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Detection and Classification of Diseases on Rice and Sugarcane: A Review

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Abstract: ***Rice and Sugarcane are one of the most important crops in Maharashtra. In the agriculture field, disease identification from the crop images and crop protection is one of the interesting research areas. Digital Image Processing can be applied for Disease identification and classification. This project presents a prototype system for detection and classification of rice and sugarcane diseases based on the images of infected plants. Images of the infected rice and sugarcane plants are captured by digital camera. Digital image processing is used to detect infected parts of the plants. Analyzing the infected part, the type of disease is detected.***

Keywords: Image processing, disease identification and classification, rice and sugarcane disease, Computer Vision Technique

I. INTRODUCTION

Plant diseases are one of the causes in the reduction of quality and quantity of agriculture crops. Reduction in both aspects can directly affect the overall production of the crop in a country. The main problem is a lack of continuous monitoring of the plants. Generally, diseases can occur on any plant at any time. However, a continuous monitoring may prevent disease infection. The main approach adopted in practice for detection and identification of plant diseases is naked eye observation through experts. The decision making capability of an expert also depends on his/her physical condition, such as fatigue and eye sight, work pressure, climate etc. So this method is time consuming and less efficient.

On any plant, diseases are mainly caused by bacteria, fungi, and viruses. Image processing operations can be applied on external appearances of infected plants. However, the symptoms of diseases are different for different plants. Each disease has its own unique characteristics. Diseases differ in shape, size, and colour of disease symptoms. Some of the diseases might have the same colour, but different shapes; while some have different colours but same shapes. Sometimes farmers get confused and are unable to take proper decision for selection of pesticides resulting in inefficient crop protection. This project attempts to apply concepts of Image Processing to solve the problem of automatic detection and classification of diseases of the rice and sugarcane crop.

II. LITERATURE REVIEW

Different approaches of Rice and Sugarcane leaf diseases have been proposed by various authors or researchers, described below.

R. Rajmohan, M. Pajany, R. Rajesh, D. Raghu Raman and U. Prabu [1] proposed a Sensor based Mobile App framework for accuracy agribusiness which furnishes agriculturists with valuable information about the paddy yield and its condition. The framework intends to make development more productive as the agriculturist can settle on better educated choices and subsequently spare time and assets.

Rakesh Chaware, Rohit Karpe, Prithvi Pakhale and Prof. Smita Desai [2] presented the critical analysis of different plants disease segmentation techniques. This provide description of leaf disease detection using image processing that can recognize problems in crops from images, based on color, texture and shape to automatically detect diseases and give the fast and accurate solutions to the farmer.

T. Gayathri Devi, P. Neelamegam [3] proposed the novel automated rice leaf disease identification and detection system using the improved support vector machine with the radial basis neural networks. Initially the captured paddy images are transformed into the gray scale image and the noise present in the image is eliminated with the help of the image clipping, cropping and smoothing process. Afterwards, the image enhancement needs to perform by applying the histogram equalization method and the particular affected region is segmented with the help of the Otsu' thresholding with k-means clustering process. From the segmented region, different features are extracted using scale invariant method and the features are classified with the help of the support vector machine trained radial basis neural network.

Harshadkumar B. Prajapati, Jitesh P. Shah and Vipul K. Dabhi [4] proposed a prototype system for detection and classification of rice diseases based on the images of infected rice plants. This prototype system is developed after detailed experimental analysis of various techniques used in image processing operations. Author considered three rice plant diseases namely Bacterial leaf blight,

Brown spot, and Leaf smut. They capture images of infected rice plants using a digital camera from a rice field. They empirically evaluate four techniques of background removal and three techniques of segmentation. To enable accurate extraction of features, they propose centroid feeding based K-means clustering for segmentation of disease portion from a leaf image. They enhance the output of K-means clustering by removing green pixels in the disease portion. They extract various features under three categories: color, shape, and texture. They use Support Vector Machine (SVM) for multi-class classification.

Arifa Khan, Manmohan Singh Yadav and Dr. Shafeeq Ahmad [5] presented the effectiveness of Image Processing and computer vision techniques for detection of disease in sugarcane plants by observing the leaves. Few major diseases in sugarcane plant like red rot, mosaic and leaf scald have been studied and detection algorithm for the same has been implemented in this research work.

Savita N. Ghaiwat, Parul Arora [8] presented a survey on different classification techniques that can be used for plant leaf diseas classification. There are so many classification techniques such as k-Nearest Neighbour Classifier, Probabilistic Neural Network, Genetic Algorithm, Support Vector Machine, and Principal Component Analysis, Artificial neural network, Fuzzy logic. This paper provides an overview of different classification techniques used for plant leaf disease classification.

III. PROPOSED APPROACH OF PLANT DISEASE IDENTIFICATION AND CLASSIFICATION

The crop disease detection process based on the crop images is shown in Figure 1.

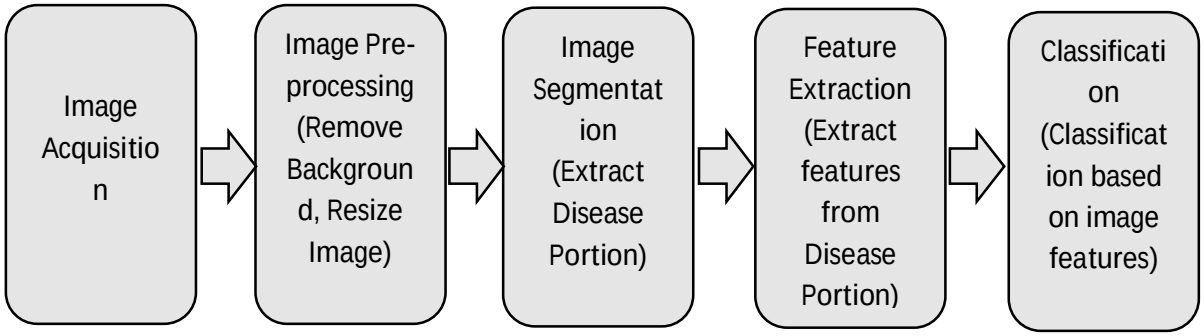

Figure 1 Proposed Approach of Plant Disease Identification from the Images

Image acquisition is the process of getting images of infected leaves. The crop disease detection process is divided into two parts as image processing and machine learning. The images are captured from the farm field. These images are further processed using image processing operations. Machine learning model classifies the disease based on the image features. Various steps of image processing include image background removal, noise removal, image resizing, image segmentation, image feature extraction. Machine learning includes feature selection and classification. For different image dataset, techniques at each intermediate step might vary. For example, image resizing is not necessary every time, some image database contains images with low resolution. The evaluation of the system is carried out by the machine learning evaluation metrics such as accuracy, precision, recall, and confusion matrix.

Some of the diseases on rice crop are Bacterial Blight, Gall Midge, Stem Borer, Plant Hopper, Swarming Caterpillar, Blast, etc. and on Sugarcane are Smut, Grassy Shoot, Rust, etc.

a) b) c) d) e)

Figure 2 Sample pictures: a) Bacterial Blight b) Gall Midge c) Blast d) Smut e) Grassy Shoot

IV. CONCLUSION

In the agriculture field, Disease identification from the crop images and crop protection is one of the interesting research areas. This project presents a prototype system for detection and classification of rice and sugarcane diseases based on the images of infected plants.

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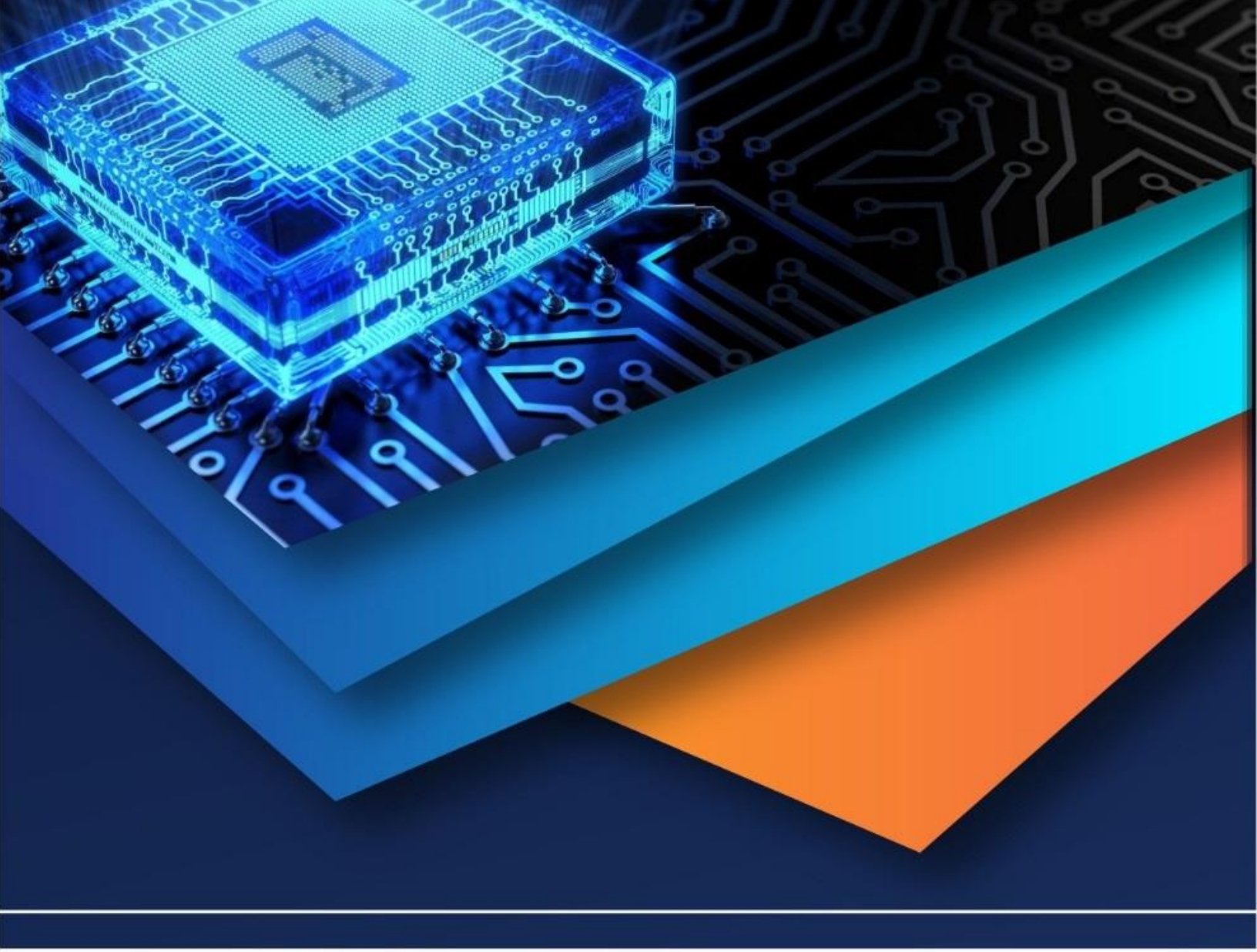

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