# An Efficient Leaf Disease Detection and Classification for Agricultural Plant

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*Abstract*— Traditional scheme used for disease scoring scale to grade the plant diseases is primarily based on bare eye observation by agriculture professional or plant pathologist. In this scheme proportion scale was totally used to define different disease severities in an illustrated series of disease evaluation keys for field crops. In the past few years, researchers have studied a number of cultures exploiting different parts of a plant. The evaluation of plant leaf diseases using this approach which may be subjective, time consuming and cost effective. Also precise grading of leaf diseases is necessary to the determination of pest control measures. In order to develop this practice, here we propose a technique for automatically grading the damaged leaf area using k means clustering, which uses square Euclidian distances technique for segmentation of leaf image. For grading of leaf diseases which emerge on leaves based on segmented contaminated region are done automatically by estimating the proportion of the unit pixel expressed under diseased region area and unit pixel expressed under Leaf section area. In count, a contaminated leaf is classified into any one of the disease categories. Experiments are performed by individually utilizing color features, texture features, and their combinations to train three models based on ANN classifier.

***Keywords:*** Agricultural Plant, Leaf Disease Detection, K-Means Clustering Algorithm, Artificial neural networks (ANN)

## I. INTRODUCTION

Leaf diseases like Bacterial Leaf Blight, Septoria Brown Spot, and Bean Leaf pod Mottle are cause major reduction in yield loss and lead to concern quality of soybean Products [1], thus influence market and farmers life. An effective means to manage soybean foliar diseases is by applying fungicides. To check the method for disease assessment, black and white drawings from a manual of disease evaluation keys showing foliar diseases with different disease severities. Although there is a trade recognized corresponding standard to grade the leaf speck disease [4-7], the bare eye observation scheme is largely adopted in the production practice. Because of the dissimilarity of personal familiarity and practical experience; the similar samples are classified into different grades by different experts. Therefore, the outcome is typically subjective and it is impossible to evaluate the disease extent accurately. Although grid paper system can be used to get better the accuracy, it is seldom used in practice due to cumbersome operation practice and prolonged. Hence looking for a quick and exact method to measure plant disease severity is of great practical significance. Since the late 1970s, computer image processing technology is useful in the agricultural engineering research, such as agricultural goods quality examination and classification, the crop growth state monitoring, plant disease and insect pest's detection, and further agricultural robot [8, 9]. With the modern improvement in the field of image processing and pattern recognition techniques, it is possible to develop an computerization system for disease evaluation of plant leaf based on the visual symptoms on leaf image. The plant disease grading is important procedure to develop diagnostic plant and explore resistant varieties to the disease. Traditionally, plant pathologists score the disease level based on their own discretion using illustrated diagram key for particular disease.

## II. EXISTING SYSTEM AND DISADVANTAGES

The Feature Discontinuity extract the areas have different properties like intensity, texture, color, etc. likeness groups the image pixel values into different groups with some existing criteria. PCA Based on pixel similarity with the neighboring pixel value, the procedure used is region based. In leaf infection detection, segmentation is used to recognize the contaminated area. As of this, features of a section are computed; we have to dig out the features equivalent to the disease in this scheme Not Clearly Recognition Leaf Disease Result.

### *A. Drawback:*

- Noise High,
- Output Not Clearly Recognition Leaf Disease,
- Low Accuracy

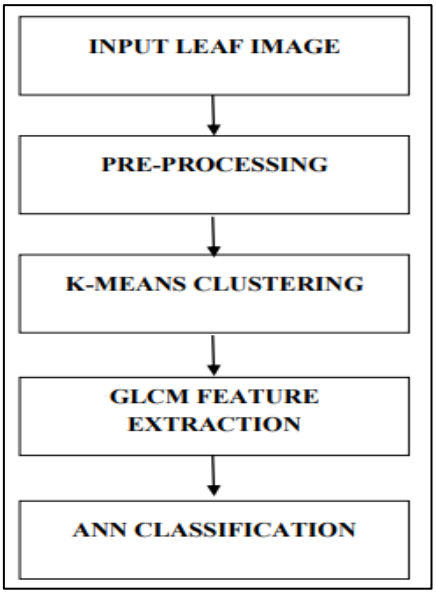
## III. PROPOSED SYSTEM AND ADVANTAGES

In the proposed work, we have determined on identification of Leaf Spot disease and Leaf Miner from the photographic signs and grade them using image processing algorithms. The proposed framework has been implemented in three steps. First, image segmentation is performed using K means clustering to identify the infected area. After that step leaf feature values are extracted from segmented area using feature extraction techniques such as GLCM. These feature values are then used to trained and then for classification into infected or non-infected leaf type. As third step these features specified to the classifier to categorize the disease in the crop. We used ANN classifier to obtain efficient results. The Benefits are as follows:

- The code is loosely based on the following paper Best Accuracy.
- "Automated Plant Disease Analysis (APDA) which concert of Artificial Neural Network Classification Techniques based leaf diseases Identification.
- Processing time Fully Reduction,
- Better Result.

## IV. BLOCK DIAGRAM




Block diagram of proposed system

## V. SYSTEM DESIGN AND DEVELOPMENT

- Input – RGB Image,
- Image Pre-Processing
- K-Means Segmentation,
- Feature Extraction using GLCM,
- ANN Classification.

### *A. Input – RGB Image:*

The RGB color model is one of the widely used color illustration method in computer graphics. It uses a color coordinate system with three primary colors: Input Leaf Image Pre-Processing K-Means Clustering GLCM Feature Extraction ANN Classification Each primary color can obtain a pixel intensity value range from 0(lowest) to 255(highest) on an unsigned integer 8 bit value. Integration these three primary colors at different pixel intensity levels generates a range of colors. The set of all the colors obtained by such a linear mixture of red, green and blue forms the cube shaped RGB color space.

#### *1) Image Pre-Processing and Segmentation:*

The pre-processing involved the procedures to prepare the images for subsequent analysis. The affected lea images were converted from RGB color format t gray scale images. Segmentation is referred to the procedure of clustering the pixel values with definite properties into prominent regions and these regions correspond to different faces, things or natural parts of the things. We proposed k-means segmentation technique to fragment goal areas. Target areas are individual areas in the image that represent visual symptoms of a disease.

### *B. K-Means Segmentation:*

K-means clustering is a process of vector quantization, originally from signal processing, that is popular for cluster analysis in data mining. K-means clustering aims to separation n observations into k clusters in which each examination belongs to the cluster with the adjacent mean, helping as a prototype of the cluster.

#### *1) K-Means Clustering Algorithm*

Clustering is a technique to divide a set of data into a specific number of groups. In kmeans clustering, it partitions a collection of data into a k number group of data. It classifies a given set of data into k number of disjoint cluster. K-means algorithm has of two distinct phases. In the first phase it calculates the k centroid and in the second phase it takes each point to the cluster which has nearest centroid from the respective data point. There are different methods to define the distance of the nearest centroid and one of the most used methods is Euclidean distance. Once the grouping is done it recalculate the new centroid of each cluster and based on that centroid, a new Euclidean distance is calculated between each center and each data point and assigns the points in the cluster which have minimum Euclidean distance. Every group in the division is defined by its part objects and by its centroid. Let us consider an image with resolution of x×y and the image has to be cluster into k number of cluster. Let p(x, y) be an input pixels to be cluster and ck be the cluster centers. The algorithm for k-means clustering is following as:

1) Number of cluster k and Centre should be initialized.
2) For each pixel of an image, calculate the Euclidean distance d, between the center and each pixel of an image using the relation given below.
3) Allocate all the pixel values to the adjacent center based on distance d.
4) After all pixels have been assigned, recalculate new position of the center using the relation given below.

$$c_k = \frac{1}{k} \sum_{y \in c_k} \sum_{x \in c_k} p(x, y)$$

5) Reiterate the procedure until it satisfies the to error value.
6) Reshape the cluster pixels into image. Even though k-means has the huge benefit of being easy to implement, it has some drawbacks. The quality of the final clustering results is depends on the arbitrary selection of initial centroid. So if the initial centroid is randomly chosen, it will get different result for different initial centers. So the initial center will be suspiciously chosen so that we get our need segmentation. And as well computational difficulty is another term which we require to consider while designing the K-means clustering. It relies on the number of iteration, number of clusters and number of elements.

### *C. Feature Extraction:*

The symptoms associated with various Phyto-pathological disease of leaves under examination visible on the affected leaves were extracted from their respective images using K-mean. The image analysis was mainly focuses on the extraction of shape features and their color based segmentation. The image analysis technique is done using Gray-level co-occurrence matrix. The affected areas differ in color and texture and are overriding in classifying disease symptoms. So, we measured both texture and color feature values for classification purpose. Picture texture explained as a purpose of the surface variation in pixel intensity values (gray values). The use of color features in the noticeable

light spectrum provided additional image characteristic features over traditional gray-scale representation. GLCM is a method in which both color and texture features are taken into account to arrive at unique features which represent that image.

The extracted feature values are:

- Energy,
- Entropy,
- Homogeneity,
- Contrast,
- Correlation
- Mean,
- Standard Deviation,

### *D. ANN Classification:*

At present ANN is popular classification tool used for pattern recognition and other classification purposes. Artificial neural networks (ANN) are a group of supervised learning methods that can be applied to classification or regression. The normal ANN classifier takes the set of involvement data and calculates to classify them in one of the only two separate classes. ANN classifier is trained by a given set of training data and a model is willing to classify test data established upon this model. Most habitual classification models are established on the empirical risk minimization principle. ANN implements the structural risk minimization principle which pursues to reduce the training error and a sureness interval term. A number of submission showed that ANN hold the superior classification capability in production with minor sample, nonlinearity and high dimensionality pattern identification. A decision plane is one that splits among a set of objects having different class association. Classifier that separate a set of objects into their corresponding classes with a line. Supreme classification tasks, are not that modest, and often more difficult structures are desirable in order to make an optimal separation, i.e., appropriately classify novel objects on the basis of the examples that are accessible. All the evidence from beyond processes is given to multiclass ANN .The Multiclass ANN were used for cotton disease classification.

## VI. CONCLUSION AND FUTURE ENHANCEMENT

### *A. Conclusion*

In this paper we illustrate our work concerned with the discrimination between healthy and diseased to crops using an ANN. In this paper, in that order the applications of K-means clustering have been formulated for clustering and classification of diseases that concern on plant leaves. The whole practice of leaf classification can be implemented in this study, extracted using the Gray-Level Co-occurrence Matrix (GLCM) and Artificial Neural Network, using leaf detection, feature extraction and GLCM features are rendered to an ANN classifier for purpose of classification. The leaf is used for classifying Accuracy Using Precision and Recall Value Analysis Detection Result.

### *B. Future Scope*

For future study, different ANN neural network architectures can be used for classification. We can expand this task to categorize disease symptoms affected on other part like fruits, vegetables, etc. we may work for better application like we develop diseased and full detail about the disease.

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