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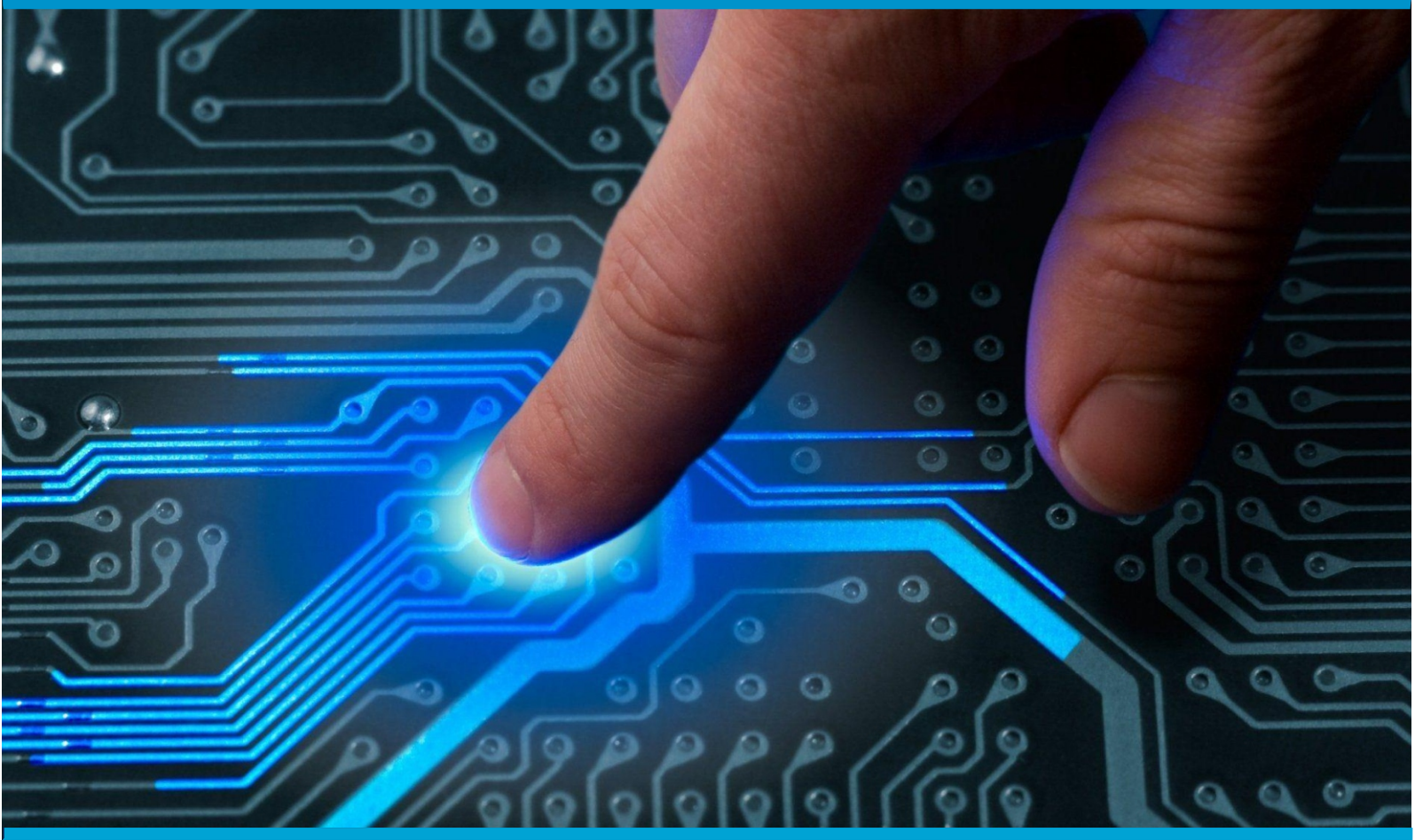

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Paddy Leaf Disease Detection and Quantification Using Image Processing Techniques

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ABSTRACT: In this project the main aim is to detect the paddy leaf disease intensity using a computational technique such as image processing. Automatic recognition of plant disease is needed to detect disease symptoms early on when they appear on the growing leaf.
Paddy leaf diseases can cause significant harm both qualitatively and quantitatively to agricultural products. Detection of paddy leaf disease is an important topic of study, as it can offer benefits in the inspection of large crop fields and thus immediately detect diseases symptoms as soon as they appear on leaves. Disease can affect the paddy leaf at different growth stages and all parts of the plants, such as the leaf neck and the node.
In this paper, modern technique was implemented to find out the paddy leaf-related diseases for the rapid and precise result as it is microscopic in nature, whereas leaf diagnosis through naked eye observation takes time to detect diseases. K-means segmentation and Gray level co-occurrence matrix (GLCM) are implemented in our proposed method to extract features and Artificial Neural Network (ANN) for classification /Identification of disease.

KEYWORDS: Image processing, K-means clustering, GLCM, ANN.

I. INTRODUCTION

The Indian economy plays an important role in agriculture. Almost 70% of the Indian economy is dependent on cultivation. Paddy is one of the world's important food crops. Given the rising population, the demand for products such as rice is increasing day by day. A key theme of this project is to classify paddy-related diseases.The main objective is to deliver computational techniques such as image processing to detect and find the severity of the paddy leaf disease. The conventional approach to detecting and identifying plant leaf disease with naked eye, which is a very slow process as well as less precision. In certain countries it is costly and time consuming to take advice from experts to find out about plant leaf disease due to expert availability. Uneven checkup of plants results in increasing of various diseases on plants which requires more chemicals to cure it and also these chemicals are toxic to others. Automatic recognition of plant leaf diseases are required to detect the features of disease in early stages when they appear on the growing leaf.
The processing of images starts with the capture of high quality digital images. In the experiment database, safe and unhealthy images are collected and processed. For image magnification, images are then applied for pre-processing. Captured leaf images are segmented to form clusters using K-means clustering process. Features are extracted, before K-means and classification are applied. The machine finally identifies diseases. The techniques involved in identifying paddy leaf diseases are image acquisition, image preprocessing, image segmentation, extraction and classification of features.

Initially, it can be used in image acquisition at the early stage of the device to read the different format images such as jpeg, jpg, gif, bmp. Afterwards Different pre-processing methods are used to capture the image to enhance and eliminate the unwanted image noise. Using colour conversion, RGB images are converted into grey images during preprocessing. Using various contrast enhancement techniques such as histogram equalisation and contrast correction, to improve the contrast. Partitions of an image in different regions are processed in segmentation, each pixel containing the similar attributes in the image through various techniques such as K-means, Fuzzy c-mean (FCM), Principal Component Analysis (PCA). Classification is a tool for recognising and detecting the plant leaf diseases. All classification algorithms are based on the assumption of one or more features depicting the image. There are various forms of approach to classification such as SVM, artificial neural networks (ANN), and Fuzzy classification. The

extraction function uses various types of feature values such as the texture feature, structure feature, and geometric feature.

II. RELATED WORK

Literature survey is the first step towards preparing new methodologies for the specific field of interest by moving research forward.
This project is aimed to detect and identify a variety of paddy leaf diseases such as Blast disease (BD), Brown spot disease (BPD), Narrow brown spot disease (NBSD), which stops the paddy 's growth and safety. Disease can infect paddy as the neck and node of the leaf at different stages of development, and all parts of the plant. A paddy leaf disease identification system based on image processing using the K-means algorithm is used to eliminate noise and unwanted image spots. The noise-free images are filtered, the image filtered is transformed to an improved image for segmentation. Extracting shape and colour-based functions. The leaf disease is identified by using the ANN and Fuzzy classifier.
In order to increase crop field growth and productivity, farmers need automated monitoring of paddy leaf pathogens instead of traditional approach , i.e. manual disease monitoring does not provide satisfactory results as naked eye observations take more time and need expertise in traditional method detection of paddy leaf pathogens, hence it is ineffective.

III. METHODOLOGY

The key theme of the project is to detect diseases linked to paddy leaves. We are developing an automated system for farmers to identify paddy leaf diseases in order to resolve this problem. The key aim is to give an efficient solution to the problem in a technical way.
Detection of paddy leaf disease in the proposed method is performed using various techniques such as Image Acquisition, Pre-Processing of Image , Image Segmentation and Classification Algorithm to increase the accuracy of better detection of paddy leaf disease.
For this initiative, the following approach is suggested, requiring six phases of work:

A. Image Acquisition : Picture retrieval is the first step in digital image processing and the digital camera captures the image and stores it for intense MATLAB operations in digital media. It is also a hardware recovery action, so it can be forwarded by further phase. We collect various paddy leaf pictures of diseases here.

B.Image Pre-Processing: Pre-Processing refers to the transformations that apply to our knowledge. Pre-processing of data is a method used to transform raw data into a clean dataset.
Improving the image data , i.e. containing unnecessary distortions, or improving those image features for further processing, is the primary cause of image pre-processing. Preprocessing approach uses different methods, such as adjusting image size , shape, noise filtering, image transfer and image transformation, image enhancement, and morphological operations.

C. Image Segmentation : Image segmentation is the process by which digital image is transformed into many segments and an image is rendered into something for easier study. For locating the objects and the bounding line of that image , image segmentation is used. We have used K-means clustering method in segmentation to divide images into clusters. The severe cluster after segmentation is the disease part of the leaf. The To classify the segmented images into k numbers of groups based on functions, the k-means clustering algorithm is applied.

Algorithm:
The procedure for K-Means Clustering Algorithm:
Step1: Classify the images into p number of groups where p should be known.
Step2: Mark p points at randomly in cluster centroid.
Step3: Mapping objects to their closest cluster centroid.
Step4: Calculate the mean, centroid or perimeter of all images in each cluster.
Step 5: Repeat steps 2, 3 and 4 until the equal points are mapped to each cluster.

D.Feature Extraction : Desired feature vectors such as colour , texture, morphology and structures are extracted in feature extraction. Extraction of features is a method necessary for resources to accurately represent a wide collection of data. Statistical texture characteristics are obtained using the Gray Level Cooccurrence Matrix (GLCM) formula for texture classification and texture characteristics are determined from the statistical distribution of the observed combination of strength at the defined location relative to others. In GLCM, numbers of grey levels are significant, and

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statistics are also graded in the order of first, second, and higher for the number of intensity points in each combination. Power, entropy, covariance, knowledge measure of association, contrast etc. are various statistical texture characteristics of GLCM.

No	Features	Formula
1	Contrast	$\sum_i \sum_j \|i-j\|^2 p(i,j,d,\theta)$
2	Correlation	$\sum_{i,j} \frac{(i-\mu_i)(j-\mu_j)p(i,j)}{\sigma_i \sigma_j}$
3	Energy	$\sum_i \sum_j p(i,j,d,\theta)^2$
4	Homogeneity	$\sum_i \sum_j p(i,j,d,\theta)/(1+\|i-j\|)$

Table 1. Shows list of formulae

E. Classification : Classification technique is applied by dividing the classes on statistical features which depend on it. For the design of the database, the image is obtained and passed through pre-processing , segmentation, extraction of features, then selecting the name of the disease for the specified leaf and finally stored in the database.

F. Finding Intensity : Determining the severity of the paddy leaf affected.
The step-by - step methodology proposed consists of acquiring the leaf image, preprocessing the image, segmenting the images using the method of clustering k-means, withdrawing features using the GLCM method and finally classifying the system.

Algorithm
Step 1: Start
Step 2: Taking RGB image initially, i.e. paddy leaf image as input.
Step 3: Applying Preprocessing techniques to the picture of the leaf.
Step 4: Applying color based segmentation using k-means clustering
Step 5: Identifying the affected regions by disease in paddy leaf.
Step 6: By extracting the features of the diseased part by using GLCM.
Step 7: Applying Classification techniques to enhance the paddy leaf disease.
Step 8: Finding a proportion of the area affected.
Step 9: Stop.

The proposed system's flow chart as shown in Figure 1.

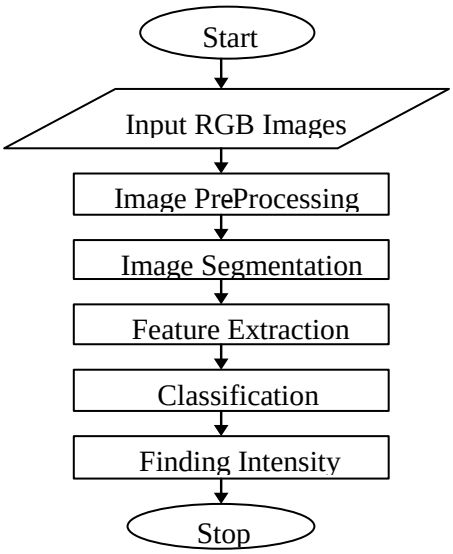

Figure 1. Dataflow diagram of the proposed system

IV. RESULTS

Captured diseased paddy leaf images for MATLAB image processing system. Captured paddy leaf images for MATLAB image processing system figure 2.
In pre-processing image, to improve image capture by adjusting image size and form, noise filtering, image conversion, and contrast. Here, as shown in figure 3, different MATLAB code to resize image, to increase variance and RGB to grey scale conversion for image enhancement.

Figure 2. Original Image (Pre-Processed Image)

Figure 3 . Image Enhancement

The following output screen shows the cropped Image where the diseased part located as shown in figure 4.

Deleting noise. Noise after cropping the image is the result of errors in the image acquisition process resulting in pixel values that do not represent the actual scene 's true intensities. There are many ways of integrating noise into an image, depending on how the image is produced. To suppress salt and pepper noise and apply median philtre as shown in figure 5.

Figure 4. Cropped Image

Figure 5. Filtered Image

Here, in terms of Hue , Saturation, and meaning, HSV color space describes colors. The HSV model explains color similarity to how the human eye appears to perceive color. Comparisons depend on color, brightness and vibrancy as shown in figure 6.
The image labeled by cluster index as shown in figure 7.

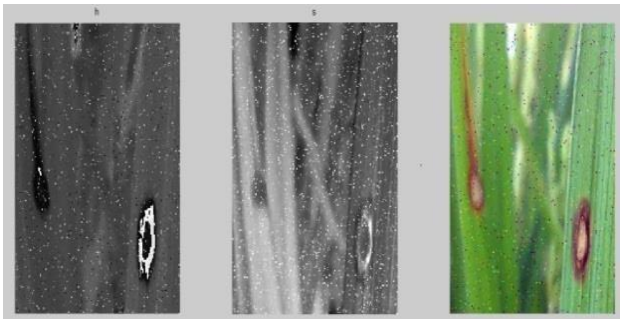

Figure 6. Converting RGB to HSV (Hue Saturation Value)

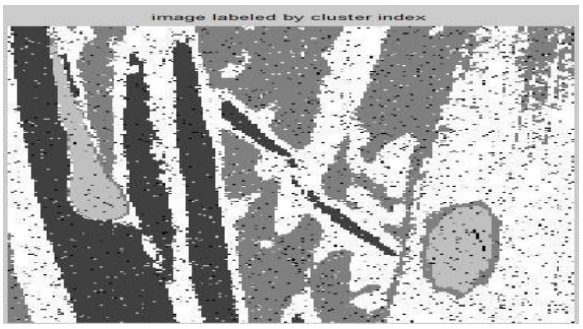

Figure 7. Clustered indexed image

The K-means clustering algorithm is used in segmentation to break the images into clusters. The severe cluster is the disease aspect of the leaf following segmentation. The paddy leaf image was identified by this algorithm, resulting in image segmentation into clusters. The segmented leaf picture is divided into 5 clusters in which the disease is present in one or more clusters. as shown in figure 8.

The intensive cluster is the disease section of the paddy after segmentation.

Finally, identified the defected region of the given leaf image as shown in figure 9.

Figure 8. Object in fourth Clustered Image

Figure 9. Defected regions identification

GLCM's statistical texture characteristics among these diseases are energy, correlation, mean, variance, entropy, contrast, standard deviation, etc., bacterial blight, false smut, leaf blast, leaf spot.

The safe range of leaves is shown in Table 1: These ranges are obtained on the basis of entropy, mean and standard deviation of healthy leaf images other than this range.

Feature Extraction	Healthy Image Range
Entropy	<5
Mean	<5
Standard Deviation	<20

Table 1: Safe range of leaves

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Diseased leaf feature values as shown in table 2: There are values for that. A leaf is taken here. This is a diseased leaf, so the obtained entropy value is 6, the obtained mean is 5, and the standard deviation value is 20.

There are values for that. A leaf is taken here. It is a safe leaf so the entropy value obtained is 1, mean obtained is 1 and the standard deviation value is 10.

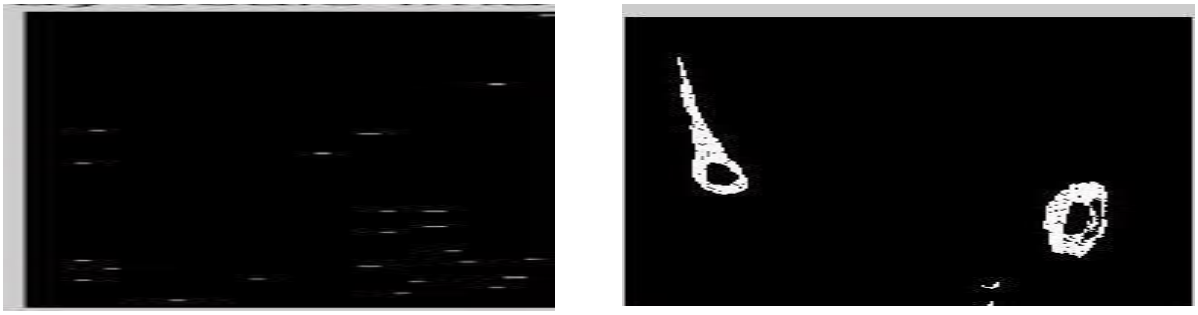
Entropy	6
Mean	5
Standard Deviation	20

Table 2. Diseased leaf values for Entropy, Mean and Standard Deviation.

Entropy	1
Mean	1
Standard Deviation	20

Table 3. Diseased leaf values for Entropy, Mean and Standard Deviation.

Comparison of Healthy leaf and diseased leaf images as shown in figure 10.



a) Healthy Leaf b) Diseased Leaf

Figure 10. Healthy and Diseased leaf images

V. CONCLUSION

It provides effective and transparent identification and classification of plant leaf disease by using image processing from MATLAB. The methodology proposed in this paper is based on clustering of k-means and classification techniques that are designed to detect paddy leaf disease. Ultimate MATLAB applications for digital image processing. Leaf spot and stem rot disease are observed in this device. It provides quick and effective time for processing throughout.

Further enhancement of this work requires further experimentation with broad training sets to identify various damaged leaves caused by insects or diseases and to establish a system of experts. In large numbers, the diseased images should be collected and then sent to agricultural research station experts to estimate the impact of diseases on crops and to recommend remedial steps for them. This technique can be extended to detect diseases on fruits , leaves, vegetables, etc.,

REFERNCES

1. RadhikaDeshmukh&ManjushaDeshmukh, Ph.D. "Paddy Leaf disease detection, pp.8-1.
2. Jitesh P. Shah, Harshadkumar B. Prajapati, "A Report on Rice Plant Disease Detection and Classification

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|| Volume 8, Issue 9, September 2020 ||

3. Titan Pall,'DAMAGED PADDY LEAF DETECTION USING IMAGE PROCESSING, Volume 3, October 2012.'
4. Image processing method for grading and disease detection by S. Gaikwad, K. J. Karande/(IJCSIT) International Journal of Computer Science and IT Vol. 7 (2), and 519-522.
5. A Study for Identification of Agricultural Plant Diseases Using Various Techniques By Mr. NP. Kumbhar, International Journal of Electrical and Electronic Engineering(IJEEE) vol.9, issue no.1, January-June 2017.
6. Disease identification and diagnosis by Mr. KhushalKhairnar, Mr. RahulDagade on the plant using image processing. Number 108-December 2014, No. 13.
7. Detection of rice disease Using pattern recognition, Proceedings of SantanuPhadikar And Jaya Sil, 11th International Conference on Computer and Information Technology (ICCIT 2008), 25-27 December 2008, Khulna, Bangladesh.
8. Design of monitoring & control plant disease system based on DSP & FPGA, by Chunxia Zhang, Xiuqing Wang, Xudong Li,2nd International Conference on Networks Stability, Wireless Communications and Trusted Computing in 2010.
9. https:/in.mathworks.com/help/matlab/matlabprog/creating-in-files.html functions
10. GUBBALA SANDHYA, DR. KUNJAM NAGESWARA RAO, 'A Novel Method for Iris Plant Classification Using Particle Swarm Optimization Algorithm, Issue 6, Vol 5,pp.49-66,2016.'

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