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IOT based Crop Recommendation, Crop Disease Prediction and Its Solution

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Abstract – *Agriculture plays a vital role in India. India is the world's largest producer of different crops but still, it uses traditional framing methods therefore crop yield becomes down. Hence, with the introduction of newer seed varieties, new methods of agriculture crop production have increased. But without using the smarter ways, the agricultural field still having an imperfection. And due to these farmers need a smarter way to increase crop production. Hence, to maximize the crop yield some smart methods came into the picture used in IoT and Machine Learning. In this paper, we will review the algorithms like Random Forest, Decision Tree, ANN to get better accuracy for the system.*

Key Words: Precision Agriculture, agriculture, crop recommendation system, crop disease prediction, Internet of Things, Machine Learning.

1. Introduction

India is an agricultural nation, where the population is over 1.2 billion, out of which around 70% of the population depends upon agriculture. Agriculture is a primary source of earning for Indian citizens and agriculture also has made an influence on India's economy. Agriculturists have an immeasurable variety to choose equitable products of the soil crops. The selection of the crop by the farmer plays a vital role in the economical returns to the farmer.

The proposed system is a smart agriculture system which is automated to help farmers to increase crop production by predicting the crop to be sown. The system will detect soil quality and provided a list of selected general crops placed on a database. The system used different sensors that measured pH level, soil moisture, temperature, and humidity. After designing the system for pH, soil moisture, humidity, and temperature sensor, the next step is to build a model for crop recommendation. The database will compose of recommended minimum and maximum values of temperature, humidity, pH, soil moisture recommended for growing crops commonly planted in the country. After that weather forecasting will be done. In that weather forecasting, google API is used for taking the real-time weather values. Then by checking the weather condition, recommend the crop to be sown. Due to changing environmental conditions continuously crop arises the different diseases for controlling that system will recommend the solution to destroy disease. For maximizing the crop yield farmers use the pesticide, fertilizer in the high amount due to this toxicity of soil increases for controlling this activity system will recommend the best pesticide and fertilizer with best measurements.

2. Motivation

India is a nation in which agriculture plays a prime role. The prosperity of the farmers prospers the nation. Thus our system would help farmers in sowing the right seeds based on soil requirements to increase productivity and acquire profit. As a result, farmers can plant the right crop that will increase the yield and also increasing the overall productivity of the nation. As agricultural productivity mainly depends upon the soil condition which in turn depends upon nutrients present in the soil. Based on soil analysis crop should be recommended to the farmers to increase crop productivity and in turn, increase the financial status of the farmers. Also, farmers face huge losses due to various crop diseases. Crop diseases not only affect food security at the global level, but it also has adverse consequences for small-scale farmers whose income depends on healthy cultivation. The proposed system provides a solution for crop diseases by detecting them using automated image processing techniques. The objective of the proposed system is to detect crop disease present on the leaves and provide preventive measures for the detected disease.

3. Literature Survey

Low-cost iot+ml design for smart farming with multiple application paper authors Fahad Kamraan Syed, Agniswar Paul, Ajay Kumar, Jaideep Cherukuri in paper [1] proposed system for water management systems and improve current irrigation methods. An IoT and ML-based farming system always keeps farmers aware of the upcoming weather possibilities and gives them the best suggestions about irrigation methods and crops thereby helping in better yield.

Prof. Neepa Shah and other co-authors in paper [2] proposed and implemented a crop recommendation system, which can be easily used by farmers. The system would assist the farmers in making an informed decision about which crop to grow depending on a variety of environmental factors. The second Subsystem is called Rainfall Predictor, which predicts

the rainfall of the next 12 months. The high accuracies provided by both these models make them very efficient for all practical and real-time purposes.

The system in paper [3] suggested by authors Jagadish Kashinath Kamble proposed a system that helps the users Detecting the disease of the crop. The main purpose of this system is to help farmers with disease detection with speed and accuracy using Information and Communication Technology (ICT). The method used to design a plant disease detector for farmers for the early detection of plant disease infection and getting appropriate cure remotely. In the proposed system we define the application of texture analysis for detecting plant diseases with the help of different image processing techniques.

The system in paper [4] developed by Sundrameenakshi.G, Jayasuriya.A, Srioviya.G, Sumathi which suggests the best crops for farmers based on the soil test report and also suggesting the best fertilizers for the crops The crop recommendation is be based on Ph and soil type. The recommendation for fertilizers is be based on Nitrogen(N), Phosphorous(P), Potassium(K) values. The values are to predict the growth and yield of fruits and flowers of the plants.

The system in paper [5] developed Mayuresh Deodhar, Rushikesh Bhave, Kevin Bhalodia, and prof. Mansing Rathod which predicts which would be the suitable crop in a particular region and application will also detect a disease from the image of the crop if crop is suffering from any with the help of the image processing technique.

In Paper [6] authors proposed Agriculture Analysis Using Data Mining and Machine Learning technique. In this analysis, they used some of the common data mining techniques in the field of agriculture. Some of these techniques, such as the k-means, k nearest neighbor, SVM, and Bayesian network. Data mining in agriculture is an upcoming research field.

4. Proposed System Architecture

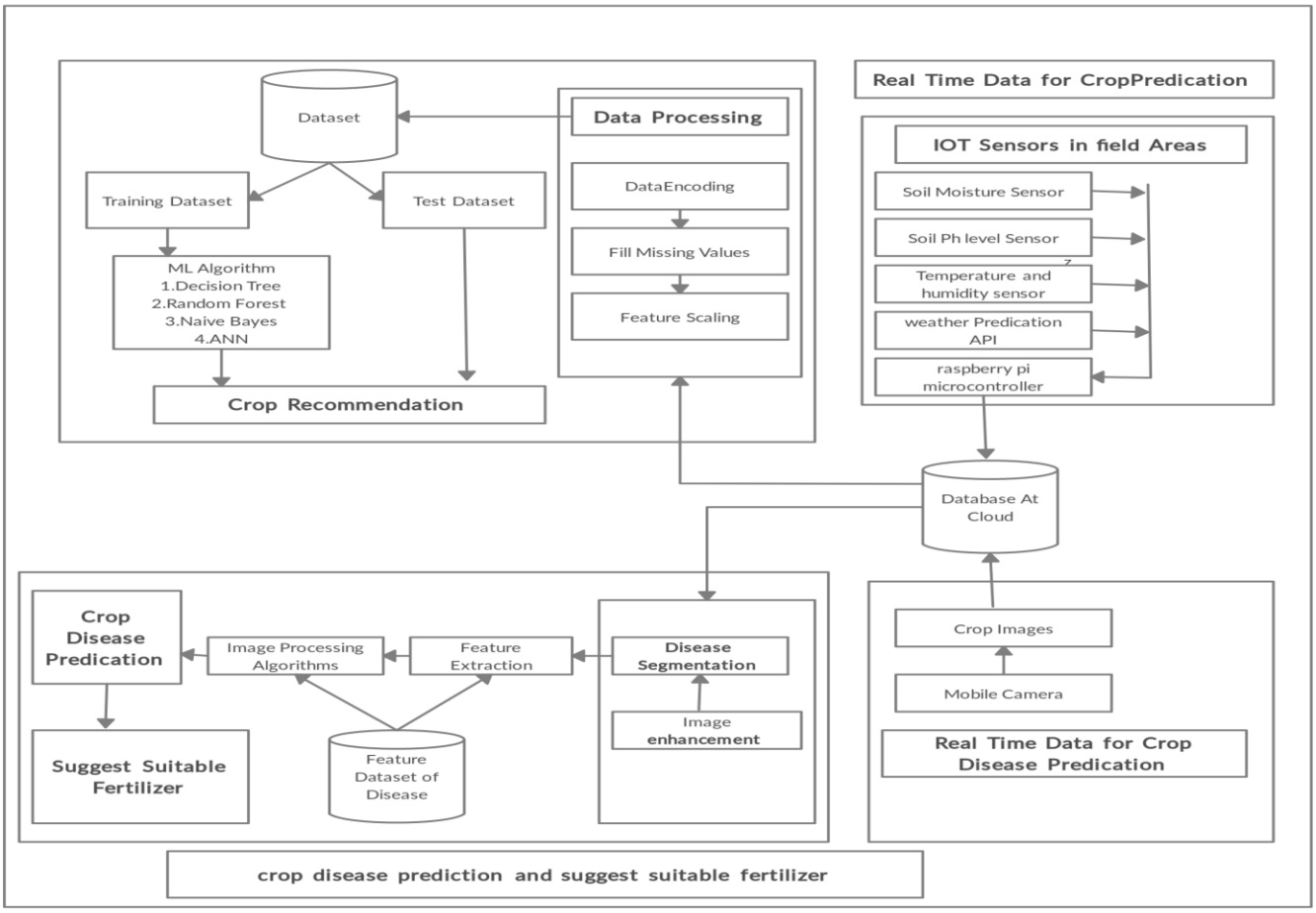

Fig.System Architecture

Fig. System Architecture for Crop Recommendation System and Crop Disease Prediction and its solution which recommend the best crop to sown and also suggest fertilizer for same.

There are various sensors like soil moisture sensor, soil pH level sensor, temperature, and humidity sensor are used to measure the various parameters like soil moisture level, pH value, rainfall in that regions which will used to recommend the crop to be sown. If crop gets infected, then captures the images of an infected crop via mobile camera for recommendation of best fertilizer then all data stored on cloud.

After that data processing will be done on data which is stored on cloud by applying different rules. Then divides the dataset into training and testing dataset. Apply the different machine learning algorithms like Decision tree, Random forest, Naïve Bayes, ANN on training dataset used to prepare a training model to recommend the crop. For crop disease prediction, it fetches the data from database for crop disease segmentation by providing infected crop image. Then on extracted features image processing algorithms will apply and crop disease prediction will done.

For a particular disease system will also be recommend the best pesticide and fertilizer for soil to increase crop yield.

5. CONCLUSIONS

Agriculture being an important part of our economy, it is essential to ensure that even the smallest investment done in the agriculture sector should be taken care of when it comes to farming and crop seeds are one of them. So it is essential to check if the correct crop has been chosen for suitable soil that matches its requirements to benefit the farmer. This system would assist the farmers in making an informed decision about which crop to grow depending on a variety of environmental and geographical factors. The ML and IoT based suggestions will significantly educate the farmer and help them minimize costs and make strategic decisions by replacing intuition and passed-down knowledge with far more reliable data-driven ML models. This allows for a scalable, reliable solution to an important problem affecting hundreds of millions of people. Our future work aims at developing this model with more soil attributes and with a larger data set.

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