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Histogram Approach for Detection of Maize Leaf Damage

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Abstract– **Turcicum Leaf Blight disease in Maize are the most major diseases which appear as spots on the leaves. If not treated on time, causes the rigorous loss. In this paper proposes a novel methodology of an image processing methodology to address one of the core issues of plant pathology i.e., disease identification and its grading. At first, the captured images are processed for enhancement. Then image segmentation is carried out to get target regions (disease spots). Later, image features such as shape, color and texture are extracted for the disease spots based on histogram. These resultants features are then given as input to disease classifier to appropriately identify and grade the diseases. Finally, based on the phase of the disease, the treatment consultative module can be prepared by on the lookout for agricultural experts, so plateful the farmers.**

***Index Terms*– Turcicum Leaf Blight Disease, Texture, Histogram Approach, Segmentation and Objective Function**

I. INTRODUCTION

THE one and only area that serves the food desires of the intact human race is the Agriculture zone. It has played a key responsibility in the development of human civilization [11]. Plants exist all over the place; we live, as well as places without us. Plant disease is one of the essential causes that reduces quantity and degrades quality of the agricultural merchandises. Plant diseases have turned into a terrible as it can cause significant reduction in both quality and quantity of agricultural products. Some researchers are portentous to verdict the Maize leaves using different loom suggesting the various implementation ways as illustrated and discussed below. In the research of identifying and diagnosing Maize disease using computer vision intellectively in the agriculture, feature selection is a key question in pattern recognition and affects the design and performance of the classifier. Mainly the fuzzy feature selection approach fuzzy curves (FC) and surfaces (FS) - is proposed to select features of Maize disease leaves image. Sannakki S.S., et al. [1] proposed method for segmentation to collect the color and texture are extracted for the disease spots. Ahmed Rafea et al., [2] used for integrating image scrutiny techniques into diagnostic expert scheme. R. Pydipati et al., T.F. Burks et al., [3] mainly used proper disease control measures must be undertaken in citrus groves to minimize losses. Sanjeev S Sannakkil et al., [4] proposed for to automatically grade the disease spread on plant leaves by employing Fuzzy Logic. Viraj A. Gulhane et al., [5] used the features could be extracted using self organizing feature map together with a back-propagation neural network is used to recognize color of image. Major maize diseases are Turcicum Leaf Blight, Maydis Leaf Blight, Banded Leaf and Sheath Blight, Powdery Mildew, Downy Mildew and Bacterial Stalk Rot. Out [6] of these we are working with one of the major severe maize disease that is Turcicum Leaf Blight. It appears in most maize grown area in India and sometimes is causing total loss of the crop.

II. PROPOSD METHODOLOGY

The proposed methodology aims to model a promising disease grading system for plant leaves. For the experimentation purpose, pomegranate leaves are considered. The flow chart of the methodology is presented in the annexure 1 in the appendix. The system is divided into the following steps: (1) Image enhancement (2) Image Pre-processing (3) Color image segmentation (4) Histogram draw (5) Disease grading by picks value.

The proposed system is an efficient module that identifies various diseases of that plant and also determines the stage in which the disease is. The system employs various image processing and machine learning techniques.

A. Image Enhancement

The aim of image enhancement is to improve the interpretability or perception of information in images for human viewers, or to provide `better' input [7] for other automated image processing techniques. Image enhancement techniques can be divided into two broad categories:

i). Spatial domain methods, which operate directly on pixels, and
ii). Frequency domain methods, which operate on the Fourier transform of an image.

For the purpose of image enhancement, authors have visited and captured images from several pomegranate farms in the places of Nadia District e.g., Krishnanagar Block-1, Chapra Block, Dhantola Block and Ranaghat Block, India and improve the interpretability or perception of information in images for human viewers.

B. Image Pre-processing

Image processing is a structure of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image [8]. Preprocessing uses the techniques such as image resize segmentation, filtering, cropping, contrast enhancement, angle correction, morphological operations etc.

C. Color Image Segmentation

Image segmentation refers to the progression of partitioning the digital image into its ingredient regions or objects so as to change the representation of the image into something that is more consequential and easier to analyze [9]. K-means clustering technique has been used in the present work to carry out segmentation. K-Means Clustering is a method of cluster analysis which aims to partition n observations into k mutually exclusive clusters in which each observation belongs to the cluster with the nearest mean.

The objective function is:

$$Z = \sum_{x=1}^{r}\sum_{y=1}^{c} | G_x^{\,y} - S_j |^2 ------(1)$$

Where $| G_x^{\,y} - S_j |^2$ is a chosen distance measure between a data point $G_x^{\,y}$ and the cluster centre S_j, is an indicator of the distance of the *n* data points from their respective cluster centers. The K-Means follows by:

i) Place K points into the space represented by the objects that are being clustered. These points represent initial group centroids [10].
ii) Assign each object to the group that has the closest centroid.
iii) When all objects have been assigned, recalculate the positions of the K centroids.
iv) Repeat Steps 2 and 3 until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.

D. Histogram Draw

Generally, in image processing expressions area of a binary image is the total number of on pixels in the image. The original resized image is converted to binary image such that the pixels corresponding to the leaf image are on. Then we plot the histogram for calculate the change the pick value.

F. Disease Grading by Picks Value

A histogram based System is developed for disease grading by referring to the disease scoring scale in Table I. The main grading system depends on:

$$G = \sum_{x=0}^{r-1}\sum_{y=0}^{c-1} P(x,y)\log P(x,y) -------(2)$$

Where G = grade value, P(x,y) = Image matrix function, r=row value and c=Colum value,

$$P(x,y) = \frac{p(x,y,1,0)}{\sum_{x=0}^{r-1}\sum_{y=0}^{c-1} P(x,y,1,0)} -------(3)$$

Table I: Disease grading

Disease Grade	Training Sample	Testing Sample	Classifier Accuracy
Downy Mildew	210	43	83.5%
Powdery Mildew	210	48	95.2%
Normal	210	47	96.7%
Negative	210	45	93.56%

III. PROPOSED WORK FLOW DIAGRM

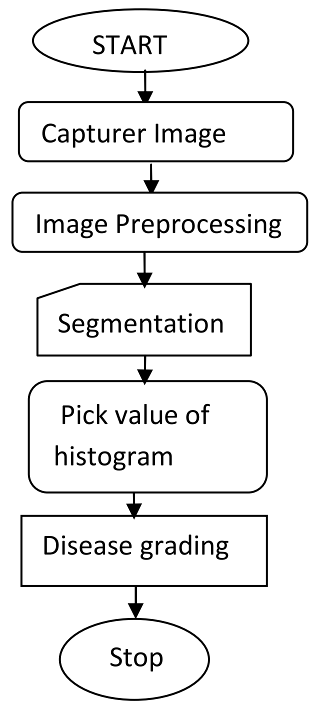

Fig. 1: Flow Diagram

IV. RESULT AND DISCUSSION

Now, Maize leaf images are used to test proposed algorithm (Fig. 1). First we get the Original leaf (Fig. 2) and another disease leaf (Fig. 3). Then we calculate the gray value of each leaf (Fig. 4 & Fig. 5). Finally we segmented the each image using K-Mean clustering, i.e., background removed image (Fig. 6 & Fig. 7) .Now we get picks values from each histogram (Fig. 8 & Fig. 9) and define the disease grading.

Fig. 2: Original disease free leaf

Fig. 3: Original affected leaf

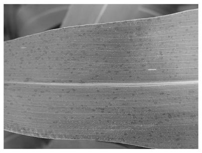

Fig. 4: Gray Image

Fig. 5: Gray Image

Fig. 6: Background remove Image

Fig. 7: Background remove Image

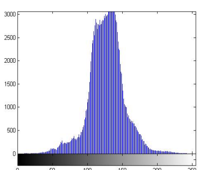

Fig. 8: Histogram

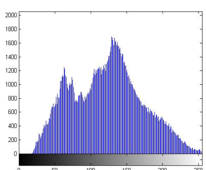

Fig. 9: Histogram

V. CONCLUSION

In this paper, we proposed a novel histogram based detection of leaf damage technique for Maize. Using the histogram approach and color image segmentation technique to exact intensity pattern to Turcicum Leaf Blight disease accordingly it is then possible to analyze the different Maize leaf diseases. Here there is more scope to reduce the various errors which will be occurred during the simulation, that can be minimize as the more no of input is provided accordingly. The result from the preliminary study indicated that the proposed strategy is effective to assess disease intensity by the plant pathologist more precisely.

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