International Journal for Innovative Engineering and Management Research
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Volume 06, Issue 05, Pages: 36–41.

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CLASSIFICATION OF LEAF DISEASE BASED ON MULTICLASS SVM CLASSIFIER

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ABSTRACT

India, the country where the main source of income is from agriculture. Farmers grow a variety of crops based on their requirement. Since the plants suffer from the disease, the production of crop decreases due to infections caused by several types of diseases on its leaf, fruit, and stem. Leaf diseases are mainly caused by bacteria, fungi, virus etc. Diseases are often difficult to control. Diagnosis of the disease should be done accurately and proper actions should be taken at the appropriate time. Image Processing is the trending technique in detection and classification of plant leaf disease. This work describes how to automatically detect leaf diseases. The given system will provide a fast, spontaneous, precise and very economical method in detecting and classifying leaf diseases. This paper is envisioned to assist in the detecting and classifying leaf diseases using Multiclass SVM classification technique. First, the affected region is discovered using segmentation by K-means clustering, then features (color and texture) are extracted. Lastly, classification technique is applied in detecting the type of leaf disease. The proposed system effectively detects, classify the disease and also upload the disease details into the IoT cloud, from where the user can access the details from his mobile remotely.

Keywords: Image Processing, Leaf diseases detection, K-means clustering, feature extraction, Multiclass SVM Classification.

1.INTRODUCTION

India is a cultivated country and about 80% of the population depends upon on agriculture. Farmers have large range of difference for selecting various acceptable crops and finding the suitable herbicides and pesticides for plant. Disease on plant leads to the convincing reduction in both the quality and productivity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants.Support Vector Machines (SVM) classification approach are proposed and used in this paper. Health of plant leaf and disease on plant leaf plays an important role in successful cultivate of crops in the farm.In early Days, analyses of plant diseases were done manually by the expertise person in that field only. This requires huge amount of work and also requires excessive processing time. The

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image processing techniques can be used in that paper. In most of the cases disease symptoms are seen on the leaves, stem and fruit.Mostly image processing includes regarding images as signals while applying signal processing methods, it is among very quickly growing technologies today, its applications in various aspects of a business. Image Processing is cast core research area within engineering and computer science regulation too.Image processing basically contains the following three steps:

a)Importing the image with ocular scanner or by digital photography.

b)Analyzing and handling the image which includes data condensation and image enhancement and spotting patterns that are not to human eyes like satellite photographs.

c)Output is the last stage in which result can be changed image or report that is based on image analysis.

2.PROPOSED METHODOLOGY STEPS INVOLVED

The first step is to acquire images of various leafs from the Digital camera or any source. There are various image processing techniques applied to detect the disease. Image processing is used to get useful features that can prove important for further process. With image processing, SVM and k-means is also used, k-means is an algorithm and SVM is the classifier. Then next various techniques are to use to get and result in hand.Figure 1 shows the flow of the proposed system and the vision dependent detection algorithm. The initial step is to pick up the sample images of all the leaves from the camera. The flow of the process of the proposed system:

1)Input Image.
2)Blur Soften Image.
3)Converting the input image from RGB to HSV format.
4)Color Thresholding.
5)Separating the Foreground and the Background.
6)Leaf segmentation Feature Extraction of the leaf.
7)Disease recognition using SVM and K-means.
8)Desired result

Fig. 2.1: Flow of the proposed approach

2.1.1. Input image:

Images can be taken by the digital camera and by using the images the data can be saved. Then for training the data set also for the comparison of the diseased leave and healthy leave

2.1.2.Blur soften image:

After acquiring the image next step is to apply blur soften to the image. Blurring of

the image means each pixels of the image gets spread over. Sharpening of the image can be reduced by using blurring and detection can be accurate. Blurring the image helps to reduce the amount of noise in the image. When the image is taken it contains some noise which can make detecting the affected area tough process. By blurring the image the noise can be reduced.

2.1.3.Converting image from RGB to HSV

Blurring helps to reduce the noise and conversion of RGB to HSV (Hue Saturation Value) can be helpful where the color description plays an important role. RGB color space describes the colors in the form of red, green, blue present. Usually HSV model is preferred over RGB color model. RGB model determines color as a collection of primary colors. HSV model's description of color is identical as of the human eye

Color Thresholding Conversion of the image from the RGB to HSV leads to the thresholding of the image. The simplest method of thresholding is to replace each pixel of a particular image with a black pixel if the intensity of the image is less than the fixed the constant, or can be replaced by white pixel if the intensity of the image is greater than the constant.

2.1.4.Separating the image fore ground:

The separation of the foreground and background plays an important role in obtaining the diseased part of the leaf. In this approach the foreground of the image is extracted. So automatically therefore the foreground is separated and is helpful in detection.

2.1.5. Leaf segmentation: The image is segmented into various parts according to the region of interest. This detects the division of the same and meaningful regions. In other words image segmentation is used to separate the objects from the background of the image. Then after the segmentation the segmented part is given to the clustering algorithm that is k-means.

2.1.6.Feature extraction :

The input given to the algorithm is huge and can lead to complex processing. The inputs given are compact of binded together so that it represents as set of features. If the features of the image are extracted wisely then that whatever feature set is available it gauges proper information from the input in order to perform relevant task.

3.Support Vector Machine:

Support Vector machine (SVM) is a non-linear Classifier. This is a new trend in machine learning algorithm which is used in many pattern recognition problems, including texture classification. In SVM, the input data is non-linearly mapped to linearly separated data in some high dimensional space providing good classification performance. SVM maximizes the marginal distance between different classes. The division of classes is carried out with different kernels.SVM is designed to work with only two classes by determining the hyper plane to dividedtwo classes. This is done by maximizing the margin from the hyper plane to the two classes. The samples closest to the margin that were selected to determine the hyper plane is known as support vectors .Fig below shows the support vector machines concept. Multiclass classification is also applicable and is basically built up by various two class

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SVMs to solve the problem, either by using one-versus-all or one versus-one. The winning class is then determined by the highest output function or the maximum votes respectively

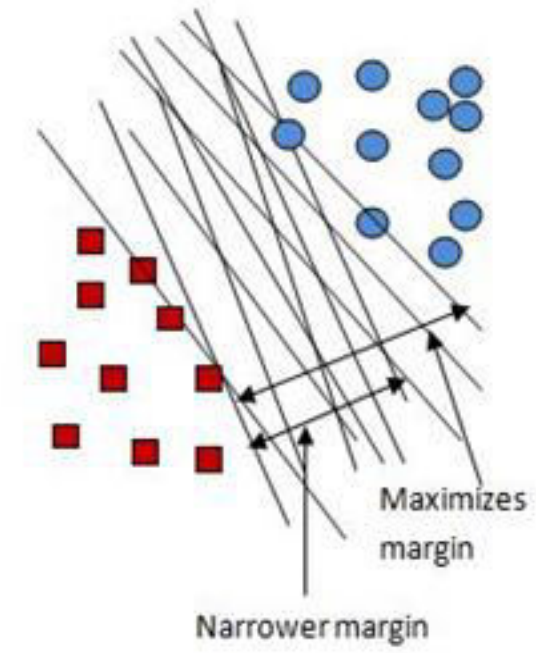

Fig.3.8.2 Support vector machine

3.2 Main advantages of SVM are

1. Its prediction accuracy is high.
2. Its working is robust when training examples contain errors.
3. Its simple geometric interpretation and a sparse solution.
4. Like neural networks the computational complexity of SVMs does not depend on the dimensionality of the input space.

4.RESULTS AND PERFORMANCES

To have a closer look at the results and interim outcomes of this work variety of inputs are necessary. Some of the variations in same class images are to be observed

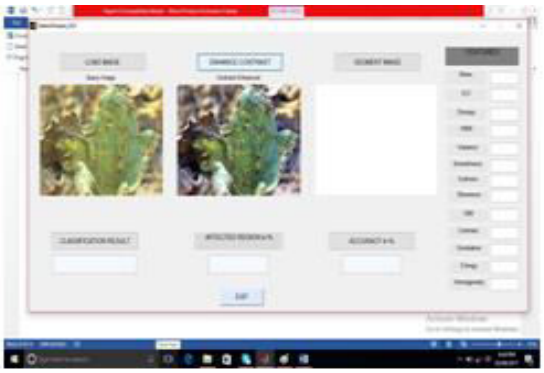

Fig 4.1 Home Page

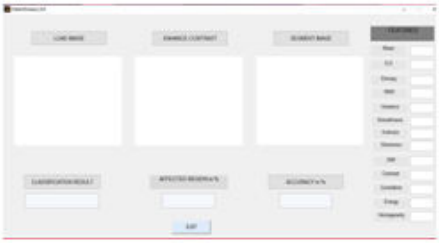

Fig 4.2 Contrast Enhanced Image

The input image is first preprocessed and the contrast is enhanced so that the minute details are visible on a larger scale. Then the enhanced image is converted into gray format representation. The second image in Fig 3.2 shows the improved version of the input image. The image will be contrasted and then displayed. Now select the Segment Image option.

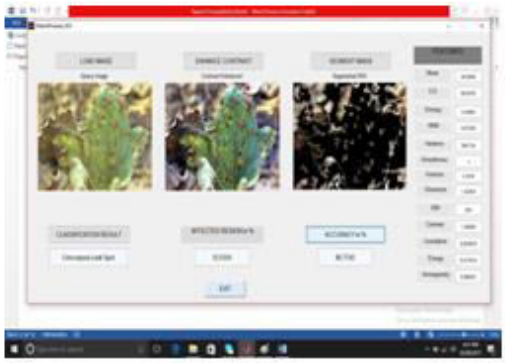

Fig4.3 Segmented images

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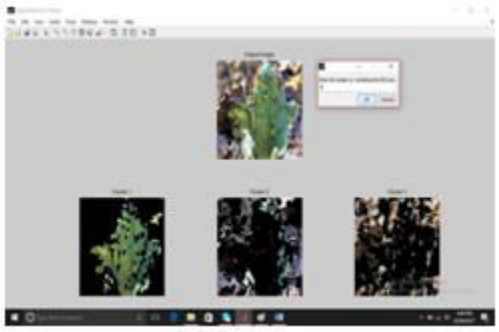

Select one among the segmented images in which the disease can be identified clearly. The selected image will then be used for further processing.

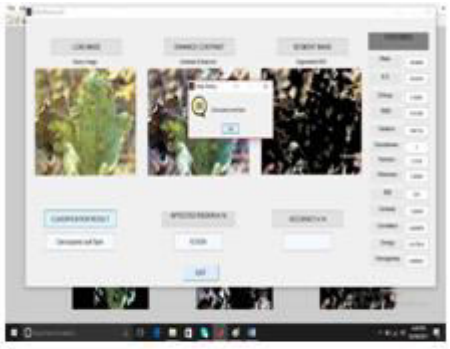

Fig 4.4 Classification of disease

one image is selected and classified based on th ROI,. The classifier detects that the input leaf image belongs to the Cercospora Spot disease type.

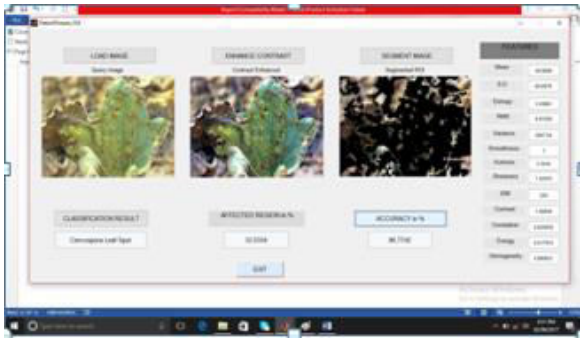

Fig 4.5 Accuracy Computation

The computed accuracy will be displayed. For accuracy calculation, the kernel function is changed and the cross validation along with class performance is

Accuracy of Linear Kernel with 500 iterations is: 96.7742% Accuracy of RBF Kernel with 500 iterations is: 95.1613% Accuracy of Polynomial Kernel with 500 iterations is: 96.7742% The accuracy for different kernel emphasizes upon the spread of space vector (points) in space. That is since the accuracy for the linear kernel is highest it means the space vector describing the features set is more linear than radial basis function than the polynomial spread.

5.CONCLUSION

The world is moving more towards technology dependent era. Every day we keep hearing owes of farmers that even after using costly fertilizers the leaves were eaten away by various diseases. One of the most sensitive and costly treatments in India in terms of leaf concerned is that of pomegranate. The expertise in this field is rarely available. Since the opinion of an expert can vary from that of a novice, for the benefit of all it is advisory to make the most use of the technology available to infer or conclude for treatments. The machine learning methods bring this aspect to reality, by observing the database and helping the botanists in the diagnosis of diseases where a lot of precision is required. And one of the machine learning technique, SVM is used in this project for classification of leaf diseases. The accuracy results in an available range from mid-90 to top 90%. This can be bettered by increasing the database. However, the results obtained from real life images are very encouraging.

6.FUTURE SCOPE

SVM, though a binary classification technique, with a simple manipulation, can

be used for a multiple class case. This provides more space not just to classify but to identify the diseases. Presently the system is semi-automatic. This can be completely automatic by choosing ROI based on criterion such as principal components analysis, or choosing the cluster with larger disease area etc. With the proper database, this method can be applied to more diseases. Example: liver diseases, skin cancer, breast cancer identification and classification etc.

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