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Plant Leaf Disease Detection using K means Segmentation

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Abstract

In the image processing area the segmentation of image plays a major role because it is applied in agricultural areas to detect and classifies the various leaf diseases. Classification is performed based on their distinct characteristics. This work focuses the detection and recognition of paddy leaf diseases using SVM classifier. K means clustering is used for segmentation of images. This method provides a solution to the early recognition of diseases. By using this method farmers can automatically identify the leaf diseases at initial stages.

Keywords: K means clustering, Support Vector machine (SVM), GLCM,

1.Introduction

Agriculture is the chief determination of most of the countries. One third of India's population depends on agriculture. With the help of technological aids the desired quality and yield is improved. Image processing is a suitable method to increase the yield of plant in the agricultural fields. The human power is limited for detection of initial stage diseases.So there is necessity to develop a system that automatically detect and recognizes the leaf diseases using their distinct characteristics. Image processing performs a vital Role. The system provides a competence to input images and process to obtain the results using image processing.

2.Literature Review

Leaf diseases detection is presented in [1] which using k means clustering to identify the affected areas and classify the disease type using neural network. Image segmentation for leaf region is described using Otsu method in [2], and finally it is graded. The paper [3] presented a visually observable diseases and their symptoms of a particular plant. A work for discriminating three cotton leaf maladies in particular Bacterial Blight, Myrothecium, Alternaria is proposed in [4] in which dynamic shape mode is utilized for Image Segmentation

In paper [5] cotton leaf analysis using Principal Component Analysis and KNN Classifier which consists sicknesses like Blight, Gray Mildew, A novel method is introduced for the Cercospora leaf spot detection in sugar beet in [6]. A plant disease detection utilizing neural network classifier was demonstrated in [7].An automatic detection of diseases and diseased part presented in the leaf images of plants are discussed in paper [8].

The paper [9] emphasized a software approach of automatic detection and computation of of plant leaf diseases using texture features. The Paper [10] reviews the growth and symptoms of plant diseases

3.Proposed Methodology

First the input images are collected from the surrounding agricultural lands. Then for further processing, the image processing methods are fed to extract the required features. Figure 1

represents the steps of proposed image processing system. It illustrates the step by step processing associated in the proposed system.

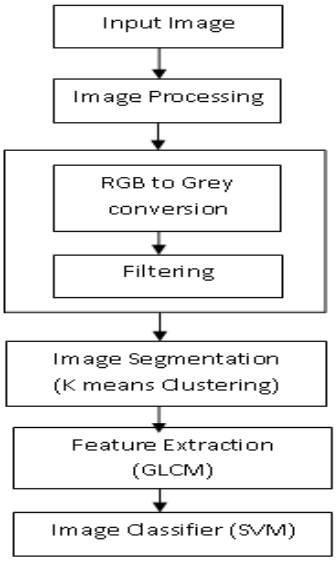

Figure 1 Steps for Proposed Image Processing System

Algorithm

a) Acquired RGB image
b) Conversion of RGB image to digital image.
c) Image Segmentation algorithm uses K means clustering
d) GLCM feature extraction
e) SVM classifier is used for image recognition.

A. Image Acquisition

The images are taken for the detection in the first step. Then it is applied to processing stage.

B. Image Processing

Image pre- processing is achieved by contrast enhancement method.

C. Image Segmentation

Image segmentation is used to serrate the distinct parts with some information in the image. K means clustering method is used for the proposedmethod.

K Means Segmentation

K-Means clustering algorithm classifies the input data points into many number of classes based on clusters inherent distances. The algorithm assigns that data features to create a vector space for clustering. These data points are clustered around centroids.

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

where k is number of clusters Si , i = 1, 2, . . . , k and μi is the mean or centroid of all the points xj∈ Si.

Algorithm Steps:

1. Computing the histogram based on the intensities.
2. Initialize the centroids with k random intensities.
3. Perform the steps until the Cluster labels of the images reaches constant.
4. Clustering is done based on distance from the intensities of centrods to the cluster intensities from the c

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

5. New centrod of each cluster is computed

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

where k is the number of clusters to be found, i number of iterations,

K-means clustering is performed to split the paddy leaf image into three clusters. In these three clusters, one or two clusters resemble the diseases which will give the segmentation.

D) Feature Extraction

GLCM function is used to perform the feature extraction.The Grey Level Coocurrence Matrix (GLCM) technique is the second order statistical texture feature extraction method. Consider the third and higher order textures. These are computationally difficult to implement.

A GLCM is a matrix where the number of rows and columns are assigned equal to the number of gray levels, G, in the image. The matrix element P (i, j | Δx, Δy) is the relative frequency with which two pixels, separated by a pixel distance (Δx, Δy), occur within a given neighborhood, one with intensity 'i' and the other with intensity 'j'. The matrix element P (i, j | d, ɵ) contains the second order statistical probability values for changes between gray levels 'i' and 'j' at a particular displacement distance d and at a particular angle (ɵ).

E) CLASSIFIER

To recognize the diseases the Support vector machine classifier is used

Support Vector Machine (SVM)

Support vector machine is binary classifier used to analyse the data and recognize classification pattern. SVM is used for classification both linear and non linear data. SVM reduces the empirical classification error and increase the geometric margin.SVM works on the principle of structural minimization that is it is based on algorithm.

4.Results and Discussions

This proposed system gives the accurate detection of leaf diseases with less computation. Support vector classifier is used to recognize the disease. The Matlab software is used to compute the results. The results of simulation is depicted below.

Figure 2. Input image

Figure 3. Pre processed image

Figure.4 Segmented image

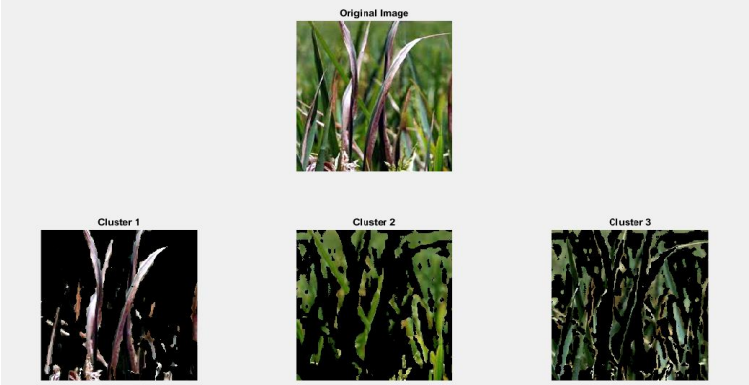

Figure 5 Clustering Image

FEATURES	
Mean	27.4259
S.D	60.4156
Entropy	2.65563
RMS	6.7326
Variance	2913.89
Smoothness	1
Kurtosis	7.08795
Skewness	2.26154
IDM	255
Contrast	0.743367
Correlation	0.871295
Energy	0.589542
Homogeneity	0.91216

Figure. 6 Computed Features

CLASSIFICATION RESULT	AFFECTED REGION in %	ACCURACY in %
Bacterial Blight	15.0155	98.3871

Figure 7 Classification Result

5.Conclusion

Disease detection and recognition is the major issue in plant management. The diseases are mostly visible on the plant leafs. Normally the plant is affected by Bacterial, Fungal and Viral leaf diseases. Accuracy is the major characteristics detection diseases. In this paper four diseases are detected and recognized. The proposed system achieves an accuracy of 98.3%.

References

[1]. 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.
[2]. 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.
[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] P. R. Rothe, "Cotton Leaf Disease Identification Using Pattern Recognition Techniques", International Conference On Pervasive Computing, 2015.
[5] Viraj A. Gulhane, Maheshkumar H. Kolekar, "Diagnosis Of Diseases On Cotton Leaves Using Principal Component Analysis Classifier", Annual IEEE India Conference, 2014.
[6] Rong Zhou, Shun‟ichi Kaneko, Fumio Tanaka, Miyuki Kayamori, Motoshige Shimizu, "Early Detection And Continuous Quantization Of Plant Disease Using Template Matching And Support Vector Machine Algorithms", First International Symposium On Computing And Networking, 2013.
[7] Dheeb Al Bashish, Malik Braik, and Sulieman Bani-Ahmad, "A Framework for Detection and Classification of Plant Leaf and Stem Diseases," Department of Information Technology, IEEE International Conference on Signal and Image Processing, 2010
[8] Santanu Phadik ar and Jaya Sil, "Rice Disease Identification using Pattern Recognition Techniques," 11th International Conference on Computer and Information Technology (ICCIT 2008),IEEE Proceedings, 2008
[9] S. Ananthi, S. Vishnu Varthini, "Detection and classification of plant leaf diseases," International Journal of Research in Engineering & Applied Sciences, Volume 2, Issue 2 (February 2012), ISSN: 2249-3905, 2012.
[10] Jiazhi Pan, Yong He, "Recognition of plants by leaves digital image and neural network," International Conference on Computer Science and Software Engineering,IEEE Computer Society, 2008.