Plant Disease Detection using Image Processing

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Abstract **- The existing system the farmers are using for the detection of diseases in the plants is that- they could be identified through the naked eye and there knowledge about plant disease. For doing so, on large number of plants is time consuming, difficult and accuracy is not good. Consulting experts is of great cost. In such kind of conditions to improve the accuracy rate and make it more beneficial suggested techniques are implemented where devices are used for the automatic detection of the diseases that makes the process cheaper and easier. High degree of the complexity is incorporated by observing the symptoms on the plant leave optically where the plant disease could be easily diagnosed.**

Now days most of the agro help centers and many farmers use different types of technology to improve production in agriculture. The most important source of energy is plants. Plants are often prone to diseases which may cause social and economic losses. Many diseases are initially spotted on the leaves of the plants. It could lead to more harm if the disease is not identified in the first stage. By identifying the color features of the leaves image processing helps in the detection of the diseases and also provides prevention to the particular diseases.[4]At the very first stage the image is segmented by taking the picture of the plant in the RGB form and later the green pixel is detached. Texture statistics is an arrangement of intensities in a region that is used for the extraction by the segments is finally completed and the disease prevention is provided according to the analysis.

Keywords—***Image processing; Pre-processing; segmentation; Extraction; SVM Classifier; Spots; Peach and Corn.***

I. INTRODUCTION

Agriculture has become the key to rise in human civilization it is the art and science of cultivating live stocks and plants. Many of the farmers are not able to identify the diseases in the plants which may lead to loss in agriculture products. Agro scientist can provide a better solution by using the images and videos of crops that provides a better view. There are many diseases that affects the plants, where the symptoms are not recognizable at the very first stage which may lead to social and economic loses .To make things easier image processing is used, that helps to overcome these kind of situations, by extracting the features of the leaves where the diseases can be easily detected. Image processing involves steps like image acquisition, pre-processing, segmentation, feature extraction and classification

Based on the multiple linear regressions a new recognition system of image is proposed. Image segmentation and recognition system consists of the number of innovations [7] [3].Multiple linear regression and feature extraction are used while creating the recognition system. Evaluation of results has proved that the system has high precision, reliability and image-recognition ability. The results indicate that the approach is beneficial which supports in the detection of the diseases with very less efforts [6].

A. Image Processing

In recent technology researchers are frequently trying to increase the collectively of plants [1]. They have been successful by growing the higher breed seeds and plants. But there are problems that still exist which becomes a main concern while cultivating crop and those are crop diseases and the pesticides problem. Due to such kind of problems, the yield of the crop decreases and hence the country suffers the lack of cultivation of plant [2]. Most of the times diseases needs to be prevented at the very early stage, but if the prevention is not taken in the early stage it may lead to severe damage [3][4]To avoid such loses diseases needs to be detected at the early stage .Crop like Corn is being grown in long duration that is 10 to 18 months, that may lead to attack of many diseases [5]. Fungal diseases are the most predominant disease in the corn that appears as small spots on the leaves.

The leaves become totally damaged and completely covered with spots in the case of the severe infections. Frequent use of the pesticides increases level of the toxins in the products which leads to many health diseases and also plays a main role in the contamination of the ground water. In the recent days pesticides price has been increasing day by day. Thus the modern technology helps to enhance the productivity of the crops with less efforts and time consumption.

Three types of diseases that have been taken as model for detection are:

a. Corn Grey Leaf Spot
b. Corn Common Rust
c. Peach Bacterial Spot

B. Algorithms Used

Algorithms used in feature extraction are:

a. Image Acquisition
b. Image Sharpening
c. Edge Detection
d. Greyscale Image
e. Adaptive Histogram Equalization
f. Shape, Color and Texture Features
g. Support Vector Machine(SVM) Let us discuss

SVMin detail:

Linear SVM:

The design of SVM is plain: Here in this algorithm, there is a creation of line or a hyperplane which is used to separate data to classes. Classification task is an approach which is usually involved in setting data apart into testing and training sets. In a training data set each instance contains single target value" that is the class labels and many attributes" (i.e. the features of observed variables). This approach creates a need of finding a separate hyperplane that is used to separate the points in to the two classes. One is the negatives (class "-1") and the other is the positives (class"+1").

As stated by the SVM algorithm, it is required to find out the points which are near to the line from both the classes. These points are known as support vectors. It is necessary to compute the distance between the support vectors and line. This distance is said to be the margin. The main aim here is to maximize the margin. Therefore the hyperplane which has the maximum margin is said to be the optimal hyperplane. Margins for SVM trained with samples from two classes along with the Maximum margin hyper plane as shown in Fig.1.

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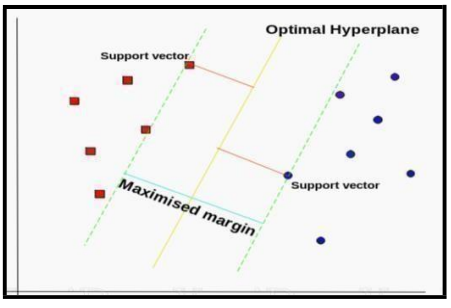

Fig.1, Linear SVM which shows selection of hyperplane

Non Linear SVM:

The following algorithm is conventionally similar, excluded one point which says that all the dot products will be replaced by a nonlinear kernel function. It permits the algorithm to fit into the maximum-margin hyperplane in a feature space that is transformed. The transformation may actually be t high dimensional and nonlinear although the classifier is a hyper plane in the transformed feature space, it may be nonlinear in the original input space. The comparison is shown in Fig.2.

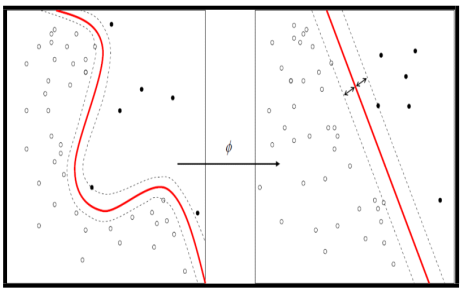

Fig.2, Nonlinear SVM

Multi Class SVM:

The aim of Multiclass SVM is to use support vector machines for assigning labels to instances , here the labels will be taken from a definable set of diverse elements. Support vector machines(SVM) are supervised learning models which are linked with machine learning.

Learning algorithms are used for analyzing data and to recognize patterns, they are used for categorizing and also for multivariate analysis.

Database:

Database holds a huge quantity of sample image files which are accommodating the disease images and non-disease images. The features will be withdrawal as per the opinion of Image feature extraction techniques, and then that particular image file will be saved in the database [6].

II . LITERATURE SURVEY

Table I. Analysis of papers

Sr. No	Title	Author Name and year of Publication	Techniques Used
1	A faster technique on rice disease detection	Taohidul Islam, Manish Sah, SudiptoBaral, Rudra Roy Choudhury ,2018.	Uses RGB values.
2	Wheat disease detection using image processing	Varsha P. Gaikwad, Dr. Vijaya Musande, 2017.	Classifies plant disease with color, shape and size.
3.	Plant disease detection using image processing	Sachin D. Khirade, A.B.Patil, 2017.	Segmentation and Feature Extraction.
4.	A deep learning approach using on-site plant disease detection.	Konstantinos P. Ferentinos, 2018.	Leaf localization methods.
5.	Tomato late blight using dwt and component analysis.	Hiteshwari Sabrol, Satish Kumar, 2017.	Tomato late blight using dwt and component analysis.

III. EXISTING SYSTEM

Even though there are many systems that have been developed till now using different machine learning algorithms like Random Forest, Naive bayes, Artificial Neural network the accuracy of those models are low and the works using those classification techniques is done with the mind set of detecting disease for only one species of plants. These works have been used in Karnataka by few farmers. Farmers still use naked eyes to detect diseases which is serious problem as a farmer is not aware of what type of disease the plant is infected. Farmers are still facing the issues and the techniques they are using to detect the disease are time consuming.

IV. PROPOSED APPROACH

The suggested work focus more on recognition of disease on the corn and peach leaf using Matlab.

The images are contemplated for additional feature extraction, which will be done by using one of the exceeding algorithms. There are numerous characteristics of images which are yet to be drawn out, this initiated method is going to examine a little bit of them. The following Fig.3 shows the system architecture and the authentic progress of the concept. The principal focus of this scheme is to provide assistance to the farmers, facing the loss due to insufficient understanding of numerous diseases. The notion will be more user- friendly.

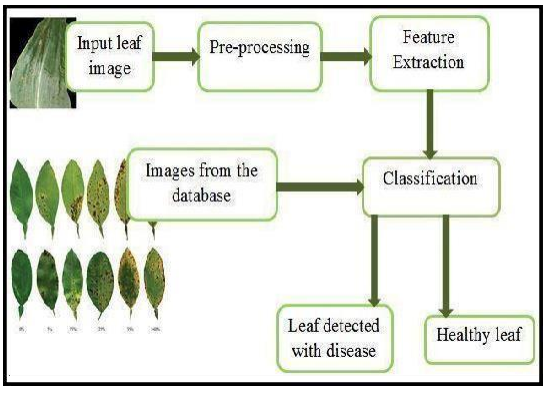

Fig.3, System architecture

The propound method includes the preceding :

1. Image Acquisition
2. Image Preprocessing
3. Segmentation
4. Feature Extraction
5. Classification

Image Acquisition:

In this step Images of plant leaf to be tested for disease is fed to our software. In this step the images as shown in Fig.4, are converted to grayscale images as it becomes easier to perform classification process on black and white image which is2-Dimage. In this step the system will access the snapshot of the plant and load the image into the system.

Steps that follow the image acquisition are. Input: image (JPG format)

Finer standard resolutions will be utilized for image-analysis and JPEG is the format in which these images are usually saved.

RGB Grayscale

Fig.4, Conversion from RGB to Gray

B. Image Preprocessing:

A simple sharpening operator is the unsharp filter which has obtained its name from the reality that it actually strengthens edges (and additional peak frequency parts in an image) through a procedure in which the original image will be let free of unsharp, or smoothed, version of an image by eliminatingthem.

C. Segmentation:

The procedure of dividing a digital image into various fragments (set of pixels, are additionally called as super pixels) is known as Image Segmentation. The outcome of image segmentation is a set of fragments that jointly shield the entire image or a set of outline obtained from the image. Every pixel in a zone is close regarding to some distinctive or determined attributes like color, shape and texture.

D. Feature Extraction:

Shape feature extraction: Solidity, extent, minor axis length and eccentricity are the shape features used in this paper. These features are taken in order to extract the diseased region in the leaf considered.

Texture feature extraction: Contrast, correlation and energy are the texture features used in the paper. These features are taken in order to extract the diseased region in the leaf considered. Finally the variation of pixels and its adjacent pixels will be calculated.

Color feature extraction: In concern with translation, scaling and rotation the color feature extraction has a unique way of showing image representation. The features used for color are mean, skewness, and kurtosis. Here, we transform RGB to LAB.

E. Classification:

In classification involves in separating data into two genre training sets and testing sets. The training set contains one target value and several attributes for each instance or data. Here the major part is to locate the separating hyperplane which will divide these points into two different classes as the positives classes as "+1" and the negative classes as "-1". The final output is shown in the Fig.5.

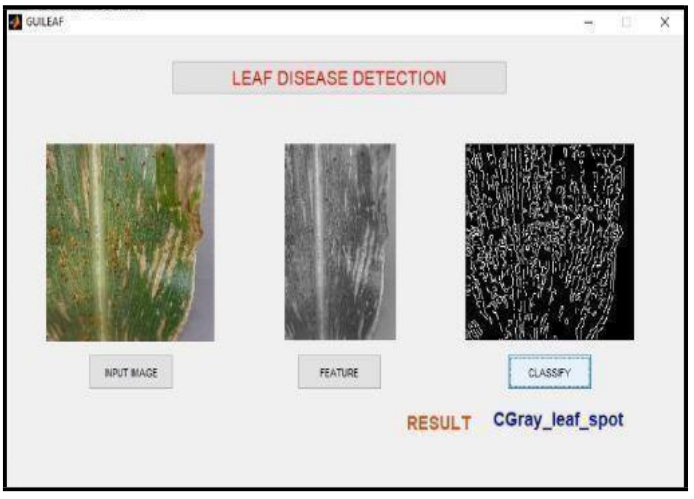

Fig.5, Final Output

V. CONCLUSION

This project proposed to point out disease in the leaf with a union of shape, texture and color feature withdrawal. Initially the farmers sends a digital image of the diseased leaf of a plant and these images are read in MATLAB and processed automatically based on SVM and the results were shown. The output of this project is to get hold of relevant results that can spot out diseased leaf of certain commonly caused disease to plants. Firstly, healthyand diseased images are composed and pre-processed. Later, attributes like shape, color and texture are taken out from these images. Finally, these images are sorted by means of supportvector machine (SVM).

machine classifier. Based on the classified type of disease a text message was sent to the user in the project.

In this project, we demonstrated only few types of diseases which were commonly caused and it can be extended for more disease in future. Here only text message was sent to the farmer but in future robot can be sent to spray the pesticides to the plants automatically without human interaction.

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