CROP DISEASE DETECTION

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ABSTRACT

Plant diseases are generally caused by pest, insects, pathogens and decrease the productivity to large scale if not controlled within time. Farmers are losing money as a result of different crop diseases. When the cultivated area is large, measured in acres, it becomes tiresome for the cultivators to regularly examine the crops. The suggested system offers a way to automatically detect diseases using photos from a remote sensing device while also offering a solution for routinely monitoring the planted area. The suggested approach alerts farmers to crop diseases so they can take additional action. The suggested system's goal is to detect infections early, as soon as they begin to spread to the leaves' outer layer. The two phases of the proposed system's operation start with training data sets. This includes training on data sets from both healthy and ill individuals. The second stage involves crop monitoring and disease identification using Canny's edge detection technology.

1.0 Introduction:-

Civilization began with agriculture. India is a predominantly agrarian nation with a crop-based economy. All economies are based on agriculture. To meet the requirement in a country like India where the population is growing and food demand is constantly rising, agricultural sector advancements are needed.

To withstand the shifting economic conditions in India, the agriculture industry needs a significant upgrade. Crop health is essential for maximum yield, hence a highly technological method is required for routine crop monitoring. One of the main causes of the severe drop in the quantity and quality of agricultural goods is crop disease. There are numerous types of pesticides that can be used to reduce disease and boost output. However, it might be challenging and expensive to identify the most recent disease, an appropriate pesticide, and expert advice to control the infected sickness.

Symptoms on leaves are the primary indicator of disease on a plant. Therefore, a machine vision system that can automatically identify diseases from images and recommend an appropriate pesticide as a remedy is needed.

1.1 **Objectives:-**

- To collect an image dataset.
- To select the appropriate algorithm for the detection of diseases.
- To train and test a model on the collected dataset.
- To test the designed model.
- Finally propose a prototype for the actual system.

2.0 Market/Consumer Need Assessment:-

Growing worries about agricultural disease, which negatively impacts crop productivity and necessitates ongoing monitoring, have been raised in recent years.
However, the conventional method, which calls for human observation, is very costly and necessitates highly skilled human-based expertise. Therefore, there is a need for a monitoring, recognition, and detection system that can be put at the farms that is both economical and accurate.
Initial Customer Needs List Obtained :-

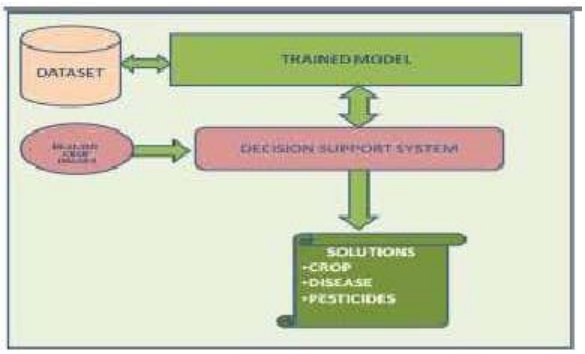
- Accurate
- Easy to operate
- Easy maintenance
- Portable

3.0 Proposed approach:-

The two phases of the proposed system start with training datasets. Images of both healthy and sick leaves are gathered. The threshold is extracted for both ageing and diseases after the dataset is available with healthy and sick picture samples. Remote sensing is used to acquire photos on a regular basis. RGB values are taken from the monitored images and compared to the threshold images. Histogram analysis and edge detection techniques are used to spot specific plant diseases depending on whether the threshold is higher or lower than a set value.

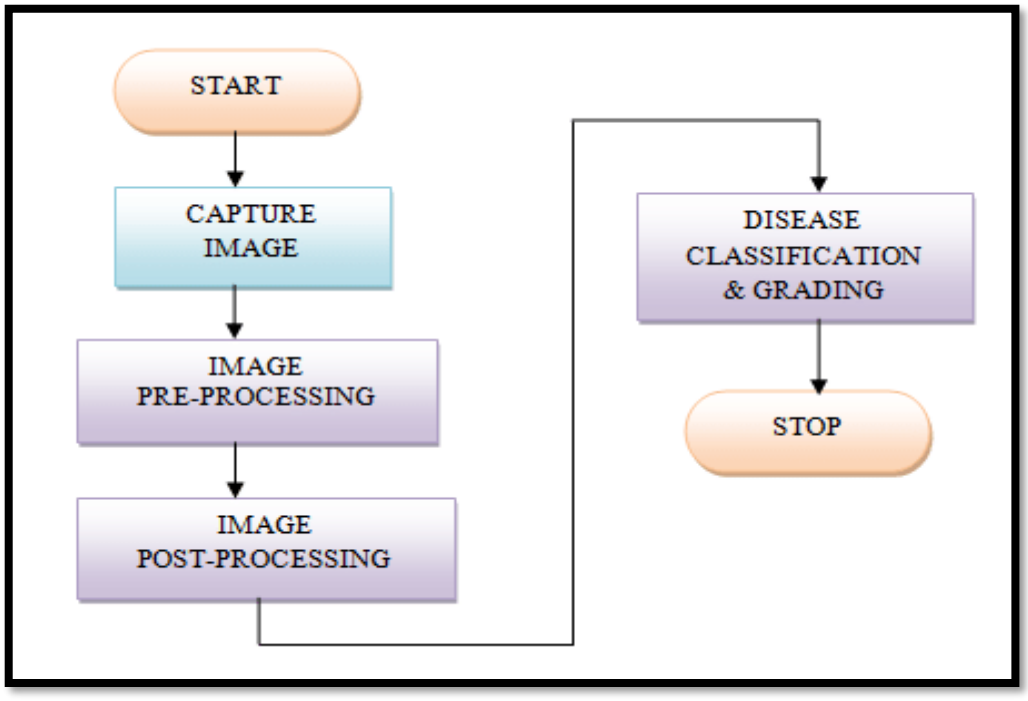
a. Disease detection:-

Disease Support System receives a reference image as input. To make the next decision, this system uses a trained model. The dataset is used by the trained model to generate accurate suggestions. Check to see if ageing is the cause if there is a significant shift in the Reference Image's threshold. If so, there is no need to inform the farmer. However, if the change is brought on by a disease, as shown by the malformations and colour changes in the leaves, edge detection and histogram analysis will be used to provide the right answer.



b. Algorithm for detection diseases

1. Start
2. Read the reference image
3. Check the threshold
4. If change in threshold due to aging then goto step 7.
5. Else
   a. Convert the image into grayscale.
   b. Apply Canny edge detection algorithm
   c. Get the histogram value.
6. Identify the particular disease for the reference image.
7. Stop.



4.0 Target Specifications and Characterization:-

- Crop disease detection:-
  The device will be able to identify whether the crop is having disease or not.
- The tool should be reasonably priced so that even small farmers might use it.
- Add more features.

5.0 External Search:

5.1 Applicable Patents and Regulations:-

- Patents on ML algorithm developed.
- Protection regulations.
- Laws related to privacy for collecting data from users.
- Having a purpose for responsibility.

5.2 Applicable Constraints:-

Expertise:

- Requires extensive study to gather a global dataset for crop disease identification in order to deliver more complex and precise results.
- Confidential disease data to be obtained to train the model.

5.3 Business Opportunity:-

- Crop diseases are a significant issue because they significantly lower the quantity and quality of agricultural goods. Since this is the only method that offers a chance to find diseases at an early stage, an automatic system for detecting crop diseases has an obvious advantage in monitoring large fields.
- A set of cameras and computer systems that are mounted on a vehicle make up the solution. The primary computer vision system inspects camera picture streams, looks for sickly

crops, and performs categorization. Different methods might be used to deliver the inspection results.

- Our automated early disease diagnosis method is based on artificial neural networks, which are currently the most reliable method for classifying images. Our solution's high processing speed and excellent classification accuracy are its key benefits. A system for identifying crop diseases can serve as a global detector, picking up on common anomalies on the crops. Our ongoing study, however, focuses on accurately identifying specific disorders. Our machine learning model will be able to distinguish a wide range of various diseases after thorough training on a variety of datasets.

6.0 Concept generation:-

Farmers typically identify crop diseases with their unaided eyes in both the past and the present, which forces them to make difficult judgments about which fertilisers to use. To ensure the actual disease diagnosis, extensive knowledge of the different types of diseases is required, as well as a great deal of expertise. Farmers are frequently puzzled by certain diseases because they resemble one another so closely. We need better and more accurate instructions on how to apply fertilisers, to correctly identify diseases, and to be able to tell apart two or more disease types that are identical when seen visually in order to avoid this predicament. Artificial neural networks, or ANN for short, are useful in this situation. But we are unable to do our work with just one ANN. As a result, we create a number of them and stack them one atop the other to create a layer. Between the input layer, where weights and data are provided, and the output layer, which represents the result, we can create multiple layers, which are referred to as hidden layers. This creates a deep neural network, and the study of it is known as deep learning. Additionally, we employed the CNN (Convolutional Neural Network) algorithm for deep learning.

Detecting crop diseases and pests is a key area of research in the science of machine vision. It is a system that gathers photos of crops using machine vision equipment and determines whether any pests or illnesses are present. Currently, equipment for detecting crop diseases and pests based on machine vision has primarily been used in agriculture.

7.0 Final Product:

7.1 Frontend:

- User Interface:- It will display all the monitoring related stuff like whether the crops are having disease or not, will recognize the different kind of crops so as to know which crop are efficient, also will display if the crops are afflicted with any kind of disease.
- Feedback System:- To comprehend the needs of the client that have not been addressed, a valuable feedback system option must be built. Our models will be continually trained as a result.

7.2 Backend:

- Storage: For storing dataset, User info, Model Parameters.
- Machine learning models: For all detection and monitoring related stuff.
- Update framework: To update model parameters, add more crops images to the dataset.

8.0 Conclusion:-

The farmers who practise agriculture will greatly benefit from this prototype. Just one of the functions that will be carried out by the device/system is what I have incorporated in this report. The entire crop monitoring system will assist the farmer in raising crop production, which will immediately serve the farmer in raising his yield. Machine learning techniques are used to train the model which helps to take a proper decision regarding the diseases. The farmer is advised to use pesticides as a cure for contagious diseases to control them.