Plant Health Prediction Using Machine Learning

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ABSTRACT

As India is an agricultural country, to prevent losses in yields, identification of plant disease is very important. Due to traditional method of plant disease detection millions of rupees are being spend to protect crops against various disease. It is difficult to detect plant disease manually. It requires expertise in plant disease to detect exact disease, requires lots of hard work and also it is time consuming, still their will not be surety of correctness of result. Hence technologies like image processing and machine learning are very useful for detection of plant disease. We present an application of machine learning to solve a particular problem of diagnosis of plant disease based on plant images taken with a camera.

Keywords: OpenCV, SVM, feature extraction, segmentation.

I.INTRODUCTION

In this paper we tackle the challenge of diagnosis of diseases in plants from images of the leaves. Plant diseases can cause lots of economic as well as production losses in agriculture industry. Management of disease is very challenging task. Usually symptoms of diseases like colored spots are seen on the leaves of the plant. Sometimes farmers face difficulty in identifying the plant diseases. Which can lead to loss of crop because every disease having different remedy to work out according to virus, fungi and bacteria. Normally current disease detection approach is manual. When disease occurs on plant, farmers have to keep eyes on the infection. This disease detection technique is time consuming and some precautions are needed while selecting pesticides for plants.

Most of the plant diseases are caused by viruses, bacteria and fungi. The diseases cause due to these organisms which are characterized by different visual symptoms. This paper focuses on how machine learning and image processing is utilized in detection of plant diseases. Major steps of the processing are images are captured from the fields, then preprocessed. The infected parts are extracted from the leaf from the segmented images features are extracted and finally disease classification is performed using machine learning techniques.

System success is depends on how accurately system carries operations of machine learning and image processing. The performance can be evaluated by accuracy of machine learning algorithms. To get understanding of various works we carry out survey of different approaches and techniques of machine learning and image processing used for detecting plant diseases. And therefore the quality of product could be increased.

Fig.1 Infected leafs of cotton plant

II. LITERATURE SURVEY

In machine learning different techniques are available which work jointly with image processing for detection of the diseases occurs on plants. Fast and accurate detection of diseases is required because as early the diseases are identified and detected on plants the early we can reduce the losses which leads to maximum gain in agriculture. Different researchers apply different methods for identification and detection of diseases seen on the plant.

1] Authors build a Smartphone based system for Plant Disease Incidence and Severity Measurements. For this they collected 7386 images of leaves of cassava plant. These images are divided into different categories. There are 4

diseased categories and 1 healthy category this is the first category of image. These categories are also divided into severity levels from 1 to 5. 1 is for healthy and 5 is severely diseased. In this system user capture image and upload that image to the server. Server recognizes disease using different categories and also identify its severity level from 1 to 5. The color and shape of image is mainly considered for feature extraction. They use HVC color transformation and ORB feature extraction to extract the features from leaves. They use three classifier linearSVC, KNN and Extra tree for classification they also use scikit-learn toolbox for learning.

2] Authors build a palm oil leaf disease detection system. The Anthracnose and chimaera are two diseases seen on the palm tree. These diseases are identified based on the dots over the palm oil leaf. The Camera used for taking the images of leaves. Camera used can be any type of camera. Then for processing image is send to computer. Computer receives the image and also run the matlab which is used for detection purpose. For image enhancement they use contrast enhancement which minimizes the noise. Then the RGB color space image is transformed into L*a*b color space. After that K-means clustering is performed to form a clusters based on color. They use graycomatrix for feature extraction. By using this method they obtain gray-level co-occurrence matrix. For classification multiclass SVM classifier is used and then accuracy is calculated.

3] Authors build the system for disease detection and classification of citrus leaves using digital image processing .This collected data are indiscriminately divided into training and testing sets. They start with image capturing using digital camera. They transform the captured image into 256*256 pixels. Next pre-processing of image is done where RGB color images are turned into L*a*b color space. Then segmentation is done on the images. For this k-means clustering method is used. Using this method diseased part of the image is detected. After that feature extraction is performed. For this purpose a texture based method is used named as Gray-level co-occurrence matrix. And with the help of this method 5 features are extracted they are contrast, energy, homogeneity and correlation. For classification SVM classifier is used.

4] Authors build a system for detection of disease for Soybean plant. They used the image processing for the following reasons.1)To find the diseased leaf 2) To find diseased area. For image capturing they use a digital camera. The image captured is in the form of RGB so they transform the image into L*a*b Color space. The image segmentation is done using the k-means clustering and diseased and healthy part is separated. Then percentage of diseased part is calculated using then equation P=AD/AT*100.

III. OpenCV:

OpenCV is library of Python designed to solve computer vision problem. OpenCV supports number of algorithms related to Computer Vision and Machine Learning and is expanding day by day. OpenCV supports programming languages like C++, Python, Java etc. OpenCV-Python is the Python API of OpenCV. Best qualities of OpenCV C++ API and Python language are combined in OpenCV.

IV. SUPPORT VECTOR MACHINE (SVM):

SVM is commonly used classification algorithm for disease prediction. It is a supervised learning algorithm. There are two elements used for the implementation are the mathematical programming and the kernel functions. Classification is performed by drawing hyperplanes and in two class classification; the hyperplane is equidistant from both the classes. Support vector are the data instances which are used to define the hyperplane. Distance between hyperplane and the nearest support vector is the margin. The distance of margin should be as large as possible because for good separation. There will be less error due to large distance but if margin is close then it is more sensitive to noise .A margin must have no points in its interior region.

V. PROPOSED SYSTEM

We are developing a web application to predict the health of the plant. For that first we will take the picture of plants i.e. cotton plant at regular interval of time and send it to the server. We will have information of client on our system such as name, contact number. After receiving the image we perform segmentation then we extract the features from image because for identification of diseases we need features. We will get dataset after performing feature extraction then we train the model using SVM algorithm. After that we will test that model using the testing data. Then by providing some real time data(i.e. images captured by camera) we will check whether the plant is having disease or not. And also provide the remedies for the diseased plant. System will send health status of plant to the clients registered mobile number.
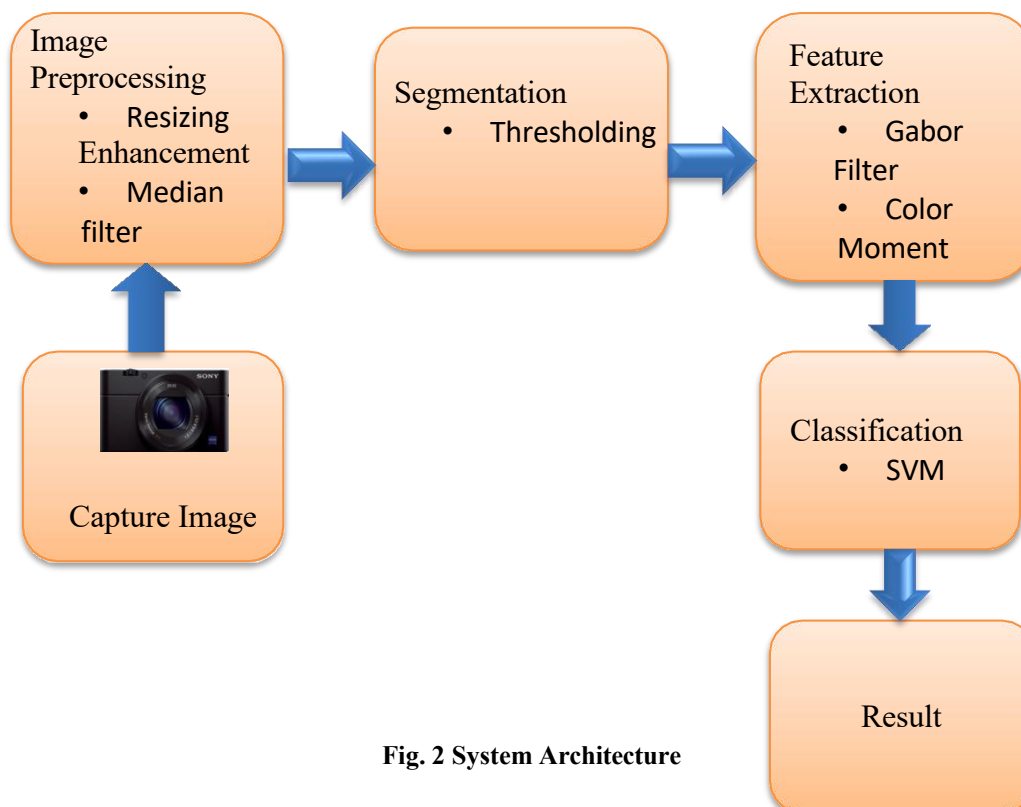

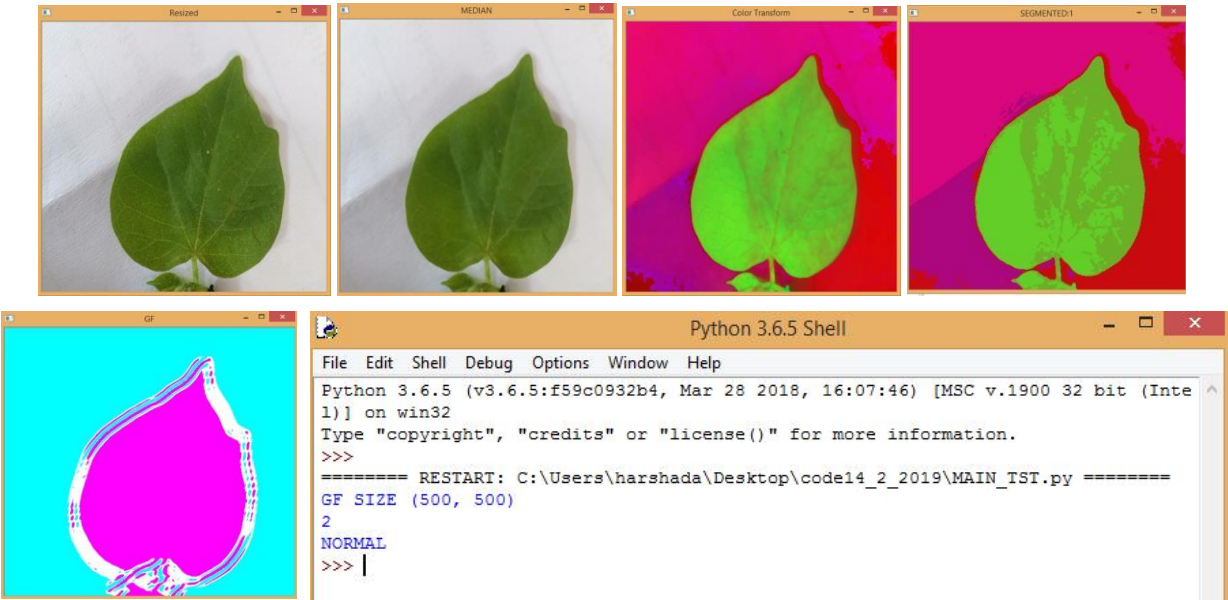**Fig. 2 System Architecture**

VI. RESULTS
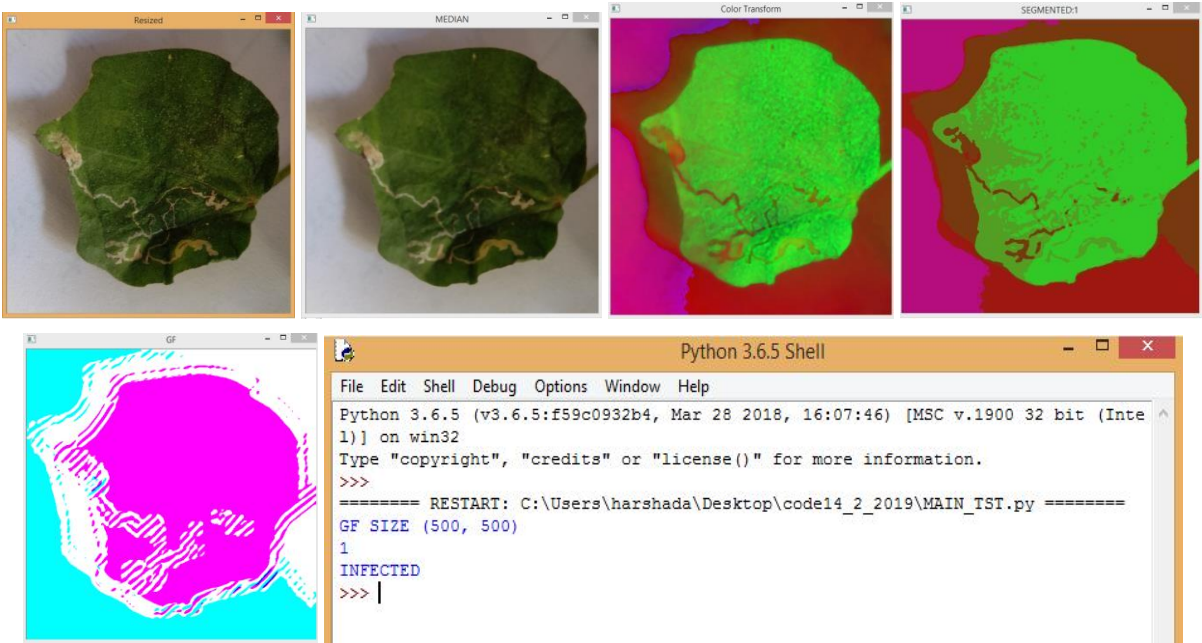

Fig. 3 Results of healthy leaf

Fig. 4 Results of diseased leaf

VI. FUTURE SCOPE

We can also use different parts of plant for detection of plant disease and we can use night camera for capturing the images when it is dark. In future, we will design more robust classifier considering features from root, stem etc. for diagnosis of diseases.

VII. CONCLUSION

In this paper, our survey on detection and classification of cotton leaf disease using image processing and machine learning techniques is carried out using computer technologies, an automated system can be built which can provide notification of disease. It is very important to detect and classify plant disease for the successful cultivation of the crops, this can be done using image processing and machine learning. By this project, the detection of disease as well as suggestion of remedies for curing it is achieved.

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