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Detection and Recognition of Leaf Disease Using Image Processing

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Abstract:
The image segmentation performs a significant role in the field of image processing because of its wide range of applications in the agricultural fields to identify plants diseases by classifying the different diseases. Classification is a technique to classify the plants diseases on different morphological characteristics. Different classifiers are used to classify such as SVM (Support Vector Machine), K- nearest neighbour classifiers, Artificial Neural Networks, Fuzzy Logic, etc. This paper presents image processing techniques used for the early detection of different Plants diseases by different authors with different techniques. The main focus of our work is on the critical analysis of different plants disease segmentation techniques. This project provide description of leaf disease detection using image processing that can recognize problems in crops from images, based on colour, texture and shape to automatically detect diseases and give the fast and accurate solutions to the farmer.

Keywords: Image processing, SVM (Support Vector Machine), K-Clustering

I.INTRODUCTION

India is well known for agricultural country; wherein about70% of the population depends on agriculture. Farmers have wide range of multiplicity to select suitable crops for their farm. However, the cultivation of these crops for optimum yield and quality produce is mostly technical. It can be improved by the aid of technological support. The management of perennial crops requires close controlling especially for the management of diseases that can affect production significantly and afterword the post-harvest life. The image processing is best technique used in agricultural applications for following purposes. Predict plant disease from image of plants. The plant disease diagnosis is limited by human visual capabilities because most of the first symptoms are microscopic. This process is tedious, time consuming. There is need for design system that automatically recognizes, classifies and quantitatively detects plant disease symptoms. In case of plant disease the disease is known as any impairment of normal physiological function of plants, producing characteristic symptoms. A symptom is a reality accompanying something and is observed as evidence of its existence. Disease is caused by pathogen which is any agent causing disease. Disease management is a challenging task. Mostly diseases are seen on the leaves on plants or stems of the plant. Precise quantification of these visually observed diseases, pests, traits has not studied yet because of the complication of visual patterns .In most of the cases diseases are seen on the leaves or stems of the plant. Therefore recognition of plants, leaves and finding out the diseases, symptoms of the disease attack, plays a important role in successful cultivation of crops. Hence developing a computer vision system to detect, recognize, and classify disease affected on crops which will avoid human interference and hence lead to précised unbiased decision about disease infection and its further valuation. The development of an automated system also helps farmers avoid consulting divine. Automatic detection of leaf diseases is most important research topic as it may prove gain in monitoring large fields of crops, and thus automatically detect the diseases from the symptoms that present on the plant leaves. This enables machine vision that is to provide image based Here image processing plays important Role. The system provides the facility to Capture image, process it and get result through image processing. In this paper section I represent the Introduction, section II literature survey. The section III represents the proposed technology, section IV include the which classifier are used, section V experimental result and section VI conclusion.

II.LITERATURE SURVEY

The paper consists [1], of two phases to identify the affected part of the disease. Initially Edge detection based Image segmentation is done, and at lastly image analysis and classification of diseases is carried out using our proposed Homogeneous Pixel Counting Technique for Cotton Diseases Detection (HPCCDD) Algorithm. The goal of this research work is identify the disease affected part of cotton leaf sport by using the image analysis technique. In [2], present paper to detection of leaf diseases. In this used method is threefold: 1) identifying the infected object based upon k-means clustering; 2) extracting the features set of the infected objects using color co-occurrence methodology for texture analysis; 3) detecting and classifying the type of disease using NNs, moreover, the presented scheme classifies the plant leaves into infected and not-infected classes. In [3], The process of image segmentation was analysed and leaf region was segmented by using Otsu method. In the HSI color system, H component was chosen to segment disease spot to reduce the disturbance of illumination changes and the vein. Then disease spot regions were segmented by using Sobel operator to examine disease spot edges. Finally plant diseases are graded by calculating the quotient of disease spot and leaf areas. In [4] the authors have worked on the development of methods for the automatic classification of leaf diseases based on high resolution multispectral and stereo images. Leaves of sugar beet are used for evaluating their approach. Sugar beet leaves might be infected by several diseases, such as rusts (Uromycesbetae), powdery mildew (Erysiphebetae).In [20], a fast and accurate new method is developed based on computer image processing for grading of plant diseases. For that, leaf region was segmented by using Otsu method [15; 12;13]. After that the disease spot regions were segmented by using Sobel operator to detect the disease spot edges. Finally, plant diseases are graded by calculating the quotient of disease spot and leaf areas.

III.METHODOLOGY

The overall concept that is the framework for any vision related algorithm of image classification is almost the same. First, the digital images are acquired from the environment using a digital camera. Then image-processing techniques are applied to the acquired images to extract useful features that are necessary for further analysis. After that, several analytical discriminating techniques are used to classify the images according to the specific problem at hand. Figure 1 depicts the basic procedure of the proposed vision-based detection algorithm in this research. Ancient days crop disease identification process through the laboratory condition. However, this requires continuous monitoring of experts which might be prohibitively expensive in large farms. Further, in some developing countries, farmers may have to go long distances to contact experts, this makes consulting experts too expensive and time consuming. Existing learning techniques discussed yields low precision rates, high dimensionality, identification of disease consumes more time. The basic problems regarding high error rate and low accuracy, a fast and accurate recognition and classification of the diseases is required by inspecting the infected leaf spot images and identifying the severity of the diseases.

A. Steps for Existing system

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 starts with the training process. In the training process, resizing of the healthy and defected image of rice leaf has been done. Then convert RGB to Gray scale image, because canny edge detection cannot be applied directly on RGB. Then apply stem, stairs, canny edge detection, surf, entropy, warp, images. 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.

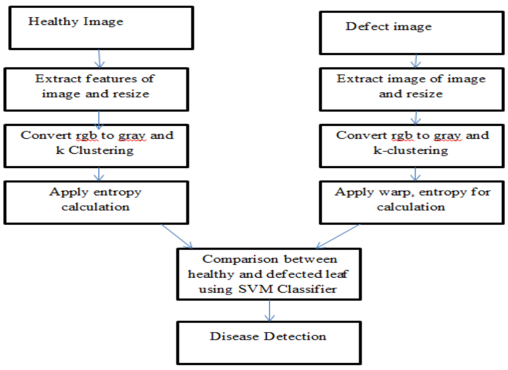


Figure.1. Architecture diagram flow for Existing Classifiers and Proposed features models

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

B. Image Processing

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. The Fig 2(right) shows image processing flow. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too. Image processing basically includes the following three steps.

- Importing the image with optical scanner or by digital photography.
- Analysing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

1. Purpose of Image processing

The purpose of image processing is divided into 5 groups. They are:

1. Visualization - Observe the objects that are not visible.
2. Image sharpening and restoration - To create a better image.
3. Image retrieval - Seek for the image of interest.
4. Measurement of pattern – Measures various objects in an image.
5. Image Recognition – Distinguish the objects in an image.

C. Image Segmentation

Image segmentation is not only the basic technology of image processing and prophase vision, but also the important component of most image analysis and visual system [5]. Image segmentation is to separate the different regions with special significance in the image. These regions do not intersect each other, and each region should meet consistency conditions in specific regions [10]. In this study two-step division is implemented to obtain the leaves and lesion areas

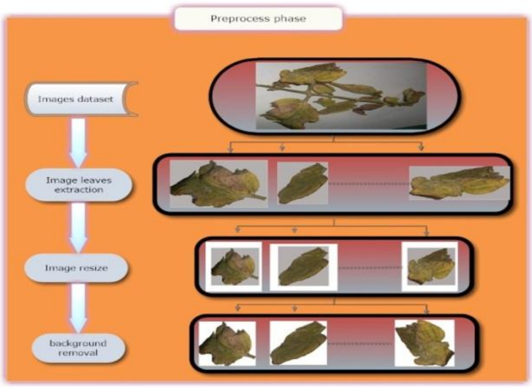


Figure.2. Image Pre-processing

D. Algorithm

1. RGB image acquisition
2. Create color transformation structure & convert color values from RGB to the space specified in that structure.
3. Apply K means clustering for image segmentation.
4. Masking of green pixels (masking green channel).
5. Remove the masked cells inside the boundaries of the infected cluster.

6. Convert the infected cluster from RGB to HIS.
7. SGDM matrix generation for H and S.
8. Calling GLCM function to calculate the features.
9. Computation of texture statistics
10. Configure SVM (classifier) for recognition.

IV.CLASSIFIER

A. Support Vector Machine (SVM)

SVM is a binary classifier to analyse the data and recognize the pattern for classification. The main goal is to design hyper plane that classifies all the training vectors in different classes. The aim is to determine a function F(x)which obtain the hyper plane. Hyper plane separates two classes of data sets. The linear classifier is defined as the optimal separating hyper plane. The data sets can be separated in two ways: linearly separated or nonlinearly separated. The vectors are said to be optimally separated if they are separated without error and the distance between the two closest vector points is maximum. For linear separable data sets, training vectors of different class of pairs (a_m, b_m)

Where m = 1,2,3,4 …, t

$a_m \epsilon \ R_n$

$b_m \epsilon \ \{ +1, -1\}$

The decision boundary is placed using maximal margin between the closest points. w being a vector perpendicular median to the street. a be the unknown of to be placed in particular class according to the decision boundary.

And hyper plane (w. a) + c =0 with c as constant

For classification

$(w \,.\, a_m) + c_0 \geq 1, \quad \forall \, b_m = +ve$ samples (1)

$(w \,.\, a_m) + c_0 \leq -1, \quad \forall \, b_m = -ve$ samples (2)

where $(w \,.\, a_m)$ shows dot product of w and a_m.

The inequalities if added i.e multiplying eq^n (1) and (2) with +1, −1, and b_m.

suppose b_m such that $b_m = 1$ for +ve samples

$b_m = -1$ for -ve samples

We get,

$b_m [\, (w \,.\, a_m) + c_0] \geq 1$

$b_m [(w \,.\, a_m) + c_0] \geq 1$

Therefore rearranging the above equations

$b_m (w \,.\, a_m) + c_0 - 1 \geq 0$

for points into dataset to in the gutter i.e on the decision boundary

$b_m (w \,.\, a_m) + c_0 - 1 = 0$

B.K-Means

K-Means algorithm is an unsupervised clustering algorithm that classifies the input data points into multiple classes based on their inherent distance from each other. The algorithm assumes that the data features form a vector space and tries to find natural clustering in them. The points are clustered around centroids μi∀i = 1 . . . k which are obtained by minimizing the objective

$$V = \sum_{i=1}^{k} \sum_{x_j \in S_i} (x_j - \mu_i)^2$$

where there are k clusters Si , i = 1, 2, . . . , k and µi is the centroid or mean point of all the points xj∈ Si As a part of this project, an iterative version of the algorithm was implemented. The algorithm takes a 2 dimensional image as input.

Various steps in the algorithm are as follows:

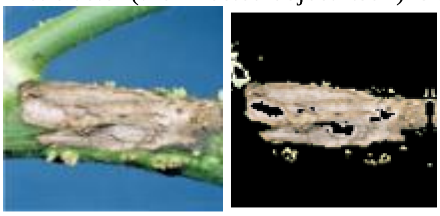
1. Compute the intensity distribution (also called the histogram) of the intensities.
2. Initialize the centroids with k random intensities.
3. Repeat the following steps until the cluster labels of the image does not change anymore.
4. Cluster the points based on distance of their intensities from the centroid intensities.

$$c^{(i)} := \arg\min_j ||x^{(i)} - \mu_j||^2$$

5. Compute the new centroid for each of the clusters.

$$\mu_i := \frac{\sum_{i=1}^{m} 1\{c_{(i)} = j\} x^{(i)}}{\sum_{i=1}^{m} 1\{c_{(i)} = j\}}$$

where k is a parameter of the algorithm (the number of clusters to be found), i iterates over the all the intensities, j iterates over all the centroids and µi are the centroid intensities. However, K-means clustering is used to partition the leaf image into four clusters in which one or more clusters contain the disease in case when the leaf is infected by more than one disease. In our experiments multiple values of number of clusters have been tested. Best results were observed when the number of clusters was 3 or 4. A stem image infected with early scorch and its first cluster (the infected object itself) is shown in Figure 5.



(a) (b)

Figure.3. A stem image infected with early scorch; a) original image b) cluster 1 image

An example of the output of K-Means clustering for a leaf infected with early scorch disease is shown in Figure 6. It is observed from Figure 6 that cluster 4 contains infected object of early scorch disease. Furthermore, clusters 1 and 2 contain the intact parts of leaf, although they are distinct from each other. However, cluster 3 represents the black background of the leaf which can be discarded primarily. Finally, the image in (e) facilitates the segmentation procedure followed in K-means algorithm.

IV.EXPERIMENT RESULT

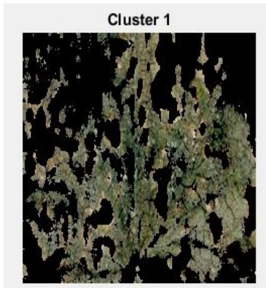
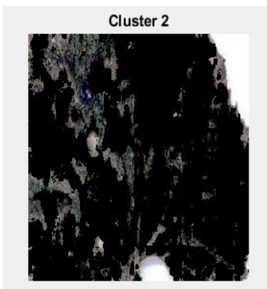


Figure.4.Original image Figure.5. Cluster1 image



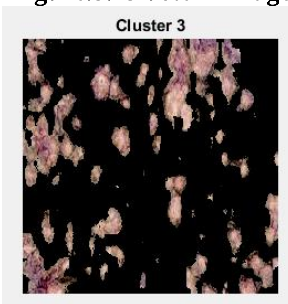


Figure.6. Cluster2 image Figure.7. Cluster2 image

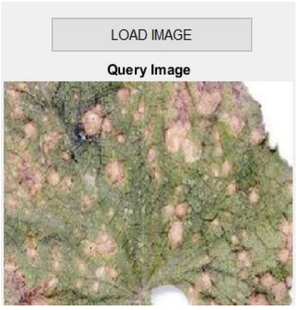
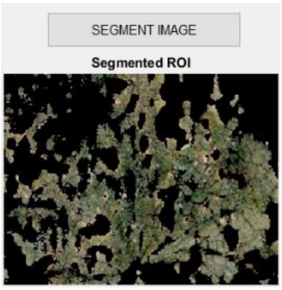


Figure.8.Qurty image Figure.9. Contrast Enhancement



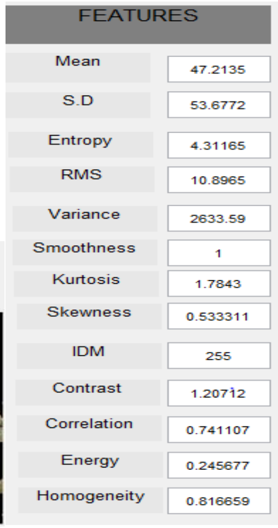


Figure.10.Segmentation Output Figure.11. Different Feature

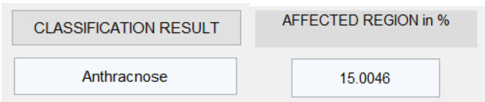


Figure.12. Classification Result

In this paper energy homogeneity, Multi SVM, kur tosis, Skewness IDM, Contrast correlation, standard deviation, entropy, RMS, variance smoothness these feature is acquired. The original image is taken from database then applies the K-mean clustering so we get the different clustering images after that contrast image and segmented image is taken. There are three diseases are identify from given leaf that are Aleternaria Atternata, Anthracnose, Bactorial blight

V.CONCLUSION

Plant Disease management is a challenging task. In that mostly diseases are seen on the leaves of the plant. Basically there are three main types of Leaf disease; they are Bacterial, Fungal and Viral. There is main characteristics of disease detection are speed and accuracy. Hence working on development of automatic, efficient, fast and accurate which is use for detection disease leaf. Work can be extended for development of machine vision system that automatically recognizes, classify and quantitatively detects leaf disease symptoms. In this paper three diseases are detected and recognize i.e Aleternaria Atternata, Anthracnose, Bactorial blight The major techniques used are K-means clustering. Some of the challenges in these techniques are optimization of the technique for a specific plant, effect of the background noise in the acquired image and automation technique for a continuous automated monitoring of plant leaf diseases under real world field conditions. The proposed approach is a valuable approach, which can significantly support an accurate detection of leaf diseases in a little computational effort with the help of support vector machine classifier in order to increase the recognition rate of final classification process. Also by computing severity and amount of disease present on the crop, only necessary and sufficient amount of pesticides can be used making agriculture production system economically efficient.

VI. REFERENCE

[1]. P.Revathi, M.Hemalatha, “Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection Techniques” ISBN, pp 169-173, 2012 IEEE.

[2]. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z. ALRahamneh, “Fast and Accurate Detection and Classification of Plant Diseases” IJCA, vol. 17(1), pp. 31-38, March 2011, IEEE-2010.

[3]. Jayamala K. Patil, Raj Kumar, “Advances In Image Processing For Detection of Plant Diseases” JABAR, vol. 2(2), pp. 135-141, June-2011.

[4]. Bauer, S. D.; Korc, F., Förstner, W. (2009): Investigationinto the classification of diseases of sugar beet leavesusing multispectral images. In: E.J. van Henten, D.Goense and C. Lokhorst: Precision agriculture “09. Wageningen Academic Publishers, p. 229-238. URL: http:// www. precision- crop- protection. unibonn. de/gk_ research/ project.php? project=3_09

[5]. Weizheng, S., Yachun, W., Zhanliang, C., andHongda, W. (2008). Grading Method of Leaf Spot Disease Based on Image Processing. In Proceedings of the2008 international Conference on Computer Science andSoftware Engineering - Volume 06 (December 12 - 14,2008). CSSE. IEEE Computer Society, Washington, DC,491-494. DOI= http:// dx.doi.org/ 10.1109/CSSE.2008.1649.

[6]. SyedA.Hayat, Ahsan Abdullah, Muhammad, A.Chaudary, YasirJ.Malik and WaseemGillani. Automatic Cleansing and classification on Cotton leaves, bolls and flowers using CMYK color splitting.

[7]. Bernardes.A.A, J.G.Rogeri, N.Marranghello, A. S. Pereira, A.F.Araujo and João Manuel R. S. Tavares. Identification of Foliar Diseases in Cotton Crop. SP, Brazil.

[8]. Meunkaewjinda. A, P.Kumsawat, K.Attakitmongcol and A.Sirikaew.2008.Grape leaf disease Detection n from color imaginary using Hybrid intelligent system”, Proceedings of ECTI-CON.

[9]. Gulhane.V. A & A. A. Gurjar, 2011. Detection of Diseases on Cotton Leaves and Its Possible Diagnosis (IJIP), 5 (5): 591-598.

[10].Ajay A. Gurjar and Viraj A. Gulhane. 2012. Disease Detection on Cotton Leaves by Eigen feature Regularization and Extraction Technique. IJECSCSE.1 (1): 1-4.