# A Survey on Leaf Disease Detection and Classification

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***Abstract-*** The detection of plants diseasethus compelled many researchers to employ image processing techniques to ease this difficult task. Moreover, even though that person has always been bad in biology but would like to know more about that plant. It simply means that he/she is interested to explore his/her knowledge in this particular area.He might be interested to know its name or about its specific features.Sometimes, he/she might be interested to search a plant if it is rare or on the verge of the existence..The approach consist of four phases that are preo-processing, segmentation, feature extraction and classification phases.Since most type of plants have unique leaves.Leaves are different from each other by characteristics such as, the shape, color, texture and vein. In this paper we have describe each and evwry method comparative study and finding its advantages and disadvantages for future direction of leaf deasies identification.

***Keywords-*** Plant Classification, Leafe Image Processing, Leafe Diseases Detection, Random forest (RF)Algorithm.

## I. INTRODUCTION

Agriculture in any country depends on the quality and quantity of farming products, especially plants. The detection of plants disease (i.e., unusual growth or dys-function) thus compelled many researchers to employ image processing techniques to ease this difficult task [1–10]. Depending upon the cause, a plant may have a specific type of infection out of a range of diseases. This fact further complicates the applicability of computer vision techniques in their proper recognition [11, 12]. Different plants disease detection techniques are proposed and a survey of traditional and innovative techniques is also presented in literature [13, 14]. Popular traditional techniques include molecular, serological, and deoxyribose nucleic acid (DNA). Volatile organic compounds and imaging & spectroscopic techniques are also utilized. innovatively to automate the detection process. Such innovative techniques are faster and do not need personnel monitoring. Research by Zhang and Meng [15] reported an accuracy of 87.99% (using an imaging technique) and 86.87% (using human experts on screen) for automatic detection of citrus canker on leaves. Their study further supports the usage of image processing techniques to automatically detect plant diseases at an early stage [15]. Thus, the articles considered in this study are those which have utilized innovative imaging techniques to identify a plant infection using leaf images.

## II. RELATED WORKS

Explaining research model, theory, technique of collecting the data, technique of analyzing the Sukhvirkaur, Shrilekhapandey and Shivani goel propose technique for semi-automatic leaf disease detection and classification system for soybean cluster. From the analyzation, grayscale images are easy to process and implement for various application because they have better clarity and suited for analysis than RGB images. Histogram equalization is used to enhance the contrast of the images and provides clear image to human eyes. Histogram equalization is used to achieve better quality image in grayscale which is used in various medical application, biological application such as digital X-rays, plant leaves disease, etc. So, these type of images will be used to analysis and diagnosis the plant leaves diseases and determines the diseases level of the plant leaves [1].

Jayne Garcia and Arnal Barbedo propose technique for Digital image processing techniques for detecting, quantifying and classifying plant diseases. This paper tried to present a comprehensive survey on the issue. Due to the large number of references, the descriptions are short, providing a quick overview of the ideas underlying age of the solutions. It is important to highlight that the work on the subject is not limited to what was shown here. Many papers on the subject could not be included in order to keep the paper length under control - the papers were selected as to consider the largest number of different problems as possible. Thus, if the reader wishes to attain a more complete understanding on a given application or problem, he/she can refer to the bibliographies of the respective articles [2].

Anand R, Veni S and Aravinth J propose technique for an application of image processing technique for detection on Brinjal leaves using K-means Clustering Method. A method for detection and classification of leaf disease is implemented. The segmentation of the diseased is implemented. The segmentation of the diseased part is done using K-Means segmentation. Then, GLCM texture feature are extraction and classification is done using SVM. The method is tested for detection of diseases in citrus leaves. Future work is to be carried out for classification of disease in different plant species and to improve the classification accuracy [3].

R.Meena Prakash, G.P. Saraswathy, G.Ramalakshmi, K.H.Mangaleshwari and T.Kaviya propose technique for

Detection of Leaf Disease and Classification using Digital Image processing. This paper mainly studies the automatic detection of tomato pests and disease based on leaf surface. The detection models are trained to classify the tomato disease and pasts by transfer learning technology, which achieves an average classification accuracy of 89%. However, the overall high performance rely on relative high-quality test images (i.e. simple background, object-centered, positive close-up shooting), future research will focus on the complicate algorithms to detect tomato pests and disease based on relative low-quality leaf images [4].

Sukhvir Kaur, Shreelekha Pandey and Shivani Goel propose technique for Plants Disease Identification and Classification Through Leaf Images: A Survey. In this paper, disease identification is bit simpler than its proper classification. Sometimes it becomes difficult for an expert to classify a particular infection with 100% confidence. Development of systems that can categorize various fungal, viral and bacteria diseases correctly may also be focused. Literature considers minerals or nutrients deficiencies as another form of plant disease. The development of systems that can effectively differentiate between an infection and a deficiency may be another interesting topic of research. This can be considered as a very difficult objective because from expert perspective separating an infected leaf from a deficient leaf is a complex task [5].

Wan Mohd Fedzil W.M.N, Shah Rizam M.S.B, R.Jailani, Nooritawati M.T propose technique for Orchid Leaf Disease Detection using Border Segmentation Techniques. An image processing algorithm to find the disease detection and identification is proposed. The pepper plant leaves are taken as the set of leaves in detecting leaf disease. The algorithm produces better results and healthy and unhealthy plants can be differentiated with the help of this algorithm. With this image analysis technique good healthy pepper plants can be extracted out from a cultivating farm which increase the productivity the presence of disease by observing the visual symptoms seen on the leaves of the plants [6].

## III. COMPARISION OF DIFFERENT METHODS

**Table 1: Pre-Processing Methods**

| Pre-processing: Comparative Analysis | | |
|---|---|---|
| **Methods** | **Advantages** | **Disadvantages** |
| Histogram Equalization[3,8,15] | Equalize the image pixels to enhance image contras level | Work with gray scale image only. |
| LAB Color conversation[8] | Highlight the colors | Decrease the image pixels intensity level when image is low contras |
| Gray Scaling[4,6,13,15] | Fast processing<br>Less complexity | Image color<br>Channel information loss |

**Table 2: Segmentation Methods**

| Segmentation : Comparative Analysis | | |
|---|---|---|
| **Methods** | **Advantages** | **Disadvantages** |
| Cluster Base<br>K-Means[1,3,14,15] | Works for noisy images | Works with fixed distance |
| Color Base<br>HSV[7,8,9,14]<br>LAB | It is give optimize results for feature extraction associated with image pixels | Overlapping and miss segmentation due to pixels closely related to each other |

**Table 3: Features Extraction Methods**

| Feature Extraction : Comparative Analysis | | |
|---|---|---|
| **Methods** | **Advantages** | **Disadvantages** |
| Texture<br>Gabor[1]<br>Wavelet Transformation | Highest retrieval result for scale image | Only consider gray scale image |
| GLCM[3,4,8,12] | Computation time is low<br>Low memory consumption | Only consider gray scale image |
| Haralick[1] | Computation accuracy high<br>Classification accuracy high | Computation of feature vector complex |
| Color: | Create robust feature set | Not cover in variant feature |

| | | |
|---|---|---|
| Color Moment[1] | Low computation | |
| Shape:<br>Vein Feature<br>Area Parametric,<br>Major Access,<br>Minor Access. | Consider age and internal feature of leaf<br>Easy to implement<br>Less complex<br>Less time consuming | Not immune to noise<br>Works with binary image only |

**Table 4: Classification Methods**

| **Classification : Comparative Analysis** | | |
|---|---|---|
| **Methods** | **Advantages** | **Disadvantages** |
| CNN[2,5] | Accuracy is high<br>Works for non-linear data | Computation cost is high<br>Complex to implement |
| SVM[1,4,9,10,14] | Less complex<br>Accurate classifier<br>Robust to noise | SVM is binary classifier to do multi-classification pair wise model is used |
| ANN[3,4,10,14] | High agree of non-linearity possible | Hard to tune parameter<br>More time to build model |
| RF | It computes, proximities between pairs of case that can be used in clustering, location outliers or give interesting view of the data<br><br>The capabilities of the above can be extended to unlabelled data leading to unsupervised clustering data view and outlier detection | Random Forests have been observed to over fit for some datasets with noisy classification/ Regression tasks |

## IV. WEEKNESS OF CURRENT APPROACH

- It uses k-means clustering so it required more time.And in this, the shape feature is not used or not able [1 ,8, 9 ,10].
- It uses k-means clustering algorithm and uses statical image so it required more time [3, 14].
- In this work, there is no used of shape and color feature [4, 7].
- No classification approach, No feature only while pixel based classify defect [6].
- It uses k-means clustering so it required more time [11].
- It uses k-means clustering so it reuired more time. And there is no used of color and shape features [12].
- It uses k-means clustering so it required more time. And there is no used of texture features [13].
- It uses k-means clustering so it required more time. And there is no used of texture and shape features [15].

## V. PROPOSED WORK

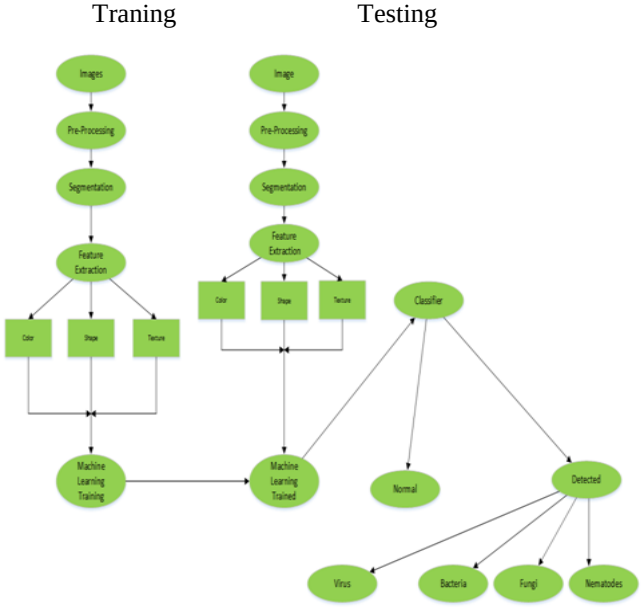


Fig.1: Proposed Flow Diagram

**Algorithm**

**Training**

Step 1: Select or upload images and its Label.
Step 2: Apply Pre-Processing using Histogram Equalization and Denoising on hole image datasets.
Step 3: Apply Colour and Cluster Based Combine Segmentation approach.
Step 4: Extract Shape, Colour and Texture Features for all images.
Step 5: Apply machine Learning Approach RF and make database.

**Testing**

Step 1: Select or upload image.
Step 2: Apply Pre-Processing using Histogram Equalization and Denoising.
Step 3: Apply Colour and Cluster Based Combine Segmentation approach.
Step 4: Extract Shape, Colour and Texture Features.
Step 5: Apply machine Learning classification Approach RF using database.
Step 6: Classify Disease type.

## VI. CONCLUSION

This paper provides the survey of different techniques for leaf disease detection. The main characteristics of disease detection are speed and accuracy. Hence there is working on development of fast, automatic, efficient and accurate system, which is use for detection disease on unhealthy leaf.We propose and experimentally evaluate a software solution for automatic detection and classification of plant leaf diseases. Work can be extended for development of system which identifies various leaf diseases . As now a day's pest are affecting plants more and more which is reducing the production at great extent . Hence fast and accurate system is required to detect the pests.

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