ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

DETECTION OF CROP DISEASES ON BASIS OF VARIOUS IMAGE PROCESSING TECHNIQUES

Daisy*, Deepinder kaur
* Research scholar, SUS Tangori.
Assistant professor, SUS Tangori.

ABSTRACT

Crops play an important role in our daily meal. But diseases in crops cause major production, so identification and quantification of crops diseases are required for adequate crop production and the determination of crop losses and design of breeding strategies in agriculture. The detection of infected or defected leaves have been done by farmers using naked eyes, which is not an accurate way and its time consuming, which contribute to many errors. So the appropriate ways are needed to be sure the amount of pesticides, insecticides and weedicides to be applied. Automatic detection of crop diseases is an essential research topic as it may prove benefits in monitoring large fields of crops and thus automatically detect symptoms of diseases. The analysis of plant leaves can be effectively done using an image processing by capturing an image of a certain crop leaf followed by extracting a predefined feature from the captured image and finally analyzing these features based on image processing techniques, which would decide the diseases and would also detect the type of crop diseases at early stages and enables early control and protection measures. Main concern of proposed system is to detect the crop diseases automatically. With the help of proposed method, five crops rice(drechslera oryzae), cotton(alternaria gossypina), groundnut(bud necrosis virus), sugarcane(collectotrichum falcatum), wheat(puccinia recondite) diseases will be detected. It is based on feature extraction of an image and various comparison techniques of an image processing.

KEYWORDS: image processing, stem, stairs, plot, bar, canny edge detection, surf, entropy, warp, imagesc, mean2, standard deviation, GLCM, SSIM, drechslera oryzae, alternaria gossypina, bud necrosis virus, collectotrichum falcatum, puccinia recondite.

INTRODUCTION

Agriculture is the simplification of nature's food webs and the rechanneling of energy for human planting and animal consumption. Agriculture or farming, being one of the important sectors of Indian society, plays an important role in providing food, economy, employment, income to the country. Plant disease diagnosis is very essential in earlier stage in order to cure and control them. Generally the naked eye method is used to identify the diseases. In this method experts are involved who have the ability to detect the changes in leaf color. This method involves lots of efforts, takes long time and also not practical for the large fields. Many times different experts identify the same disease as the different disease. This method is expensive as it requires continuous monitoring of expert. Crop disease is any abnormal condition that alters the appearance or function of a crop [8]. It is a Physiological process that affects some or all crop functions. Disease can be caused due to virus, bacterial and fungal. The visible effects are known as sign and symbol.

Symptoms: Any detectable changes in color, shape or functions of the crop in response to a pathogen or disease causing agent are a symptom. Symptoms are the visible reaction of plant to disease which may include wilting, necrosis, abnormal coloration, defoliation, fruit drop, and abnormal cellular growth [10].

Signs: Visible parts of pathogen or its products seen on the host that can be used to identify the pathogen. e.g white coating of mycelium, visible on powdery mildew, infected leaves [7].

Following examples shows that how some diseases have shattered the economies of nations:

Drechslera oryzae (brown spot leaf):-
This disease is found in rice crop. It is fungal disease, the spots look like oval eye shape with conspicuous dark brown dot in the Centre and light brown at the margin. Following factors are responsible for these diseases:
(a) This disease occurs in poor soil.
(b) Mycelial growth of drechslera oryzae at different concentrations of 5%, 10%, 15%.
(c) The plants extracts were tested against 20% using poisoned food technique [11].

Alternaria gossypina (alternaria leaf spot):
Alternaria gossypina is fungus disease found in cotton crop, which causes blighting of leaves. In early stages, the spots are pale green with irregular margins. As the spot enlarges, irregular concentric zones are formed in spots. Sometimes severe shedding of cotton leaves occur due to this disease. The most characteristic feature of the disease is the thickening of the veins of the leaf and bract, which may be pronounced as to cause an upward curling of the leaves. These thickened regions are usually of a darker green than in the healthy leaf. In severe cases, outgrowths occur on the leaves in the form of circular cups or flat expanded areas over the veins. Cups have been seen measuring as much as half an inch in diameter [8].

Bud necrosis virus (bud necrosis):
This viral disease is found in groundnut**.** This disease looks like small light green to yellowish ring spot on upper leaves, which later increases in size involving whole leaf lamina and ultimately affected part dries up [1].

Puccinia recondita:
Wheat leaf rust is fungal disease that affects wheat leaf. Round pustules of rust are produced in a cluster on leaves. It is controlled mainly by race-specific resistance.

Colletotrichum falcatum:
Sugarcane is indigenous to tropical regions of Asia, tall perennial grasses, belonging to the genus Saccharum (Poaceae and tribe Andropogoneae). Different kinds of pathogens viz., fungi, bacteria viruses and phytoplasma cause diseases in sugarcane. Of all the diseases, red rot caused by the fungus Colletotrichum falcatum [2].

1.2 comparison parameters: In this proposed work, an attempt is made to use various parameters of image processing including stem, stairs, plot, bar, canny edge detection, surf, entropy, std2, mean2, warp, imagesc, glcm and ssim for the comparison of healthy and defected leaves.

Stem:
Stem is two dimensional plots which display data as lines extending from a baseline along the *x* axis [3].

Stairs:
Stairs 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 [3].

Plot:
plot(Y) creates a 2-D line plot of the data in Y versus the index of each value [3].

Bar:
A bar chart displays the values in a vector or matrix as horizontal or vertical bars. Bar(Y) draws one bar for each element in Y.

Canny Edge detection:
Edges are the changes or discontinuities of intensity in an image. Edges typically occur on the boundary between two different regions in an image [4].

Surf:
Surf stands for speeded up robust features; it is a robust local feature detector, which can be used in computer vision tasks like object recognition or 3D reconstruction.

Entropy:
Entropy is defined in terms of the probabilistic behavior of a source of information. It is a statistical measure of randomness that can be used to characterize the texture of the input image.

Standard deviation:
Std2 stands for standard deviation; it returns the standard deviation of the elements of A along the first array dimension whose size does not equal 1.

Warp:
Image warping is a transformation which maps all positions in one image plane to positions in a second plane.

Imagesc:
The imagesc is also called as image scale. It is function, which returns the handle for an image graphics object which scales image data to the full range of the current color map and displays the image.

Glcm:
In statistical texture analysis, texture features are computed from the statistical distribution of observed combinations of intensities at specified positions relative to each other in the image.

Ssim:
Ssim stands for structural similarity index method, which is used for measuring the similarity between two images.

Mean2:
It is used to compute the mean of value of given input. The mean is arithmetic average of set of values or distribution. The input image x can be numeric or logical.

LITERATURE REVIEW

Shergill et al. (2015) proposed the cram of plant disease refers to the studies of visually observable patterns of a particular plant. Nowadays produces face many diseases. Damage of the insect is one of the most important trait/disease.

Alam et al. (2014) proposed the cram of plant disease refers to the studies of visually observable patterns of a particular plant. Nowadays produces face many diseases. Damage of the insect is one of the most important trait/disease.

Gavhale et al. (2014) proposed 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.

Ayane et al. (2014) proposed 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.

Das et al. (2014) proposed the amoebiasis caused by the gastrointestinal parasite Entamoeba histolytica has diverse disease outcomes. Study of genome and evolution of this fascinating parasite will help us to understand the basis of its virulence and explain why, when and how it causes diseases.

Schikoraa et al. (2014) proposed a growing awareness that contaminated plants, fresh fruits and vegetables are responsible for a significant proportion of food poisoning with pathogenic microorganisms indorses the demand to understand the interactions between plants and human pathogens.

Lima et al. (2014) proposed an accumulation of abnormal tau aggregates in neuron is an important pathological signature in multiple neurodegenerative disorders including Alzheimer's disease. Tau is a neuron specific microtubule-associated protein that regulates microtubule stability, which is critical for axonal outgrowth and synaptic plasticity.

PROPOSED METHODOLOGY

The following steps are proposed to achieve the above mentioned objectives:
i Load the image in matlab.
ii Extract features of an image and resize.
iii Convert RGB to grayscale image and calculate stem stairs plot bar and canny edge detection.
iv Calculating various parameters including surf, entropy, std2,mean2,warp,imagesc, glcm, ssim for comparing healthy and diseased leaf.
v Comparison of defected leaves with original database, Result or damaged detection.

Flowchart of Proposed methodology:

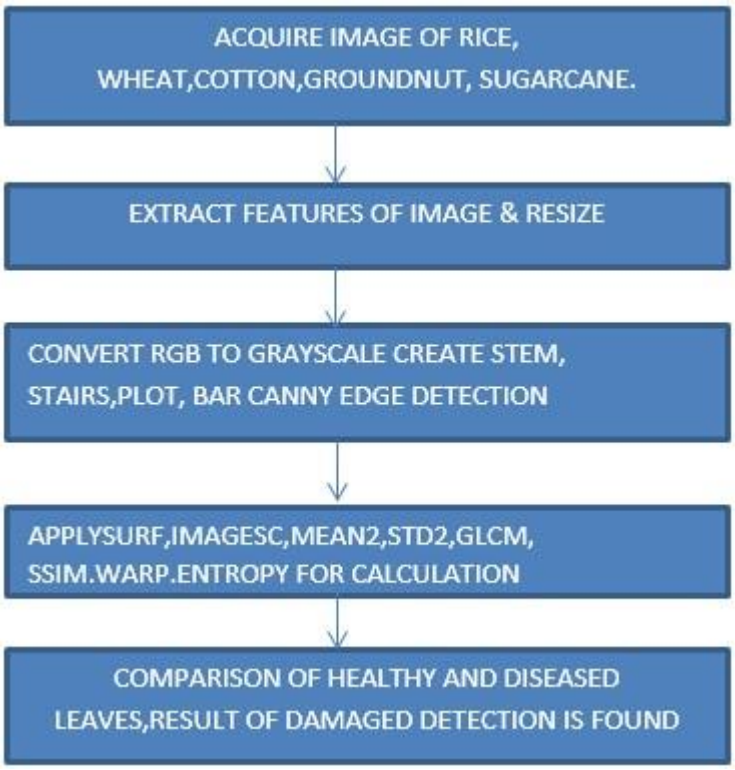


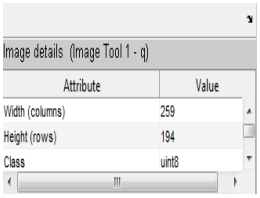
Figure 3.1: Flow Chart of Proposed work

WORK DONE

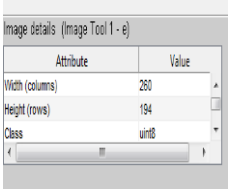
Convert RGB to grayscale image and calculate stem stairs plot bar and canny edge detection. Calculating various parameters including surf, entropy, std2, mean2, warp, imagesc, GLCM, SSIM for comparing healthy and diseased leaf.

RGB healthy leaf

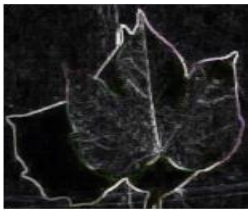
RGB defected leaf

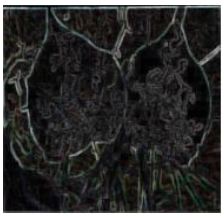


Info of healthy leaf

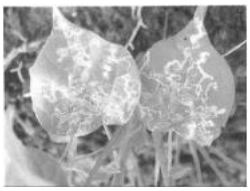


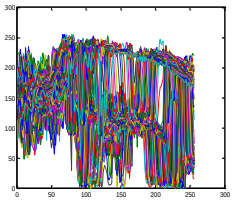
Info of defected leaf

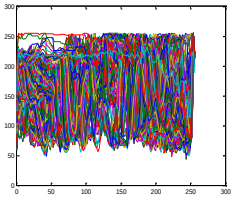

Healthy Texture

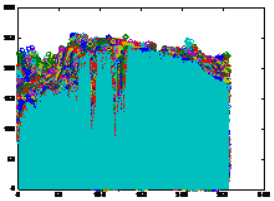

Defected texture

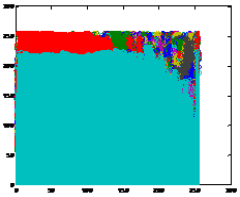

Healthy grayscale

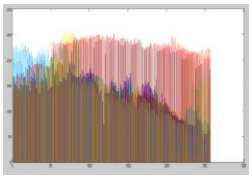

Defected grayscale

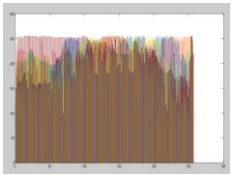

Healthy plot

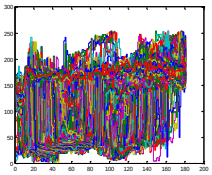

Defected plot

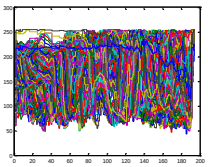

Healthy Stem


Defected stem

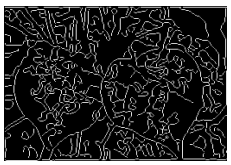

Healthy bar


Defected bar


Heathy stairs


Defected Stairs


Healthy canny edge detection


Defected canny edge detection

As the pictures of cotton crop have been taken only, in the similar manner, the images of wheat, rice, groundnut, sugarcane can be considered and the comparison of cotton, rice, wheat, groundnut and sugarcane is done below in the table.

Table 4.1: Comparison of healthy and defected leaf

Image		Type/size	Cotton	Rice	Wheat	groundnut	Sugarcane
Entropy	Original	Jpeg/256*256	7.6581	7.2321	7.6582	7.5133	7.7764
	Defected	Jpeg/256*256	7.5080	6.3549	6.7185	7.1586	7.3762
Surf	Original	Jpeg/256*256	174.0096	174.0104	174.0217	174.0096	174.0039
	Defected	Jpeg/256*256	174.0104	174.0110	174.0225	174.0103	174.0045
Warp	Original	Jpeg/256*256	174.0121	174.0117	174.0232	174.0110	174.0051
	Defected	png/256*256	174.0128	174.0123	174.0239	174.0116	174.0057
Std2	Original	Jpeg/256*256	54.2241	46.1619	53.6249	80.0262	57.7071
	Defected	png/256*256	47.9564	49.7850	42.3242	43.7861	42.1095
Mean2	Original	Jpeg/256*256	130.1110	85.2240	177.0073	191.1211	138.0663
	Defected	Jpeg/256*256	161.1750	124.4194	104.8535	87.3554	125.9997
Imagesc	Original	Jpeg/256*256	0.0105	0.0125	0.0240	0.0117	174.0034
	Defected	Jpeg/256*256	0.0110	175.0129	0.0245	175.0122	174.0063
Original GLCM	contrast	Jpeg/256*256	0.3201	0.2496	0.0967	0.5167	0.3669
	correlation		0.9308	0.9287	0.9801	0.9474	0.9302
	Contrast		0.4037	1.1646	0.1780	0.3553	0.1976

Defected GLCM	correlation	Jpeg/256*256	0.8908	0.7035	0.9204	0.8823	0.9292
SSIM	Original	Jpeg/256*256	0.1982	0.1377	0.3704	0.2008	0.1832
	Defected	Jpeg/256*256					

CONCLUSION AND FUTURE SCOPE

In this present work only five crop diseases have been found. The future work mainly concerns with the large database of crop, fruit and flowers by using advance feature of color extraction to find more diseases.

REFERENCES

[1] Akram M., Pratap N., Yadav N., "First report of Ground nut bud necrosis virus infecting wild species of Vigna, based on NP gene sequence characteristics", Phytopathologia Mediterranea (2013) 52, 3, 532−540.
[2] Al-Hiary H., Ahmad S., M. Reyalat, Braik M., and Rahamneh Z., "Fast and Accurate Detection and Classification of Plant Diseases", International Journal of Computer Applications (0975 – 8887) volume 17– no.1, March 2011.
[3] Alam S., Chandra S., Samanta D, "Automated Damaged Ginkgo Leaf Detection", International Journal of Advanced Research in Computer and Communication Engineering Volume. 3, Issue 1, January 2014.
[4] Ali M., Clausi D., "Using the Canny Edge Detector for Feature Extraction and Enhancement of Remote Sensing Images", 0-7803-7031-7/01/$10.00 (C) 2001 IEEE.
[5] Ankita P., Shandilyav k., "Digital Image Processing Approach for Fruit and Flower Leaf Identification and Recognition", International Journal Of Engineering And Computer Science ISSN:2319-7242 Volume 2 Issue 4 April, 2013 Page No. 1280-1285, IJECS Volume 2 Issue 4 April, 2013 Page No. 1280-1285 Page 1280.
[6] Arivazhagan S., Shebiah R., Ananthi S., Varthini V., "Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features", March, 2013 AgricEng International CIGR Journal Open access at http://www.cigrjournal.org Volume. 15, No.1 211, March, 2013.
[7] Ayane S., Dudhe A.S., Chipde N.U., "International journal of pure and applied research in engineering and technology", Research Article Impact Factor: 0.621 ISSN: 2319-507X Swapnil Ayane, ijpret, 2014; Volume 2 (8): 818-826 ijpret.
[8] Bashir S., Sharma N., "Remote Area Plant Disease Detection Using Image Processing", IOSR Journal of Electronics and Communication Engineering (IOSRJECE)ISSN : 2278-2834 Volume 2, Issue 6 (Sep-Oct 2012), PP 31-34.
[9] Chaudhary P, Chaudhari A, Cheeran A., Godara S., "Color Transform Based Approach for Disease Spot Detection on Plant Leaf", International Journal of Computer Science and Telecommunications Volume 3, Issue 6, June 2012.
[10] Das K., Ganguly S., "Evolutionary genomics and population structure of Entamoeba histolytica", computational and Structural Biotechnology Journal 12 (2014).
[11] Devi O., Chhetry G.K.N., "Evaluation of Antifungal Properties of Certain Plants against Drechslera Oryzae Causing Brown Leaf Spot of Rice in Manipur Valley", International Journal of Scientific and Research Publications, Volume 3, Issue 5, May 2013 1 ISSN 2250-3153.