A Grape Plant Disease Detection by Machine Learning Using Python

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***Abstract*— Image processing has been proved to be an effective tool for analysis in various fields and applications. In Agriculture sector the parameters like quantity and quality of product are the important measures from the farmers' point of view. The correct and timely identification of diseases in crops is the basis for integrated management of a farm. Generally, the disease features of any leaves are subjectively extracted by manual inspection. Automatic leaf disease identification by machine inspection can be of great benefit to those users who have little or no information about the crop they are growing. Such users include farmers, gardeners, homemakers who cannot afford the services of an expert agronomist. Here various methods and techniques involved in the field of image processing to detect diseases in various types of leaves can be achieved. The possible improvements in each of the research work will be identified and specified and at the end, overall research gaps will be identified.**

***Index Terms*— Parameters, integrated.**

I. INTRODUCTION

India is an agriculture country. 70% of Indian economy depends on agriculture but leaf infection phenomena cause the loss of major crops results in economic loss. Leaf infection is the invasion of leaf tissues by disease causing agents such as bacteria, virus, fungus etc. leading to degradation of the leaf as well as plant. This can be characterized by spots on the leaves, dryness of leaves, color change in leaves and defoliation. The leaf infections may occur due to environmental condition changes such as huge rain fall, drastic changes in temperature or may be due to improper maintenance and some insects and pesticides. Once the disease-causing organisms such as bacteria, virus etc., entered into the leaf tissue, they start multiplying and decreases the strength of the leaf and degradation starts. For instance, it is seen that the outbreak of diseases which leads to large scale death and famine. It is estimated that the outbreak of helminthosporiose of rice in north eastern India in 1943 caused a heavy loss of food grains and death of a million people.

II. Literature Review

Gittaly Dhingra describes application of agriculture using computer vision technology to recognize and classify disease of plant leaf. The paper deals with correlation between disease symptoms and impact on product yield. It also deals with increase the number of training data and testing to accomplish better accuracy [1].

Shitala Prasad proposed mobile based client-server design for leaf disease detection using Gabor wavelet transom (GWT). In this system first carried out colour conversion from the device dependent to colour space model. Mobile pre-processing can be done after acquiring leaf and converting colour space. For human vision system Human perception*a*b colour space was designed. Making human perception of lightness more accurate by changing output curves in a & b components. To perform analysis of leaf image, K-means unsupervised algorithm was used. To perform feature extraction Gabor wavelet conversion was used. Author of this paper experimented with homemade dataset. In future proposing efficiently processing of Captured Leaf images in a complex background with different lightening condition [2].

Shanwen Zhang discussed hybrid clustering method. Leaf segmentation is important in detection of plant diseases which affects reliability of feature extraction. Author used super pixel clustering in which neighboring pixels with some feature with respect to brightness, texture, colour is grouped into homogeneous regions. This can reduce complexity of images from more pixels. Author suggests that Expectation maximization (EM) algorithm may be good approach for colour image segmentation [3].

Keyvan Asefpour Vakilian demonstrate that detect two types of fungus in cucumber plant leaves. ANN model with 3 layers were utilized to identify Cubanises and S.fuliginea infection. Author has taken real time germinated seeds of cucumber on moist paper which is at degree c for 3 days. Further research is needed to increase the ability of farmers assisted robots in real time detection of fungal and viral disease [4].

Mohammed Brahimi proposed deep learning method to create classifier for detection of disease. Also proposed the occlusion concept to localize the disease regions & help to understand the disease. Author uses datasets which is published in good fellow, Bengio etc, further research is need to reduce the computation & size of deep models for small machine-like mobiles [5].

H.Al-Hiary proposed detection of plant diseases using automation and classify its diseases. Here pixels are grouped on set of features into total k classes. When leaf has more than one disease then there are more clusters that cause disease. ANN is used to detection and classification of disease. Further research needs to increase the accuracy of detection [6].

Authors present image processing technique for Rice disease identification and considered the two most common diseases in the north east India, namely Leaf Blast (Magnaporthe Grisea) and Brown Spot (Cochiobolus Miyabeanus). Image acquisition is basic step, after that author use segmentation, boundary detection and spot detection method for feature extraction of the infected parts of the leave. In this paper author introduces zooming algorithm in which SOM (Self Organising Map) neural network is used for classification diseased rice images [7].

Authors present image-processing technique for Leaf & stem disease detection. The author used a set of leaf images from Jordan's Al-Ghor area. The five plant diseases namely: Early scorch, Ashen mold, Late scorch, Cottony mold and tiny whiteness is tested by image processing technique. In this technique at starting, image acquisition is obtained and then K-Means clustering method is used for segmentation. After that in feature extraction, CCM (Colour Co-occurrence Method) is used for texture analysis of infected leaf and stem [8].

Authors used both LABVIEW and MATLAB software for image processing to detect chili plant disease. This combined technique detects disease through leaf inspection in early stage. The Image is captured using LABVIEW IMAQ Vision and MATLAB is used for further operations of image processing. Image pre-processing operations are Fourier filtering, edge detection and morphological operations [9].

Authors present image processing technique for detecting the Malus Domestica leaves disease. Intensity values of grayscale images are obtained by histogram equalization method. In image segmentation, Co-occurrence matrix method algorithm is used for texture analysis and K-means clustering algorithm is used for color analysis. Texture analysis is characterization of regions in an image by texture content [10].

Authors present image processing techniques for detecting the Bacterial infection in plant. Common infection seen on plant is Bacterial leaf scorch and early detection of this helps in improvement of plant growth. The image processing starts with image acquisition which involves basic steps such as capturing of image and converting it to computer readable format. Then clustering is done to separate foreground and background image with help of K-means clustering method in image segmentation [11].

Authors present image processing technique for detection of unhealthy region of Citrus leaf. There are four types of citrus diseases namely: (i) Citrus canker, (ii) Anthracnose, (iii) Overwatering, (iv) Citrus greening. Author proposed methodology in which image acquisition is first step for capturing image by digital camera in high resolution to create database. Color space conversion and image enhancement is done in image pre-processing [12].

Authors present image processing technique for Orchid leaf disease detection. Black leaf spot and Sun scorch are two types of orchid leaf diseases mostly found. The basic step of image processing is image acquisition for capturing images and stores it in computer for further operation. Image pre-processing involves histogram equalization, intensity adjustment and filtering for enhancing or modifying the image [13].

III. RESEARCH METHODOLOGY

The methodology section outlines the plan and method that how the study is conducted. This includes Universe of the study, sample of the study, Data and Sources of Data, study's variables and analytical framework. The details are as follows;

Image Acquisition:

First, we need to select the plant which is affected by the disease and then collect the leaf of the plant and take a snapshot of leaf and load the leaf image into the system. The first step in the proposed approach is to capture the sample from the digital camera and extract the feature.

Image preprocessing:

Image preprocessing is a sub-field of image processing and consists of techniques to improve the appearance of an image, to highlight the important features of an image and make the image more suitable for use in particular application. The abnormality of the defected leaf is revealed by the appearance of diseased spots. From the inspection of infected crops, it was found that the spots have intensity values higher than the other normal areas.

Segmentation:

It means representation of the image in more meaningful and easier to analyses way. In segmentation a digital image is partitioned into multiple segments can defined as super-pixels.

Feature Extraction:

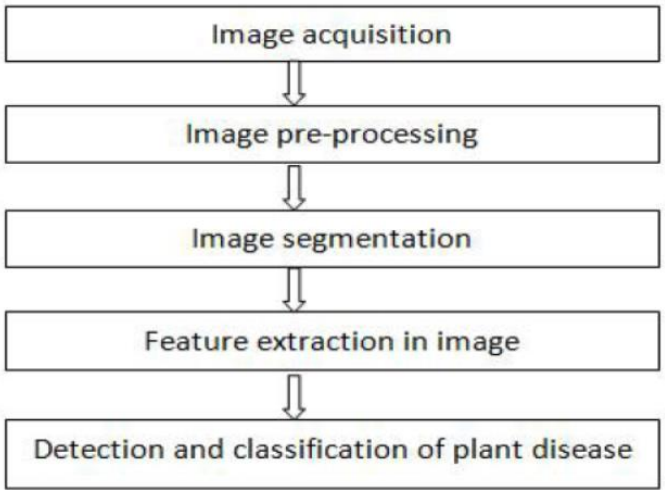
Transforming the input data into the set of features is called feature extraction. Geometric features-area, perimeter, circularity, eccentricity. Statistical features- mean, variance, entropy, correlation.

k-means clustering algorithm:

This algorithm is used to cluster/divide the object based on the feature of the leaf in to k number of groups. This is done by using the Euclidean distance metric.

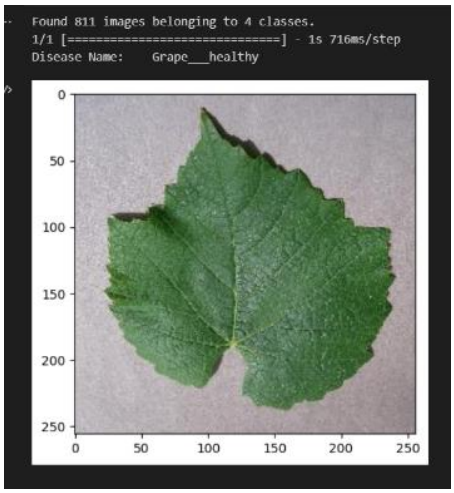
Support Vector Machine (SVM):

SVM is a statistical learning-based solver. Statistical is a mathematics of uncertainty.it aims at gaining knowledge, making decisions from a set of data.

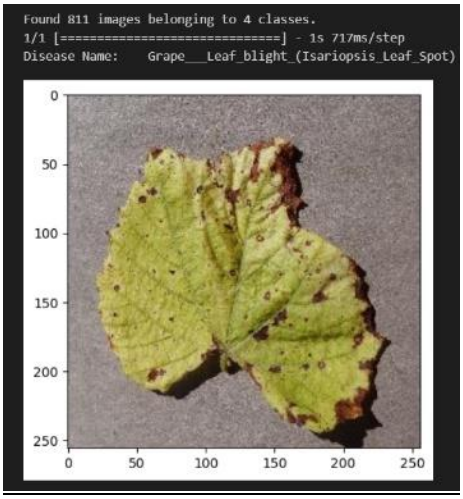


IV. RESULTS AND DICUSSION

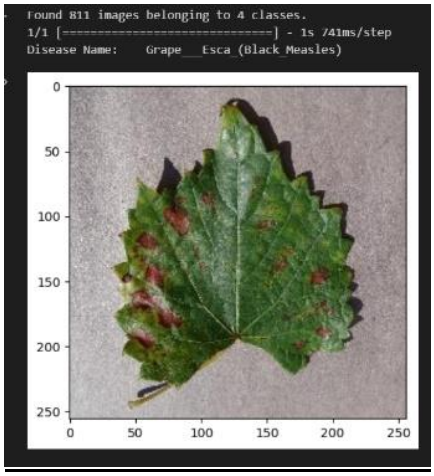
The expected results should have comparison of disease leaves with the healthy leaves which identifies the type of disease the laef has.



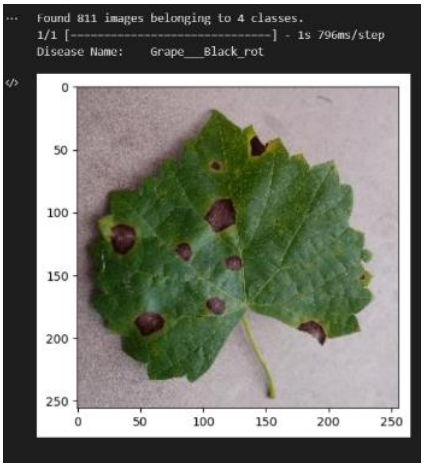
Healthy leaf



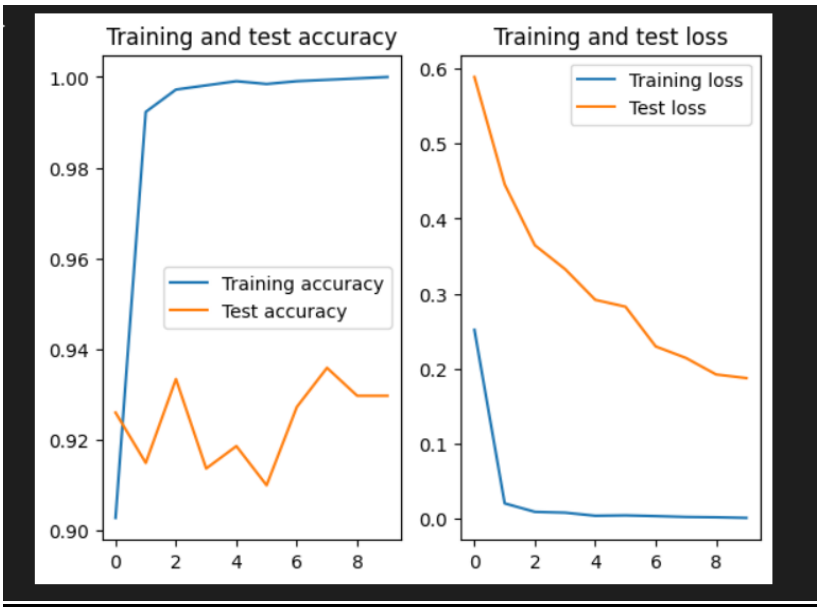
Grape leaf blight



Grape Esca
(Isariopsis leafspot)



Grape Black Rot
(Black measles)



ACCURACY

V. APPLICATIONS FOR PURPOSES:

1.To detect diseased leaf, stem, fruit
2 To quantify affected area by disease.
3.To find shape of affected area.
4.To determine colour of affected area.
5.To determine size & shape of fruits. Etc.

The leaf area monitoring is an important tool in studying physiological features related to the plant growth, photosynthetic & transpiration process. Also being helpful parameter in evaluating, damage caused by leaf diseases and pastes to find out water and environmental stress, need of fertilization, for effective management and treatment.

VI. CONCLUSION

In the proposed project of diagnosis of different leaves of different plants in accords with spot and range of red pixels in the diseased leaves using PYTHON and image processing technique. The results obtained can be more appropriate to detect and diagnose the disease. By incorporating the proposed method, the precision agricultural method can be phased out and a modem affordable robust, fast and cost-effective disease detection and diagnosis mechanism can be achieved.

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