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AGRI MONITORING SYSTEM FOR ESTIMATION OF NPK AND PH IN SOIL ALONG WITH CROP ECOMMENDATIONAND LEAF DISEASE DETECTION

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Abstract: Agriculture is India's economic backbone. Scientists are tirelessly striving to improve the cultivation of crops. This system combines all the factors like nutrient requirements, moisture content monitoring, animal intrusion and early crop disease detection methods to alert farmers. Soil nutrients are critical for achieving high crop yields and producing high-quality products. This system is used to design and develop a working system that uses Ph sensor to monitor the Ph values and to maintain the amount of alkalinity and acidity in soil for the efficient plant growth. It uses soil moisture sensor to regulate the moisture levels of the soil preventing less yield due to inadequate and nutrients erosion due to excess soil moisture. It gives an effective suggestion system for the crops using NPK sensor to prevent crop dehydration due to excess and stunted growth, discoloring on the edges to leaves due to insufficient supply of nutrients. It uses camera module to avoid the animal intrusion using alarm alert system using computer vision algorithms. Plant infections may be detected early, which helps farmers prevent losses using deep learning algorithms. After recognizing the symptoms of leaf diseases, automatic approaches for classifying plant diseases can also help with decision-making also to create a user-friendly mobile application for easy access to all the information required and deploy it on cloud so that it can be accessible from anywhere. Hence, Automatic detection and monitoring is very much important for the sustainable agricultural revenue.

Index Terms **– Agriculture, NPK, Ph, CNN, crop recommendation**.

I. INTRODUCTION

Agriculture provides farmers with a source of income by producing food and important raw materials. Agriculture confronts numerous obstacles, making it increasingly difficult to achieve its core goal of feeding an ever-increasing population. The majority of Indian farmers reside in rural areas, and the decline in agricultural growth has had a negative impact on their financial situation. Long-term solutions would need a reassessment of rural development in light of technical advancements, as well as a shift in agricultural methods toward structural changes that reflect better approaches. Not choosing right crops for the soil could be a problem to Indian farmers. Precision agriculture can be used to overcome challenges. Precision agriculture is a modern farming strategy that uses research data on soil properties, soil types, and crop production data to recommend the best crop to farmers based on their specific site factors. This reduces the number of times a crop is chosen incorrectly and boosts output. An Image processing and an IoT-based monitoring network have elevated the sensors to new heights. Human-animal conflicts have become a major problem in agriculture, resulting in significant resource losses. To address these issues, an animal intrusion alarm system was created, which uses wireless sensors to deliver an automated alert message to the landowner. This can act as an early warning system, allowing you to take appropriate action depending on the type of invader. Early disease detection is crucial in agriculture for increasing crop output. Automated methods for plant disease classification can also help in taking action after recognizing the early signs of leaf

diseases. Based on the Convolutional Neural Network (CNN) algorithm, this study presents a leaf disease detection and classification method.

II. LITERATURE SURVEY

In today's scenario, smart agriculture literature describes algorithms that classify crops suitable for soil based on the amount of nutrients available. Selection of articles in this section are expected to highlight the advantages of precision and smart agriculture, as well as areas where crop productivity can be improved.

In [1], it is highlighted the need for data mining approaches in precision agriculture. The research demonstrates how data mining assisted in improving crop productivity by providing decision support. In [2], The application of Naive Bayes classification algorithms to the classification of crops suitable for cultivation on the soil of choice. The data mining techniques used to determine the optimal crop based on soil studies are described in [3]. The soil's behavior in terms of moisture and water level is investigated, and forecasts are formed based on the findings. Soil types are checked and appropriate crops are found in paper [4] using an agriculture system based on IoT. It focuses on the management challenges that agricultural systems based on IoT face, as well as how they might serve users. [5] The probabilistic factor model is used to verify the soil nutrients level and related crop with the given soil content. It assists farmers in expanding the cultivation of any crop in a substantial way. [6] It is proposed to deploy a cloud, based on IoT strategy for precision agriculture. This system used cloud computing technologies to send the calculated values to the user's mobile phone or the system from sensors. In this paper [7], a technique for predicting and classifying plant leaf diseases automatically. There is also a survey on several disease categorization systems that can be used to detect plant leaf disease. Through image processing and feature extraction methods, the suggested system will define the cropped image of a plant. This research [8] discusses an image processing technique for analyzing coloured photos in order to detect visual signs of plant diseases. A software program detects the colour and shape. We employ Convolutional Neural Networks (CNN) to extract leaf characteristics directly from raw input data representations in this article [9], and a Deconvolutional Network (DN) approach to get intuition about the chosen features.

In reference [10], Crop losses are avoided by installing alarm systems to keep a track on the animals.

III. SYSTEM DESIGN AND IMPLEMENTATION

. The goal of our technology is to make agriculture easy and smart by utilising embedded system features. The recommended system uses a soil moisture sensor to determine moisture content, and an NPK and Ph sensor to determine NPK and Ph levels, respectively, using sensors attached to the controller. In Raspberry PI, the data is further processed. The recommended approach can anticipate crops based on soil data collected from the farm. The system also includes a IP mobile camera for detecting wild animal intrusion at the farm's entrance. In addition, it aids in the detection of numerous leaf diseases. Finally, all sensor data is transferred to the LAMP server. As a result, our automated techniques assist farmers in making the best selections at the correct moment.

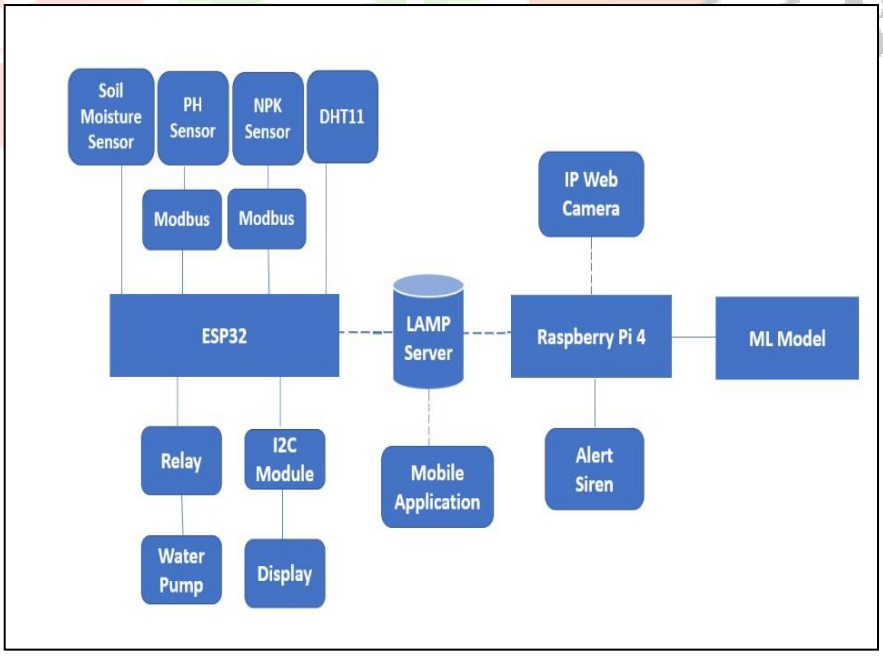

Fig: BLOCK DIAGRAM OF THE PROJECT

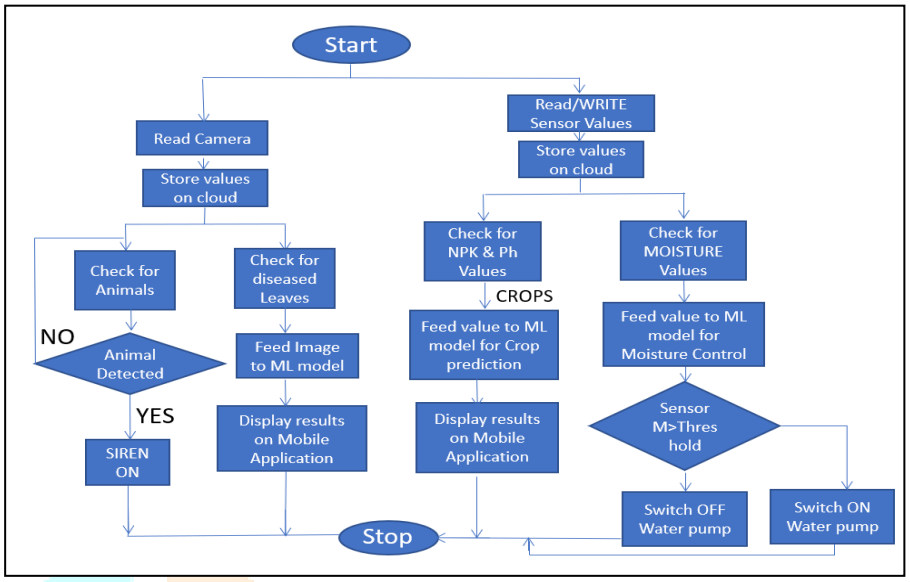

Fig: FLOW CHART OF THE PROJECT

In this project we have included three elements.

a. Crop Recommendation

The input dataset is subjected to a number of pre-processing techniques. The pre-processing dataset is then split into training and testing groups according to the indicated split ratio of 90:10, which indicates that 90% of the dataset is utilised to train the model and 10% to test it. The training dataset is used to provide each of the classifiers with the training dataset. When the testing dataset is applied to each of the classifiers, individual class labels are generated. As a consequence, the best output is shown.

b. Leaf Disease Detection

Plants are prone to a variety of diseases and disorders. There are a variety of causes that can be classified based on their impact on plants, including disturbances caused by environmental factors such as temperature, humidity, excess or insufficient food, light, and the most prevalent diseases such as bacterial, viral, and fungal infections. We employ the CNN algorithm to identify disease in plant leaves in the suggested system since the maximum accuracy can be attained with CNN if the data is good. Raspberry Pi receives input images via the Pi camera module. Image segmentation, enhancement, and colour space conversion are all part of the pre-processing. To begin, a filter is applied to the image's digital representation. After that, the images are converted into arrays. CNN classifiers are used to identify diseases in each plant class. The dataset being used is Plant Village. It is necessary to classify bacterial spot, late blight, yellow leaf curl, and other leaf diseases. Various classifications are utilised, with some for leaf illnesses and one for healthy leaves.

c. Animal Intrusion Detection

Computer vision application has grown popularity as a result of its usage of picture data, and it is now the state-of-the-art for determining about an image. When the camera detects trained animals using yolo dataset, it displays the result along with the names of wild animal and alerts the farmer using buzzer.

IV. Conclusion And Future Work

As a conclusion, N, P, and K levels in the soil have been successfully developed and tested. With other technology, this project can lessen the issues of identifying the amount of nutrients in soil at a lower cost. It can also help to avoid the unintended use of fertilizers in the soil, which can result in dead plants and a reduction in plant quality and quantity. A system for detecting and classifying leaf diseases has been implemented. This algorithm's goal is to detect anomalies on plants in their greenhouses or in their natural environment. For accuracy, the algorithm was compared to other machine learning models. The model was trained with 160 photos of tomato leaves using the Random Forest classifier. The model had a classification accuracy of about 70%. When using a large number of photos and other local features in addition to the global features, the accuracy can be improved. This research demonstrates that using the specified training model to detect animals gives us a reasonable level of accuracy. In real-time, a trained model can recognize and identify animal crosses. This application was able to assist farmers in identifying animals in their fields, as well as forest rangers in identifying animal invasions in highways and settlements.

The proposed system takes into account certain variables such as soil NPK, pH, and moisture. Depending on these, a conclusion is drawn to determine the best crops to grow in the given soil type. The data is analyzed using Random Forest, Knn, and SVM algorithms. Leaf diseases will be detected by splitting the data into testing and training. Animal intrusion will be spotted using OpenCV techniques. The mobile application is designed to display these data via sensor input. The information is saved in a cloud database, and the user can change their information at any moment. The goal of this project is to boost soil production. This work can be furthered by employing intelligent algorithms to forecast soil conditions for future crop cultivation.

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