# Implementation of Plant Leaf Diseases Detection and Classification using Image Processing Techniques

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**ABSTRACT:** In the proposed system we can detect the plant leaf disease and identify the disease. Captured Images and data base are maintained with the sample size of leaf. By using SVM classifier method, recognizes and detect the percentage of affected region, types of disease with the accuracy of 98%. Via Alternaria Alternata, Anthracnose, Bacterial Blight and Cercospora Leaf spot detection SVM classifier technique is used to identify the plant leaf disease .

**Keywords: Leaf Image; Image enhancement; Image contrast; Support Vector Machine;**

## 1. INTRODUCTION

Automatic detection of plant leaf disease and classification of leaf disease is the most important research topic as it shows an advantage in monitoring of large area of field crops and routine detect and classify the plant leaf disease. Leaf image can be capture by using the mobile camera of 25 Mega pixels or above and leaf images can be detected and classify by using the SVM classifier.

With this method farmers can easily identified the disease and according preventative measures can be taken to cure the disease and take maximum crop production. In the existing system, we are inspection the factors of the plan manually. It needs the physical inspection of plants through the naked eye and time consuming to inspected the whole field. Continuous observation of crops and maintenance is incredibly troublesome. This could decrease in crop yield production because of poor observance. Drawbacks of manual monitoring Time consumption, Manpower requirement, Detection of disease through the naked eye

### 1.1 Proposed system:

In this system images are saved in data base and by using the SVM classifier technique we can identify the percentage of affected part of the leaf and according proper method / pesticide/organic manure is used to cure the disease. This method gives the accuracy of 98%.

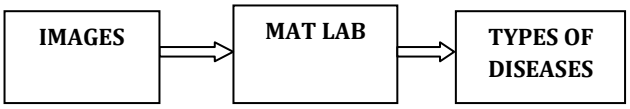


Fig.1 Proposed System block diagram

[1] Author proposed the Convolution Neural network (CNN) for detection of cotton leaf disease with the accuracy of 86%.[2] GLCM method is applied feature extraction and KNN classifier is used for detection with the accuracy of 95%.[3] Support Vector machine (SVM) algorithm is sued with five kernel function i.e., Linear, quadratic, radial basis function, sigmoid and polynomial. This method gives us the grayscale conversion. Classification was done on the basis of statistical, color and texture features based on SVM but accuracy level is 90% only.[4]Author proposed the k-means clustering algorithm and Otsu's classifier in which the infected area of leaf is segmented and analyzed. [5]Author used the methodology of Simple linear iterative clustering (SLIC) is widely applied to super pixel clustering due to its simplicity and practicality. This proposed method is appropriate for dealing with plant disease leaf image segmentation and has certain superiority in the field of plant disease detection.[6]Genetic algorithms are used to set the unlabeled points in N-dimension into K cluster and for feature extraction color co-occurrence method are used. The minimum distance criterion with K-means clustering gave an accuracy of 86.54% and with SVM the accuracy was 95.71%.[7] Author proposed the statistical and structural recognition method. The statistical recognition of patterns totally depends upon the pattern characteristics which are also statistical in nature. Structural recognition of characterizes depend on the interrelationship among the structure which contain features.[8] For detection of plant leaf are BPNN,K-means clustering and SGDN are used . For classification of plant leaf disease SVM technique is implemented.[9] Author used the Vision-based detection algorithm with

masking of the green pixels and color co-occurrence method is used to detect and identify the plant leaf disease.[10] Artificial neural network and Gabor filter is used by author for detection and identify of plant leaf disease. Gabor filter is used for feature extraction and ANN classifier is used for classification which gives the recognition rate up to 91%.

## 2. Experimental Process

The workflow of this project is very simple. In this project we detect the plant leaf disease and classify the percentage of the affected region of the leaf. Leaf images are first capture through the mobile phone and images are saved in data base and images are processed by image processing in Mat lab and percentage of affected region is identified.

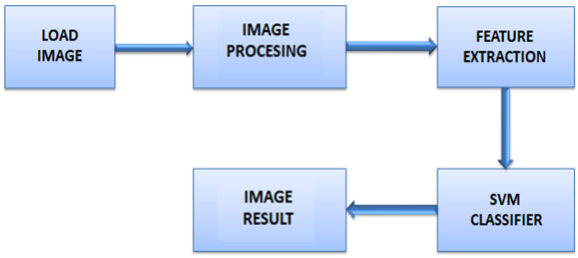


Fig.2 Work flow block diagram

## 3. METHODS AND MATERIALS

In this method, first the images are selected from the data base and then process the images through the image processing techniques in which image is enhance and then the image is segmented into 3 cluster via cluster 1, cluster 2 and cluster 3. Shown in Fig.5(a), (b) and (c), Initially choose any one cluster and then the result is classified the type of disease, affected region in leaf and percentage of accuracy for detection of disease. Features is Mean, Standard deviation, Entopy, Root mean square, Variance, Smoothness, Kurtosis, Skewness, IDM, contrast, correlation, nergy and homogeneity.

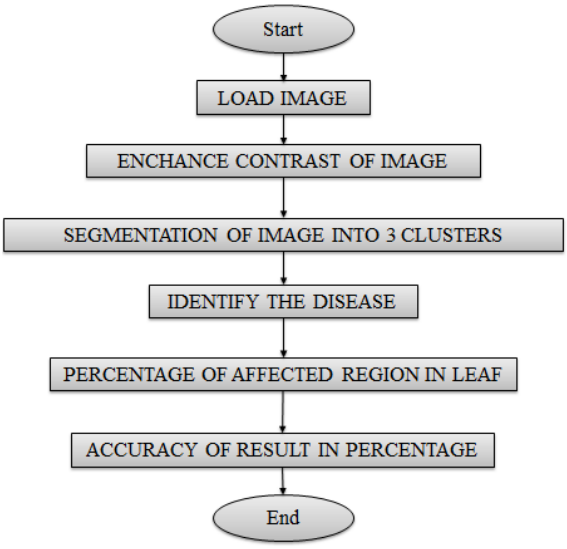


Figure-3 Flow chart

## 4. SVM Classifier:

Support-vector machines (SVM)are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. The Support Vector Machine (SVM) algorithm is a popular machine learning tool that offers solutions for both classification and regression problems. Throughout this formula, we tend to tend to plot each data item as a degree in n dimensional house (where n is vary of choices you have) with the value of each feature being the value of a selected coordinate. Then, we tend to tend to perform classification by finding the hyper-plane that differentiate the two classes okay (look at the below snapshot). In Python, scikit-learn might be a large used library for implementing machine learning algorithms, SVM is to boot getable at intervals the scikit-learn library and follow identical structure (Import library, object creation, fitting model and prediction). It works very well with clear margin of separation. It is effective in high dimensional areas. It is effective in cases where vary of dimensions is larger than the number of samples. It uses a group of employment points at intervals the decision operate (called support vectors), so it's together memory economical. the advantages is for the purpose of farming., to identify the plant disease, less human intervention, less time consuming to identify the plant leaf disease. And applications is automatic identify the plant disease and for farming purpose.

## 5. RESULT

Plant leaf image is capture by using the mobile camera and image is saved into the data base. Sample size of leaf image

is 75.Four different types of diseases taken and name of disease is Alternaria Alternata, Anthracnose, Bacterial Blight, Cercospora Leaf spot along with the healthy leaf. In this method images are first load from the data base of save images of different types of leaves and then images of leaf can be enhanced by using the image processing technique of SVM classifier method. Color segmentation is done by use of K means clustering for segmentation, Euclidean distance metric to segment the image and convergence of image by using gray scale conversion. Images can be classified into 3 clusters in which cluster 1 is medium and cluster 2 is low and cluster 3 is high segmented images. Choose any one cluster from the three clusters. After choosing the cluster images can be classified the type of disease, percentage of affected region in leaf and percentage of accuracy to identify the disease.

Fig. 3 - Image of Leaf

Fig. 4 – Enhance the input image of leaf

Features is Mean, Standard deviation, Entropy, Root mean square, Variance, Smoothness, Kurtosis, Skewness, IDM, contrast, correlation, Energy and homogeneity. Types of disease covered in this proposed system are shown in table 1.

Fig. 5(a)

Fig. 5(b)

Fig. 5(c)

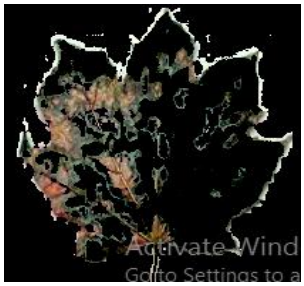


Fig. 5(d)

Fig.5 - Clustering of input image cluster 1 is medium and cluster 2 is low and cluster 3 is high segmented images.

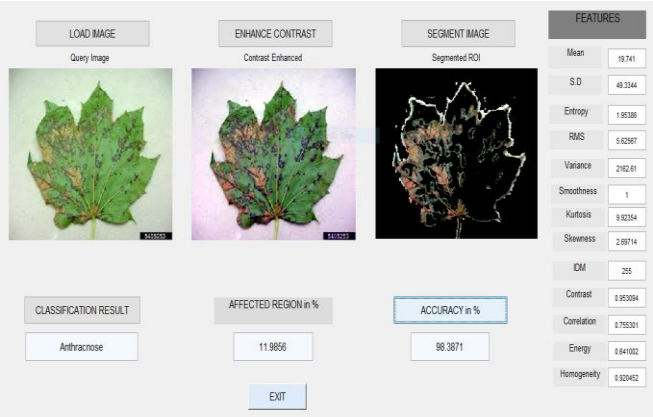


Fig. 5 shows the types of disease, % of affected region and % of accuracy.

**Table 1 – Types of disease and symptoms**

| S.No | Types of Diseases | Symptoms |
|---|---|---|
| 1. | Alternaria Alternata | AAL's main symptom is cankers in the stem. It resides in seeds and seedlings, and is often spread by spores as they become airborne and land on plants. It can also spread throughout other plants. Under severe infection, lesions enlarge and become coalesced causing blighting of the leaves. |
| 2. | Anthracnose | Anthracnose, a group of fungal diseases that affect a variety of plants in warm, humid areas. Shade trees such as sycamore, ash, oak, and maple are especially susceptible, though the disease is found in a number of plants, including grasses and annuals. |
| 3. | Bacterial Blight | Bacterial blight is small water-soaked spots on the underside of leaves. The spots enlarge and coalesce becoming brown, dry, and brittle. A narrow yellow border surrounding lesions also characterizes these spots. |
| 4. | Cercospora Leaf spot | First appear as individual, circular spots that are tan to light brown with reddish purple borders. As the disease progresses, individual spots coalesce. Heavily infected leaves first become yellow and eventually turn brown and necrotic. |
| 5. | Healthy Leaf | Color of healthy leaf is green and no dark spot is found in leaf. |

We have detected and identify different disease in different plant leaf, percentage of affected area of leaf and accuracy shown in table 2 .In tables 2 we have shown the types of plant leaf disease, affected area in leaf and accuracy of exact results. Overall the accuracy of the system is 98%.

**Table 2 – Type of disease, % of affected area, % of accuracy and image of Leaf**

| Types of Disease | Affected area (In %) | Accuracy (In %) | Images of Leaf |
|---|---|---|---|
| Alternaria Alternata | 36.23 | 98.38 |  |
| Anthracnose | 17.86 | 96.77 |  |
| Bacterial Blight | 15.00 | 98.38 |  |
| Cercospora Leaf spot | 15.24 | 98.38 |  |

| | | | |
|---|---|---|---|
| Healthy Leaf | None | 98.38 |  |

## CONCLUSION

The Proposed system, we implemented the automatic detection and identify the plant leaf disease through the image processing by using the SVM classifier technique. This technique identifies the disease, percentage of affected region with good accuracy of 98% for identification of different disease. Advantages of this proposed system is to reduce the human effort and automatic detect the diseases. This concept will modernization the agriculture, increase the yield of crop production and operable. The Future scope in this proposed system we are consider only the four types of diseases along with healthy leaf which will limited the identification and detection of plant leaf. In future sample size is increase with the more number of plant leaf disease are taken into the consideration with 99% of accuracy.

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