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EXTRACTION OF RICE DISEASE USING IMAGE PROCESSING

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ABSTRACT

Crop diseases cause significant damage and economic losses in crops worldwide. It is difficult for farmers as well as experts/doctors to identify the symptoms of diseases correctly and to specify right remedy. It is very difficult task for farmers to monitor the large farms always so farmers are in great need to develop a computerized system that monitors crop when it is infected with diseases. This can be performed by capturing an image of a crop leaf, then extracting a predefined feature from the captured image and finished by determining the disease. The proposed method is useful in crop protection especially large area farms, which is based on computerized image processing techniques that can detect diseased leaves using color information of leaves.It can be summarized by capturing an image of a certain plant leaf followed by extracting feature from the captured image then convert rgb to gray image & resize it,Create stem, stirs, canny edge detection, apply various comparison techniques, which would decide the disease and would also detect the type of plants diseases at early stages and enables early control and protection measures.

KEYWORDS: image processing, stem, stairs, canny edge detection, surf, entropy, warp, imagesc, mean2, standard deviation.

INTRODUCTION

Plant diseases cause periodic outbreak of diseases which leads to large scale death and famine.The term disease may be defined as the destruction of plant leaf. It can be bacterial, fungal and virus [6].Fungi are identified primarily from their morphology, with emphasis placed on their reproductive structures, bacteria is considered more primitive than fungi are identified primarily from their morphology, with emphasis placed on their reproductive structures. Bacteria are considered more primitive than fungi and generally have simpler life cycles. With few exceptions, bacteria exist as single cells and increase in numbers by dividing into two cells during a process called binary fission Viruses are extremely tiny particles consisting of protein and genetic material with no associated protein [9]. Since the effects of plant diseases were devastating, some of the crop cultivation has been abandoned. In this paper different image processing techniques has been used for studying rice diseases. Thedisease found in rice crop is drechsleraoryzae and brown spot leaf. It produces oval, eye shaped spots with conspicuous dark brown dot in the Centre and light brown margin. Spots are also produced on grains. Following factors are responsible for these diseases:

(a) This disease occurs in poor soil.
(b) Antifungal activity of aqueous extracts of plant which were tested in vitro against drechslera oryzae.
(c) mycelial growth of drechslera oryzae at different concentrations of 5%, 10%, 15% . Different parameters that have been included to compare a healthy and infected leaf are Stem**,** Stairs, Entropy,Surf ,Warp, Imagesc, mean2, Std2,Canny edge detection.

1.1.1 Stem: Stem givesTwo-dimensional stem plot displays data as lines extending from a baseline along the X-axis[15]. A circle (the default) or other marker whose Y-position represents the data value terminates each stem.

1.1.2 Stairs: stairs give (x,y)plots the elements in Y at the locations specified by X. The inputs X and Y must be vectors or matrices of the same size[15]. Additionally, X can be a row or column vector and Y must be a matrix with length(X) rows.

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1.1.4 Surf: It stands for speeded up robust features which provide view mathematical functions over rectangular region;surf is based on sums of 2D Haar wavelet responses and makes an efficient use of integral images. It uses an integer approximation to the determinant of Hessianblob detector, which can be computed extremely quickly with an integral image (3 integer operations). For features, it uses the sum of the Haar wavelet response around the point of interest. Again, these can be computed with the aid of the integral image.

1.1.5 Warp: Image warping is a transformation which maps all positions in one image plane to positions in a second plane. warp is a compromise between a smooth distortion and one which achieves a good match. Smoothness can be ensured by assuming a parametric form for the warp or by constraining it using differential equations. Matching can be specified by points to be brought into alignment, It displays the gray scale color map as texture map on simple rectangular surface;it is a statistical measure of randomness that can be used to characterize the texture of input image[2].

1.1.6 Imagesc: Imagesc stands for image scale, this function scales image data to full range of current color map and displays image,Imagesc displays an image,and each element of image corresponds to a rectangular area in the image. The values of the elements of image are indices into the current colormap that determine the color of each patch.

1.1.7 Std2: It computes the standard deviation of the value of element.

1.1.8 Canny edge detection: It is based on computing the squared gradient magnitude. Local maxima of the gradient magnitude that are above some threshold are then identified as edges. This thresholded local peak detection method is called non-maximum suppression (NMS)[12]. The aim of Canny's edge operator was to derive an "optimal" operator in the sense that minimizes the probability of multiply detecting an edge, reduces the probability of failing to detect an edge and minimizes the distance of the reportededge from the true edge.

LITERATURE REVIEW

Alam S.et al.(2014)presented the cram of plant disease refers to the studies of visually observable patterns of a particular plant. Nowadays produces face many traits/diseases. Damage of the insect is one of the most important trait/disease. Insecticides are not always proved efficient because insecticides may be toxic to some kind of birds. This paper introduces defect identification on Ginkgo leaves during production. This frame work introduces an active learning strategy through a set of passively trained leaf parameters. Under the supervision the trained parameters and input image are compared to know the characteristics of the leaves This algorithm is been used for identification of defective leaves using image processing techniques and for the removal of defective leaves through real time techniques [16].

Bankar S.et al.(2014**)** Presented a method for identify plant disease based on color, edge detection and histogram matching. Farmers are suffering from the problem rising from various types of plant traits/diseases. Sometimes plant's doctors & Farmers are also unable to recognize the disease that results in lack of identification of right type of disease and this leads to crop spoil if not taken care of at right time. The most significant part of research on plant disease to identify the disease based on CBIR (content based image retrieval) that is mainly concerned with the accurate detection of diseased plant. This research describes effective; sample technique for identify plant disease. The method used in this research is divided into two major phases. First phase concerns with training of healthy sample and diseased sample. Second phase concerns with the training of test sample and generates result based on the edge detection and histogram matching [13].

Gavhale M.et al.(2014**)** presented diseases in plants cause major production and economic losses as well as reduction in both quality and quantity of agricultural products. In this paper we review the need of simple plant leaves disease detection system that would facilitate advancements in agriculture. Early information on crop health and disease detection can facilitate the control of diseases through proper management strategies. This technique will improves productivity of crops. This paper also compares the benefits and limitations of these potential methods. It includes several steps viz. image acquisition, image pre-processing, features extraction and neural network based classification [9].

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Ayane S.et al.(2014**)** presented a research of identifying and diagnosing plant diseases, the patterns that appeared on the leaf are considered as important concept in detection of these diseases occurred because of nutrient deficiencies in the plant. The various features of image of leaf are extracted such as the shape of leaf, area of leaf, shape of holes present on the leaf, disease spots etc. These features could be extracted using different image processing techniques. The feature extraction is the key point of this work. These extracted features are used to determine the occurrence of the particular deficiency related to primary nutrients of cotton plant. This can be achieved by targeting the nutrient deficiency using image processing technique [15].

Rathod A.et al.(2013**)** India is an agricultural country. Farmers have wide range of diversity to select suitable fruit and vegetable crop. Research work develops the advance computing system to identify the diseases using infected images of various leaf spots. Images are captured by digital camera mobile and processed using image growing, then the part of the leaf sport has been used for the classification purpose of the train and test. The technique evolved into the system is both Image processing techniques and advance computing techniques [1].

Dhaygude S.et al.(2013**)** presented adetection of plant leaf is an very important factor to prevent serious outbreak. Automatic detection of plant disease is essential research topic. Most plant diseases are caused by fungi, bacteria, and viruses. The term disease is usually used only for the destruction of live plants. The developed processing scheme consists of four main steps, first a color transformation structure for the input RGB image is created, and this RGB is converted to HSI because RGB is for color generation and his for color descriptor. Then green pixels are masked and removed using specific threshold value, then the image is segmented and the useful segments are extracted, finally the texture statistics is computedFrom SGDM matrices. Finally the presence of diseases on the plant leaf is evaluated[10].

Garcia J.et al.(2013) presented a survey on methods that use digital image processing techniques to detect, quantify and classify plant diseases from digital images in the visible spectrum. Although disease symptoms can manifest in any part of the plant, only methods that explore visible symptoms in leaves and stems were considered. This was done for two main reasons: to limit the length of the paper and because methods dealing with roots, seeds and fruits have some peculiarities that would warrant a specific survey. The selected proposals are divided into three classes according totheir objective: detection, severity quantification, and classification. Each of those classes, in turn, is subdivided according to the main technical solution used in the algorithm [5].

Pujari J.et al.(2013) Presented lesion areas affected by anthracnose are segmented using segmentation techniques, graded based on percentage of affected area and neural network classifier is used to classify normal and anthracnose affected on fruits. We have considered three types of fruit namely mango, grape and pomegranate for our work. The developed processing scheme consists of two phases. In the first phase, segmentation techniques namely thresholding, region growing, K-means clustering and watershed are employed for separating anthracnose affected lesion areas from normal area. Then these affected areas are graded by calculating the percentage of affected area. In the second phase texture features are extracted using Run length Matrix. These features are then used for classification purpose using ANN classifier. We have conducted experimentation on a dataset of 600 fruits' image samples. The classification accuracies for normal and affected anthracnose fruit types are 84%, 65% and 76.6% respectively. The work finds application in developing a machine vision system [4].

Naikwadi S.et al.(2013**)** presented and experimentally evaluates a software solution for automatic detection and classification of plant leaf diseases. Studies of plant trait/disease refer to the studies of visually observable patterns of a particular plant. Nowadays crops face many diseases. Damage of the insect is one of the major trait/disease. Insecticides are not always proved efficient because insecticides may be toxic to some kind of birds. It also damages natural animal food chains. The following two steps are added successively after the segmentation phase. In the first step we identify the mostly green colored pixels. Next, these pixels are masked based on specific threshold values that are computed using Otsu's method, then those mostly green pixels are masked. The other additional step is that the pixels with zeros red, green and blue values and the pixels on the boundaries of the infected cluster (object) were completely removed. The experimental results demonstrate that the proposed technique is a robust technique for the detection of plant leaves diseases [14].

Pandya m.et al (2013) Feature extraction and feature matching are the basic steps of image registration and accuracy of the panoramic image is mostly depending upon the feature matching. To reduce the time for feature detecting,

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SURF is mostly used algorithm as it is the fastest descriptor. This paper shows that by increasing the matching points, image registration can be accurately done. To increase the quality of the image, the process applied on the images are filtering and edge detection, for which different operators can be used. In this paper, SURF is used for feature extraction, RANSAC is for outlier elimination, and at end affine transformation is used as transformation model. Based on experiments SURF is the fastest algorithm, so panorama image for large image can be obtained in less time period [8].

SandeepKumar.E(2013) presented a method for identification of medicinal plants based on some important features extracted from its leaf images. Medicinal plants are the essential aspects of Ayurveda system of medicine. The leaf extracts of many medicinal plants can cure various diseases and have become alternate for allopathic medicinal system now days. Hence this paper presents an approach where the plant is identified based on its leaf features such as area, color histogram and edge histogram. Experimental analysis was conducted with few medicinal plant species such as Hibiscus, Betle, Ocimum, Leucas, Vinca, Murraya ,Centella, Ruta and Mentha. The result proves this method to be a simple and an efficient attempt [11].

Chaudhary P .et al.(2012**)** presented an algorithm for disease spot segmentation using image processing techniques in plant leaf is implemented. This is the first and important phase for automatic detection and classification of plant diseases. Disease spots are different in color but not in intensity, in comparison with plant leaf color. So we color transform of RGB image can be used for better segmentation of disease spots. In this paper a comparison of the effect of CIELAB, HSI and YCbCr color space in the process of disease spot detection is done. Median filter is used for image smoothing. Finally threshold can be calculated by applying Otsu method on color component to detect the disease spot. An algorithm which is independent of background noise, plant type and disease spot color was developed and experiments were carried out on different "Monocot" and "Dicot" family plant leaves with both, noise free (white) and noisy background [10].

Kailey K. et al.(2012**)** presented a method for identify plant disease based on color, edge detection and histogram matching. Farmers are suffering from the problem rising from various types of plant traits/diseases. The most significant part of research on plant disease to identify the disease based on CBIR (content based image retrieval) that is mainly concerned with the accurate detection of diseased plant. It has significant perspective in field of agriculture. This research describes effective; sample technique for identify plant disease. The method used in this research is divided into two major phases. First phase concerns with training of healthy sample and diseased sample. Second phase concerns with the training of test sample and generates result based on the edge detection and histogram matching [7].

Bashir S. et al.(2012) India being an agro-based economy, farmers experience a lot of problem in detecting and preventing diseases in fauna. So there is a necessity in detecting diseases in fauna which proves to be effective and convenient for researchers. The color and texture features are used to recognize and classify different agriculture/horticulture produce into normal and affected regions. The combinations of features prove to be very effective in disease detection. The experimental results indicate that proposed approach significantly enhances accuracy in automatic detection of normal and affected produce. This paper presents an effective method for detection of diseases in Mauls Domestic using methods like K-mean clustering, color and texture analysis [12].

Patil J. et al.(2011) presented the studies of plant trait/disease refer to the studies of visually observable patterns of a particular plant. Nowadays crops face many traits/diseases. Damage of the insect is one of the major trait/disease. Insecticides are not always proved efficient because insecticides may be toxic to some kind of birds. It also damages natural animal food chains. A common practice for plant scientists is to estimate the damage of plant (leaf, stem) because of disease by an eye on a scale based on percentage of affected area. It results in subjectivity and low throughput. This paper provides advances in various methods used to study plant diseases/traits using image processing [6].

Al-Hiary H. et al.(2011) presented a software solution for automatic detection and classification of plant leaf diseases. The proposed solution is an improvement to the solution as it provides faster and more accurate solution. The developed processing scheme consists of four main phases. The following two steps are added successively after the segmentation phase. In the first step we identify the mostly green colored pixels. Next, these pixels are masked based

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Glasbey c.et al (1998) Image warping is a transformation which maps all positions in one image plane to positions in a second plane. It arises in many image analysis problems, whether in order to remove optical distortions introduced by a camera or a particular viewing perspective, to register an image with a map or template, or to align two or more images. The choice of warp is a compromise between a smooth distortion and one which achieves a good match. Smoothness can be ensured by assuming a parametric form for the warp or by constraining it using differential equations. Matching can be spaced by points to be brought into alignment, by local measures of correlation between images, or by the coincidence of edges. Parametric and nonparametric approaches to warping, and matching criteria, are reviewed [3].

METHODOLOGY

Step1. In the first step two images has been taken one for the healthy leaf other for the defected leaf.

Step2. The second step of detection of plant diseases startswith the training process. In the training process, resizing of the healthy and defected image of rice leaf has been done. Then convert RGB to Grayscale image, because canny edge detection cannot be applied directly on RGB. Then apply stem, stairs, canny edge detection, surf, entropy, warp, imagesc.This technique is applied on both the samples healthy as well as defected.

Step3. Once the training process of first phase samples is finished, Comparison has been done on the basis of values obtained for all the parameters used.

Proposed Method: Proposed method in the form of flow chart is shown below. It shows the step by step processing involved in the method.

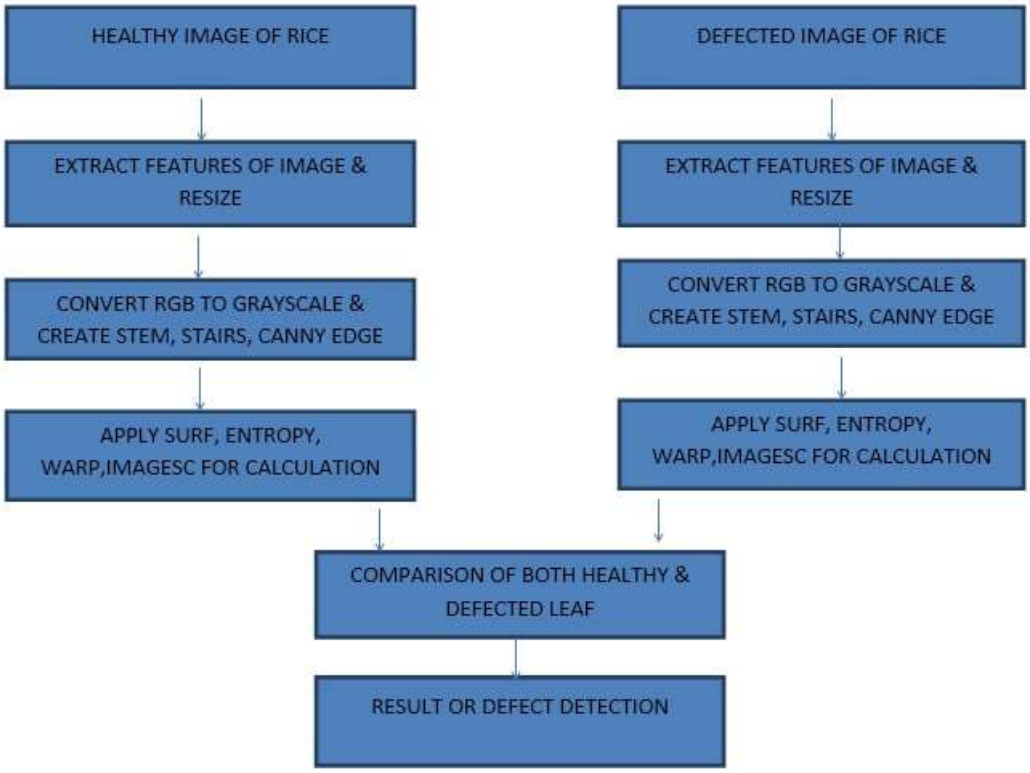

Figure 1.1: flowchart of methodology

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WORK DONE

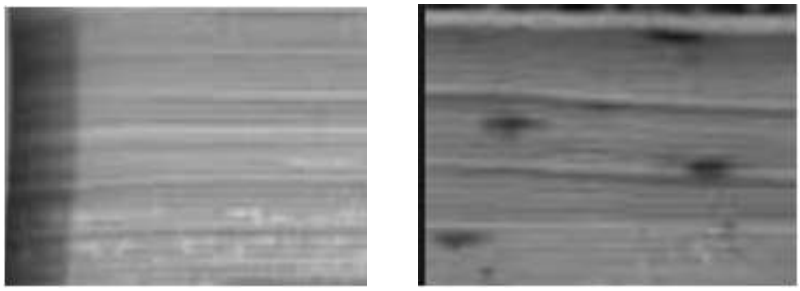
The following mechanism is used to detect the drechsleraoryzae disease of rice.

(a) The RGB image of healthy and defected leaf of rice is acquired with high resolution camera.

a) ***Healthy rice image*** ***b) Defected rice image***

Figure 1.2: RGB rice leaf images

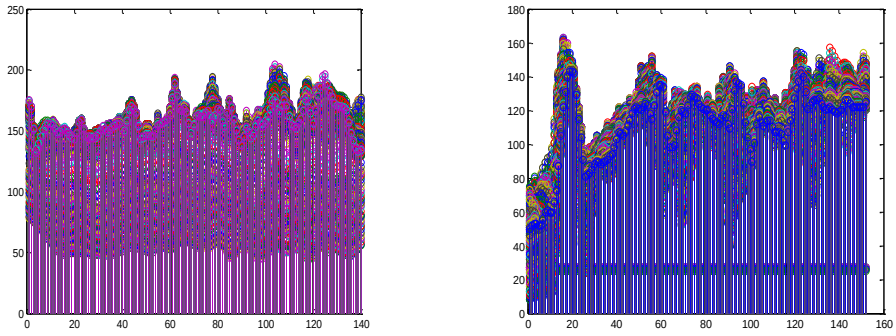
(b) Grayscale image of rice crop: Convert RGB to grayscale image in matlab



(a) Healthy rice image ***(b) defected rice image***

Figure 1.3: Grayscale rice leaf images

(c) **Stem of rice crop:** After converting to grayscale, create stem of rice crop



(a) Healthy rice image ***(b) Defected rice image***

Figure 1.4: Stem of rice leaf images

(d) Stairs of healthy image: Create stairs of rice crop

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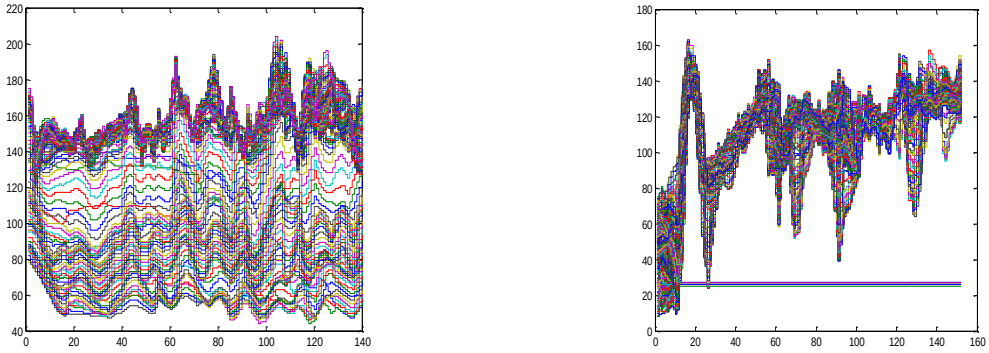

(a) Healthy rice image *(b) Defected rice image*

Figure: 1.5 Stairs of rice leaf images

(a) Canny of healthy leaf *(b) Canny of defected leaf*

Figure: 1.6 Canny Edge detection of rice leaf images

RESULTS

Table given below shows comparison of techniques of described above.

Entropy: entropy returns scalar value representing the entropy of grayscale image. It is a statistical measure of randomness that can be used to characterize the texture of input image. The larger entropy value means fine texture. The smaller entropy value stands for fewer texture distributions in the image.

IMAGE		ENTROPY VALUE
RICE	HEALTHY	6.3642
	DEFECTED	6.4328

SURF: surf provides view mathematical functions over rectangular region.

IMAGE		SURF VALUE
RICE	HEALTHY	174.0051
	DEFECTED	174.0059

WARP:warp displays the gray scalecolor map as texture map on simple rectangular surface.

IMAGE		WARP VALUE
RICE	HEALTHY	174.0066
	DEFECTED	174.0073

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IMAGESC: function scales image data to full range of current color map and displays image.

IMAGE		IMAGESC VALUE
RICE	HEALTHY	0.0074
	DEFECTED	0.0079

Mean2: it computes the mean of the value of element.

IMAGE		MEAN2 VALUE
RICE	HEALTHY	141.1262
	DEFECTED	107.1187

Std2: it computes the standard deviation of the value of element.

IMAGE		STD2 VALUE
RICE	HEALTHY	31.6819
	DEFECTED	30.0706

CONCLUSION

This is an accurate and efficient technique for automatically detection of plant diseased. Rice leaf diseased is detected by using stem, stairs, canny edge detection, surf, entropy, warp, imagesctechniques of image processing. The color features extraction are applied on samples that are contained the healthy leaf of plant and the diseased rice Leaf of the plant. Once the Stairs, Stem any canny edge of leaf Image are generated for both samples and the testing image, immediately we applied the comparison technique. As we are using std2 & mean2, imagesc, warp & surf to as to find that the leaf rice is diseased or not. Hence it detects the Drechsleraoryzae disease of rice.The future work mainly concerns with the large database and advance feature of color extraction that contains a better result of detection.

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