JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

IoT SMART PLANT MONITORING SYSTEM

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ABSTRACT

The proliferation of Internet of Things (IoT) technology has opened up innovative avenues for enhancing agricultural practices. In this paper, we propose an IoT-enabled smart plant monitoring system utilizing camera technology to provide real-time monitoring and analysis of plant health parameters. The system comprises a network of IoT devices including cameras strategically positioned within an agricultural environment. These cameras capture high-resolution images of plants at regular intervals. Image processing algorithms are employed to analyze these images and extract relevant information such as plant growth rate, leaf coloration, pest infestation, and disease symptoms.
Furthermore, the system integrates with cloud-based platforms for data storage and analysis, allowing farmers to access plant health metrics remotely via web or mobile interfaces. Machine learning techniques are leveraged to continuously improve the accuracy of plant health assessments over time, enabling proactive decision-making and precise resource allocation. The proposed IoT smart plant monitoring system offers several advantages over traditional methods, including reduced labor costs, early detection of plant stressors, and optimized resource utilization. Additionally, it facilitates data-driven insights that empower farmers to make informed decisions to improve crop yield and quality. The system is designed to be user-friendly, allowing individuals to monitor their plants remotely through a web or mobile interface. Utilizing Internet of Things (IoT) principles, the Smart Plant Monitoring System establishes a network of cameras and sensors that communicate seamlessly with a central processing unit. The captured visual data is analyzed to detect anomalies, diseases, or stress factors in plants, while environmental parameters contribute to a comprehensive understanding of the growing conditions. In conclusion, the Smart Plant Monitoring System using a camera contributes to the advancement of smart agriculture and sustainable plant care practices.

INTRODUCTION

In an era defined by technological innovation and a growing consciousness toward sustainable practices, the Smart Plant Monitoring System using advanced camera-based solutions emerges as a groundbreaking approach to revolutionize plant care. Departing from traditional methods reliant on periodic assessments, this system integrates strategically positioned cameras, environmental sensors, and sophisticated analytics to provide an unparalleled real-time understanding of plant health. The primary objectives encompass continuous monitoring, automated anomaly detection through advanced algorithms, and the creation of a user-friendly interface accessible via web or mobile platforms. The system's significance lies in its potential to redefine plant care practices, offering users immediate insights, proactive alerts, and a more engaged, informed, and sustainable approach to nurturing green environments. This paper unfolds to explore the intricate architecture, methodologies, and broader implications of the Smart

Plant Monitoring System, showcasing its transformative impact on intelligent and responsive plant management. The significance of the Smart Plant Monitoring System lies in its potential to redefine the landscape of plant care. In the pursuit of sustainable agriculture and advanced plant care, the integration of smart technologies has become a focal point of innovation. The Smart Plant Monitoring System, utilizing sophisticated camera-based solutions, represents a paradigm shift in the way we perceive and manage the health of our green companions. This revolutionary system capitalizes on visual data, intelligent sensors, and analytics to offer an unprecedented level of real-time insights into the well-being of monitored plants. Traditional plant monitoring methods, reliant on periodic assessments and manual observations, often fall short in providing a continuous, granular understanding of a plant's dynamic environment. The Smart Plant Monitoring System, powered by cameras, steps into this void, promising a more comprehensive and responsive approach to plant care. In conclusion, the Smart Plant Monitoring System utilizing camera-based technology represents a pivotal leap forward in the realm of plant care and management. This innovative system, driven by continuous visual data capture, environmental sensing, and intelligent analytics, has the potential to reshape traditional approaches to plant monitoring.

OBJECTIVE

The objective of implementing a Smart Plant Monitoring System using cameras is to create a technologically advanced and intelligent platform for comprehensive plant care. This system aims to leverage the capabilities of cameras, environmental sensors, and data analytics to offer real-time insights into the health and environmental conditions of monitored plants. By strategically deploying cameras, capturing visual data, and integrating sensors to measure humidity, temperature, and soil moisture, the system seeks to provide a holistic understanding of the plant's well-being. The primary goal is to enable proactive plant care by automating the detection of anomalies, diseases, or stress factors through advanced analytics. Through a user-friendly interface, users can remotely monitor their plants and receive timely alerts, fostering informed decision-making and promoting sustainable gardening practices. Ultimately, the objective is to empower individuals with a powerful tool that enhances their ability to care for and nurture thriving plant ecosystems.

COMPONENTS REQUIRED

- Raspberry pi
- Web cam
- Regulated power supply
- DHT11
- Relay Module
- Submersible Water Pump
- Soil moisture sensor
- BLYNK App

LITERATURE SURVEY

[1] Identification of leaf diseases in pepper plants using soft computing techniques (2016)

Digital image processing and the image analysis technology have a vital role in biology and agricultural sectors. Automatic detection of plant diseases and cultivation of healthy plants is of great importance and agricultural automation. The case of a plant, the term disease is defined as any impairment happening to the normal physiological function, producing characteristic symptoms. The studies of plant diseases refer to studying the visually observable patterns of a particular plan

[2] A Machine Learning Technique for Identification of Plant Diseases in Leaves (2021)

Plant diseases are the common reason for low yield and reduced income to the farmers. Currently, researchers are trying their best to find a mechanism that automatically detects the plant diseases. Accurate identification of plant diseases may help in finding a remedy at the earliest to control the loss. This paper attempts to develop a novel approach by using machine-learning techniques to predict the plant diseases. Experimental results show that the plant diseases can be accurately classified.

[3] Identification of Leaf Diseases of Medicinal Plants Using K-Nearest Neighbour Based on Colour, Texture, and Shape Features

Medicinal plants are plants with significant potential for development in Indonesia, as the Indonesian population is one of the largest users of medicinal plants in Asia. To obtain high-quality plants, early efforts need to be made by farmers to recognize the types of diseases and provide appropriate treatment. The main objective of this study is to identify diseases in medicinal plants through leaf image analysis based on colour and texture feature extraction, by comparing the K-Nearest Neighbour (K-NN) and Naïve Bayes methods. This comparison aims to determine which method is most suitable for identifying leaf diseases in medicinal plants.

[4] Plant Disease Identification Tracking and Forecasting Using Machine Learning

Methods like deep learning, feature extraction, and picture recognition are frequently used in disease detection. The created model also maps the soil and crop database and recommends appropriate crops depending on the number of nutrients available in the soil, enabling farmers to choose the right crops to be sown in their fields. Therefore, it is important to identify crop diseases as soon as possible. Farmers will profit from using a quick, creative approach and a crop recommendation system.

[5] Disease Identification in Papaya Plant and their Dataset

Papaya fruit which is known for its medicinal values is full of many nutrients which help human beings in fighting many ailments. This paper presents the comprehensive study of several research works done in the field of disease recognition and classification in Papaya plants. Different studies have been analyzed for comparing their problem domains, algorithms used, diseases and parts of papaya plant used along with the dataset used in corresponding research.

[6] Plant Disease Detection and Classification by Deep Learning

Deep learning is a branch of artificial intelligence. The application of deep learning in plant disease recognition can avoid the disadvantages caused by artificial selection of disease spot features, make plant disease feature extraction more objective, and improve the research efficiency and technology transformation speed. This review provides the research progress of deep learning technology in the field of crop leaf disease identification in recent years.

[7] Plant Leaf Diseases Fine-Grained Categorization Using Convolutional Neural Networks

The complex network occupies a large amount of computer memory and wastes a large amount of computing resources, which is difficult to meet the needs of low-cost terminals. This paper proposes a fine-grained disease categorization method based on attention network to solve the problem. In “Classification Model”, attention mechanism is used to increase identification ability. “Reconstruction-Generation Model” were added during training and the “Classification Model” have to pay more attention to differentiate areas to find differences instead of paying more attention to global features.

[8] Corn Leaf Diseases Diagnosis Based on K-Means Clustering and Deep Learning

Accurate diagnosis of corn crop diseases is a complex challenge faced by farmers during the growth and production stages of corn. In order to address this problem, this paper proposes a method based on K-means clustering and an improved deep learning model for accurately diagnosing three common diseases of corn leaves: gray spot, leaf spot, and rust. First, to diagnose three diseases, use the K-means algorithm to cluster sample images and then feed them into the improved deep learning model.

[9] An AIoT Based Smart Agricultural System for Pests Detection

Artificial intelligence and image recognition technologies are combined with environmental sensors and the Internet of Things (IoT) for pest identification. combined the current mature AIoT technology and deep learning and applied it to smart agriculture. We used deep learning YOLOv3 for image recognition to obtain the location of Tessaratoma, papillosa and analyze the environmental information from weather stations through Long Short-Term Memory (LSTM) to predict the occurrence of pests. environmental information from weather stations through Long Short-Term Memory (LSTM) to predict the occurrence of pests.

CONCLUSION

In conclusion, a smart plant monitoring system using a camera presents a promising solution for efficient and accurate plant health assessment. The ability to capture, process, and analyze images at regular intervals enables early detection of stress, diseases, or nutrient, deficiencies, allowing for timely intervention and improved agricultural practices. The user-friendly interface and alert mechanisms make it accessible to both farmers and researchers, providing valuable information for decision-making. As we embrace this technological evolution, it becomes evident that the Smart Plant Monitoring System not only addresses current plant care challenges but also paves the way for a future where technology harmoniously intersects with nature, fostering sustainable and intelligent approaches to plant management. The journey undertaken in this endeavor signifies a commitment to innovation, efficiency, and the coexistence of technology and the natural world, heralding a new era in smart and responsive plant monitoring systems.

ACKNOWLEDGEMENT

We would like to thank our guide Mrs. Y. Durga Bhargavi and our project coordinator Mrs. P. Swaroopa for their continuous support and guidance. We are also extremely grateful to Dr. M. V. VIJAYA SARADHI, Head of Departmentof Computer Science and Engineering (IoT), ACE Engineering College for his support and invaluable time.

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