Prediction of Plant leaf Disease using Fine Tuned Image Pre-Processing and Multi-SVM Classifier

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Abstract: The main factor for deciding growth of a country is farming. In India more than 68% of the people are living life based on agriculture. Any sort of infections to the crops leads to huge loss for the farmers and also to the economy of the country so proper treatment should be done for the disease infected to the plants or leafs to avoid huge losses and to safeguard the crop production. In this paper we are proposing an image processing and machine learning based approach to detect the type of disease on plant leaves using multi SVM classifier with GLCM features whose results of prediction have shown promising results with improved accuracy more than 90% in the simulation process.

Keywords: Plant Leaf, Disease, image processing, machine Learning, Agriculture, SVM Classifier.

1. INTRODUCTION

Economic growth of a country is decided by the rate and production of crops per year by the agriculture sector. The GDP of the country depends on agriculture around more than 18% of total GDP of the country. Different things affect the quantity and quality of the production of crops due to various weather conditions to which the plants and the crops are exposed to these diseases [1]. Any delay in detection of these diseases will lead to serious problems of crops damage and losses to the farmers. In our country around more than 30% of the crops are lost due to various diseases, pests, weeds etc. we can take reference from the Various countries as the cultivation fields are very large because of which the losses will be more. The diseases are less visible to the human eyes to properly detect the disease and classify for each and every plant.

Disease infected to even a single disease will spread to all other plants in no time therefore detection of disease is very crucial and important to prevent huge losses and damage. As farmers are less illiterate and they don't have good knowledge of those diseases to identify and apply proper pesticides to cure the disease in time. So they take help of experts in finding the disease and apply proper pesticides to plants. Hiring experts may cost them more which they cannot afford and even they also might be sometimes not so much accurate in predicting the diseases [2]. Therefore to solve this problem we are proposing an artificial intelligence approach to help farmers find the disease with accurate results and with less cost. In this proposed method an automated plant leaf disease detection and classification is done using image preprocessing and multisvm classifier which has proven to be with more accurate results in less time. The suggested model helps the farmers for accurate detection of disease by scanning the disease with this image processing technique and the machine learning process in the entire process the steps are simple and fast. The model is divided as follows collect the leaf datasets for training the machine learning algorithm after image processing and finally able to classify with good accurate results using multisvm classifier.

2. LITERATURE REVIEW

Paper by Saradhambal.G, Dhivya.R, Latha.S, R. Rajesh tells the infections for the plant leafs with image operations after processing the image. In their proposal they collected around 75 pictures of leafs with diseases infected. With five classes four with disease and one class with healthy sound leaf. Removal of common cockpits from the images after preprocessing is performed and the images are segmented with ostus segmentation algorithm after which features are extracted to resolve the images based on the type of disease using the classifier of their interest. But the exactness of accuracy is not specified with their proposed method by what they have accomplished using a very little set of images [3].

A paper by Melike Sardogan, Adem Tuncer, Yunus Ozen tells the utilization of CNN model for the prediction of leaf disease. In their dataset they used around 500 images in which 400 used for training and rest 100 used for testing. The number of classes included for classification are 5 in number. The size of image is resized to 512*512.Three frameworks for R, G, and B channels were used to contribute to CNN model and the result was given into neural network known as LVQ (Learning Vector Quantization). An accuracy of around 88% was reached. Their proposed model was distinctly for tomato related illnesses [4].

Paper by K. Elangovan, S. Nalini utilizes the svm for the order reason. In their strategy image was changed over into another shading space. After that image was trimmed and with image pre-processing procedures commotion was eliminated and smoothening was done and changed overInto greyscale images.

Division was additionally performed and afterward highlights were extricated. They thought about shading, morphology furthermore, surface as highlights and they were utilized for arrangement. They likewise doesn't specify about the precision of their proposed model [5].

Abirami Devaraj [9] specifies the utilization of a K-means clustering calculation in the segments of the image which allotments the image into k bunches. That one piece of the bunch contains a image with most of the undesirable part. He characterized infections by utilizing Random Forest Classifier which is tedious and exceptionally intricate. Suja Radha [6] proposed a strategy to ascertain the influenced district in the leaf. For segments, K-means clustering is the strategy utilized. She utilized Support Vector Machine (SVM) to order the illnesses which have high dimensional information space contrasted with that of remaining classifiers. Latha S et al. [8] proposed a novel strategies that are utilized for illness location. He talked about the Otsu Threshold calculation and K-means calculation for the segments of the images.

The Color co-event strategy what's more, Leaf shading extraction utilizing H and B segments are examined for the component extraction. Furthermore, he analyzed ANN what's more, BPNN classifiers to order the sicknesses. P. Kaur et al. [7] examined a strategy for spotting sicknesses which will show in the leaves of cucumber plants. Segments of sound and tainted regions is cultivated using a measurement design acknowledgment approach. Inside that highlights like tone, shape, what's more, surface will be removed. Those highlights are provided to the SVM, which plays out the most extreme order. He closed saying, results acquired from the SVM is so acceptable when contrasted with those we got from neural organizations.

3. PROPOSED METHOD

The figure 1 below shows the proposed method.

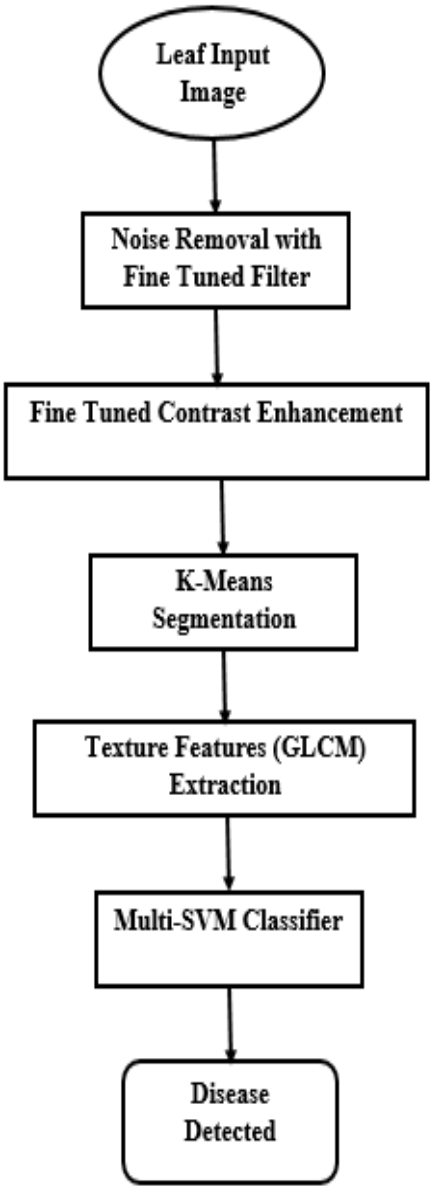

Figure 1: Proposed Method

The steps for the process as follows:

Image Acquisition:
In this process a digital colour image is loaded after capturing it from a digital camera which acts as input for the next stage in the proposed method as shown in figure1.

Image Pre-processing:
To enhance the image and to remove unwanted noises we use fine-tuned noise removal mean filter which gives noise free images and also contrast of the image is enhanced to highlight the dark regions to make it more clearly for the next steps in the process of segmentation and feature extraction.

Image Segmentation:
Here we have used k-means segmentation algorithm for separating the regions of infected and non-infected areas from the leaf image.

Feature Extraction:
GLCM (Gary level Covariance matrix) it gives the spatial relationship of pixels through which statistical features are extracted. Total 13 statistical features are extracted here which are trained and tested to the classifier.

Multiclass SVM
Classifiers are utilized for the preparation and testing of the datasets. Here we use the multisvm classifier. This procedure is utilized to test healthy and unhealthy plants leaves and show the outcome. Multi-class support vector machine as a bunch of parallel vector machine is utilized for multi class classification problems.

It is compelling in high dimensional spaces in examination with other grouping strategies arrangement precision is high. SVM is sufficiently accurate, despite the fact that preparation tests have some twisting. Training time is high with enormous informational collection for planning unique information into high measurement information.

4. EXPERIMENTAL RESULTS

The experimental results are discussed as follows.

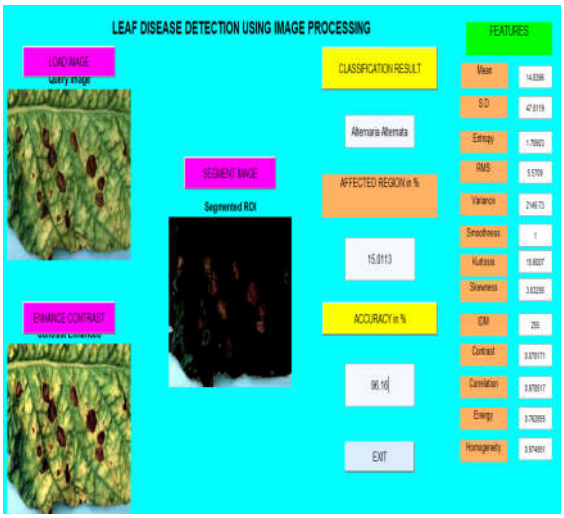

Figure 2. Simulation Overview

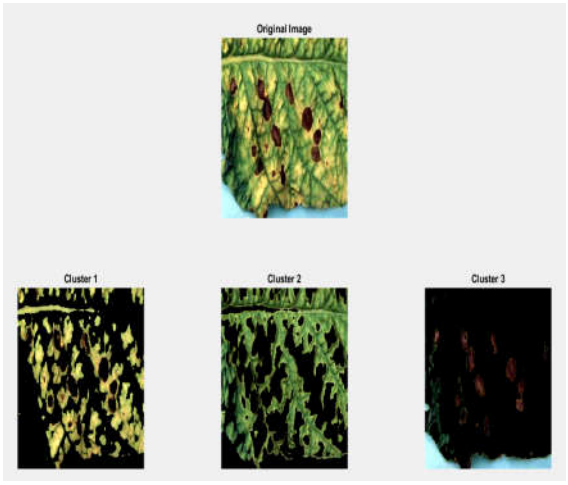

Figure 3. Segmented Images

Table1: Accuracy of proposed

Sl. No.	Disease	Affected Region (%)	Accuracy without fine tune (%)	Accuracy with fine tune (%)
1	Alternaria Alternata	16.321	88.42	96.21
2	Bacterial Blight	15.234	86.54	95.32
3	Anthracnose	15.201	87.25	96.10
4	Cercospora Leaf Spot	15.121	85.81	94.42
5	Healthy leaf	None	90.12	96.28

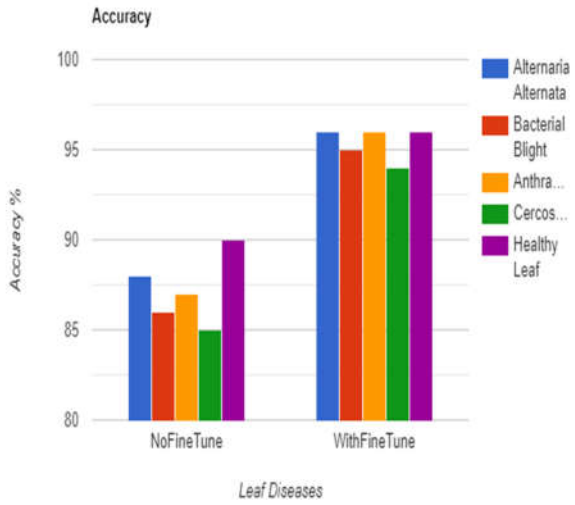

Figure 4. Accuracy Plot

5. CONCLUSION

In this paper for detecting leaf diseases we have used various images for prediction and classification. We have used fine-tuned image pre-processing for enhancing the quality of image by removing unwanted noises and improving the contrast which is further segmented using k-means segmentation for feature extraction. Here we extracted texture features and compared the multi-svm classification results with and without fine-tuned image pre-processing the results shows an improvement in our proposed method. Hence the process helped us to precisely identify the different types of diseases in plant leafs.

6. REFERENCES

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