ATMIYA UNIVERSITY

IoT FOR HEALTHY ECO-SYSTEM

A Thesis
Submitted to the
Atmiya University,
For the Degree of

DOCTOR OF PHILOSOPHY

in

ENGINEERING & TECHNOLOGY

by

Modha Hiren Jayantilal

Enrolment No. 190156003

Under the Guidance of

Dr. Ashish M. Kothari

Department of Electronics & Communication Engineering

ATMIYA UNIVERSITY,

Yogidham Gurukul, Kalawad Road,

Rajkot–360005, Gujarat (India)

January, 2023

Summary

Introduction - Times new Roman [14 Font]

The proposed research focuses on an intelligent decision support system in agriculture to save a supreme natural resource water, with increasing yield by monitoring crop health continuously. The key goal of the suggested research is optimizing the Eco-System by enhancing conventional agriculture practices with modern IoT- based trends. The research work highlights the strength of Machine Learning and Deep Learning techniques which offers marvellous upshots in precision farming. The recommended methodology not only increases flexibility but also reduce the workload of farmers, as well as boosts the agriculture revenue and economy of nations.

Chapter 1 Introduction

This unit shows the introductory part of the research which highlights the importance of a balanced Eco-system. The complications from the pollution due to electricity generation due to thermal power plants. In the field of agriculture farmers waste a lot of water for irrigation and hence the expenditure of electricity is at a high level. Also, its demonstrations the agriculture and precision farming are the major part of a healthy environment. It enhances the concept of IoT with its fabulous capability to make agriculture advancement and hence make Eco-System healthy.

Chapter 2 Literature Survey

This unit discusses the latest research and historical developments for crop disease identification and soil moisture forecasting. Different machine learning and deep learning techniques are utilized to classify the crop with different stages of diseases with high accuracy with good precision. Lots of innovative statistics-based approaches have been employed to predict soil moisture for smart irrigation, to improve yield and effective usage of water resources.

Chapter 3 Crop Diseases Identification

This unit focus on the methodologies for disease identification in crop applied in the proposed research. Based on image processing and the deep neural network

approach, several crop diseases are categorized. Different models have been created, examined, and the optimal one has eventually been determined for the classification of maize crop diseases. The best model has also been examined for consistency against several crop diseases.

Chapter 4 Soil Moisture Predictions

This unit emphasizes soil moisture prediction using different machine-learning techniques and neural networks. An authentic dataset is employed to develop a prediction model to forecast moisture inside the land and it would be analyzed using different statistical parameters.

Chapter 5 IoT Based Decision Support System

This unit represents the generalization ability of the proposed methodology with self-generated data. The IoT -based module is designed to retrieve different natural data from the land and the same research is applied on it to forecast the moisture.

Final Session exploits the conclusion and discussions regarding experience during research. The projected research is compared with previous study. It also wraps up thesis by making conclusions of proposed method and make some recommendations for future IoT based system.

Conclusion

The offered research has explored the excellent policy for precision farming. The special care of faming data by exploiting IoT based smart DSS can achieve an excellent throughput in the field of traditional agriculture progression. The suggested strategy delivers automatic farming parameter investigation and governing which may uplift the old-style farming method. Proposed scheme observes, the crop specific soil and environmental parameters monitoring with a smart Decision Support System (DSS). Artificial Neural Network (ANN) based decision support system is useful for controlling watering in the farm. The comprehensive agriculture data can also be kept in cloud-based system for large agriculture data analysis.

The proposed work has a great finding and achieves several objectives with high efficiency as well as low margin of errors. These are mentioned below.

- The suggested system can monitor the health of crop and identify the diseases with a great accuracy. This attainment increases the productivity in the field of agriculture and boost the economy of nation.
- Water is a crucial natural resource. The prediction of moisture with small error helps the effective use of water which can save water.
- The system can directly save the electricity and hence reduce the burden of "Electricity Generation" specially for thermal power station. This achievement, tortuously helps to reduce the pollution and make Eco-System healthy.
- The concept of remote sensing architecture and cloud-server, is increase the flexibility and speed of the system.
- The suggested research agrees with the opinion that, for the dataset with linear data conventional ML techniques like Linear Regression, is an excellent approach, to predict target variable, while Support Vector Machine and Neural Network is best for the dataset with nonlinear entities.

Machine learning uses transfer learning as a key approach to address the fundamental issue of insufficient training data. By loosening the requirement that the training data and the test data must be independent and equally distributed, it attempts to transfer knowledge from the source domain to the target domain. This will have a significant positive impact on numerous domains that are challenging to enhance due to a lack of training data. Transfer learning's primary advantages include resource savings and increased effectiveness while developing new models. Additionally, since the majority of the model will have already been trained, it can assist with model training when only unlabeled datasets are available.