoption of smart technologies. Plant diseases, if not identified and treated early, can drastically affect crop yield. Traditional monitoring methods are labor-intensive and often inaccurate. This research presents an AI-based system using Raspberry Pi to identify plant diseases via image processing and apply targeted fertilization using separate pumps for different diseases. This approach increases precision, reduces waste, and enhances productivity.

II. LITERATURE REVIEW

Several approaches have been developed for automated plant disease detection, using mobile apps, drones, and smart sensors. Machine learning techniques, especially convolutional neural networks (CNNs), have shown high accuracy in classifying diseases from leaf images. However, limited research exists on integrating disease detection with automated nutrient application based on specific plant needs.

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III. SYSTEM ARCHITECTURE

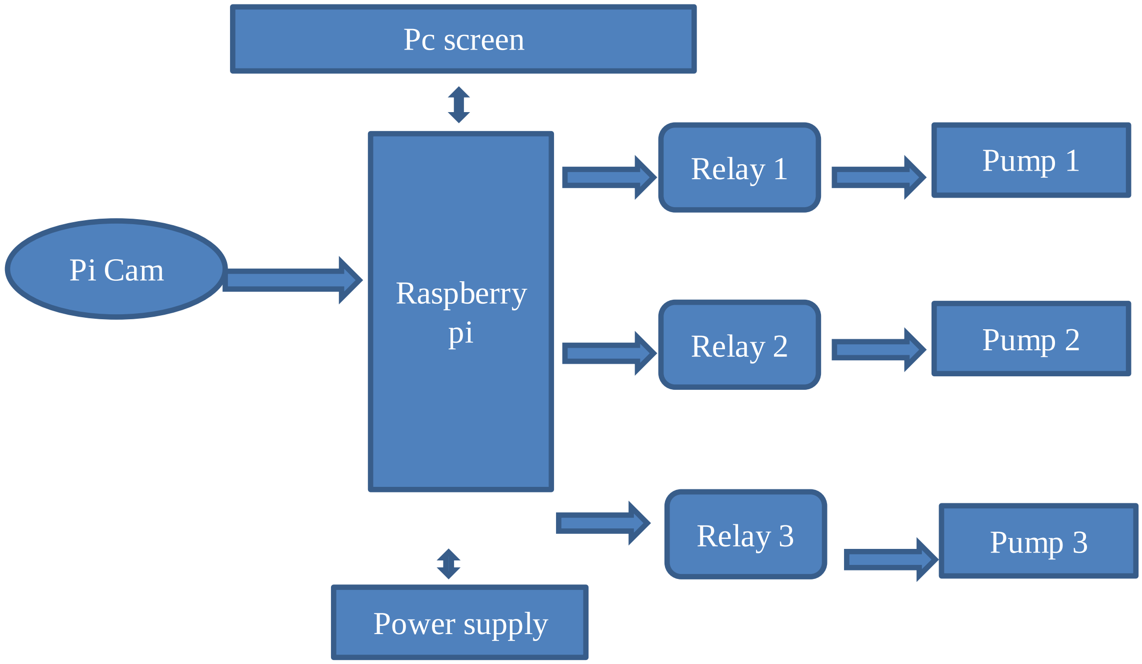

Fig1. Block diagram of project

3.1 Hardware Components

- **Raspberry Pi 4B** – Central controller for image processing and system control
- **Pi Camera Module** – Captures real-time images of plant leaves
- **Relays (3x)** – Controls the activation of the corresponding fertilizer pumps
- **Submersible Pumps (3x)** – Dispenses fertilizer for each disease type
- **Power Supply** – Powers Raspberry Pi and pump units
- **Fertilizer Tanks (3x)** – Contains nutrient mixtures specific to each disease

3.2 Software Components

- **Python and OpenCV** – For image acquisition and preprocessing
- **TensorFlow/Keras CNN model** – For classifying plant diseases
- **GPIO Library** – For controlling relays from Raspberry Pi

IV. METHODOLOGY

4.1 Disease Detection

Images of plant leaves are captured and preprocessed (resizing, normalization). A CNN model trained on a dataset of plant disease images classifies each image into one of the three disease categories:

- **Disease A** (e.g., Powdery Mildew)
- **Disease B** (e.g., Leaf Spot)
- **Disease C** (e.g., Blight)

4.2 Fertilization Logic

Each disease triggers a specific relay:

- **Relay 1:** Activates Pump A for Disease A
- **Relay 2:** Activates Pump B for Disease B
- **Relay 3:** Activates Pump C for Disease C

The pump runs for a preset duration, dispensing fertilizer directly to the affected plant's root zone.

V. RESULTS

Sample leaf photos of common tomato plant illnesses were used to test a prototype92% accu racy was attained by the CNN.When the illness was discovered, the matching pump was activated correctly. The delay between image capture and fertilizer dispensing was under 10 seconds, making it suitable for real-time applications.

5.1Future Work

- Integration of cloud-based monitoring and logging
- Expansion to detect more disease types
- Adding soil moisture and pH sensors for comprehensive plant health analysis
- Mobile app control and notifications

VI. CONCLUSION

The proposed Raspberry Pi-based system efficiently identifies plant diseases and responds with disease-specific fertilization using AI and automation. This fusion of deep learning and offers a promising direction for future smart farming technologies.

REFERENCE

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. https://doi.org/10.3389/fpls.2016.01419
2. Sladojevic, S., Arsenovic, M., Anderla, A., Culibrk, D., & Stefanovic, D. (2016). **Deep Neural Networks Based Recognition of Plant Diseases by Leaf Image**

Classification.*Computational Intelligence and Neuroscience*, 2016. https://doi.org/10.1155/2016/3289801

3. Nikhil, M. V., & Dhananjay, K. (2018). **IoT-Based Smart Agriculture Using Raspberry Pi**.*International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)*, 7(6), 6745–6751.
4. Kamilaris, A., Kartakoullis, A., & Prenafeta-Boldú, F. X. (2017). **A Review on the Practice of Big Data Analysis in Agriculture**.*Computers and Electronics in Agriculture*, 143, 23–37. https://doi.org/10.1016/j.compag.2017.09.037
5. Liakos, K. G., Busato, P., Moshou, D., Pearson, S., & Bochtis, D. (2018). **Machine Learning in Agriculture: A Review**.*Sensors*, 18(8), 2674. https://doi.org/10.3390/s18082674
6. Jha, K., Doshi, A., Patel, P., & Shah, M. (2019). **A Comprehensive Review on Automation in Agriculture using Artificial Intelligence**.*Artificial Intelligence in Agriculture*, 2, 1–12. https://doi.org/10.1016/j.aiia.2019.05.004
7. Patel, A. N., & Doshi, M. R. (2020). **Plant Disease Detection using Deep Learning and Raspberry Pi**. *International Journal of Computer Sciences and Engineering*, 8(10), 22–26.