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DETECTING DISEASES IN VARIOUS PLANTS USING DIGITAL IMAGE PROCESSING WITH REGION BASED SEGMENTATION

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ABSTRACT--Agriculture is the most important sector of Indian Economy. Indian agriculture sector accounts for 18 per cent of India's gross domestic product (GDP) and provides employment to 50% of the countries workforce. India is the world's largest producer of pulses, rice, wheat, spices and spice products. In early days, the detection of plant diseases was done manually by the expertise person in that field. This requires large amount of work and processing time. To overcome the conflict of detecting diseases in plants we use digital image processing, in this approach we use the following sequence of steps like image acquisition, image pre-processing, image segmentation, feature extraction and classification. In the above steps the particular focus is upon image segmentation, based on edge and region detection. Segmentation is first performed on the triangulation using graph cuts. Our method favors segmentations that pass through more vectorized line segments. Finally, the obtained segmentation on the triangulation is projected on to the original image and region boundaries are refined to achieve pixel accuracy. Experimental results show that the two level approaches can achieve accurate edge localization, better spatial coherence and improved efficiency.

Keywords— Segmentation, Region based, Edge based, Image acquisition, Feature extraction.

I.INTRODUCTION

With a majority of its population living in villages, rural poverty is a major problem in India. The disparity between the urban and rural incomes is also on the rise. This leads to migration to urban areas resulting in urban blight as well. Therefore addressing the problem of rural poverty assumes urgency. The major way of income in rural population is agriculture. The major disadvantage in agriculture is diseases that affect plants.

To overcome this conflict tremendous measure has to be taken to detect diseases and to analyze them and find their preventive measures in limited time. Even though human sight and perception are used, sometimes they may lead to unconditional result that may lead to error. To overcome this drawback, digital image processing technique can be used which a subcategory of digital signal is processing. Basically digital image processing uses computer algorithms to perform image processing on digital images.

II.BASIC STEPS FOR DETECTION PROCESS

The basic steps for detection process are Image Acquisition, Image Pre-Processing, Image Segmentation, Threshold based, Edge based, Region based, Feature Extraction in image, Detection and Classification of plant disease.

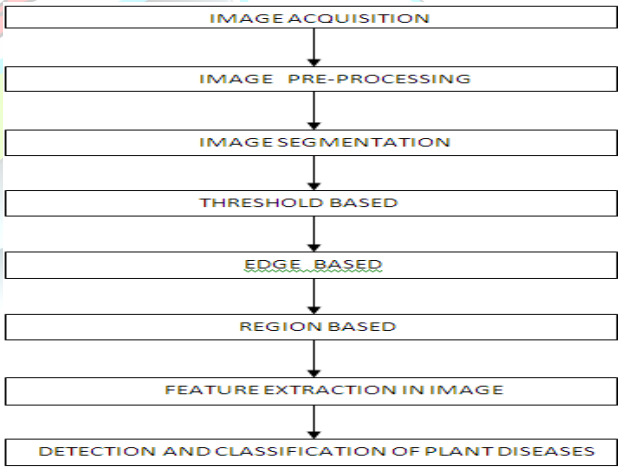

Fig.1 Basic steps for plant disease detection and classification

A.IMAGE ACQUISITION

The first stage of any vision system is the image acquisition stage. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks required today.

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However, if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the aid of some form of image enhancement. The captured image of leaf is in RGB form. Color transformation structure for the RGB image has to be created then a device independent color transformation for the structure is applied.

B.IMAGE PREPROCESSING

Image pre-processing is the name for operations on images at the lowest level of abstraction whose aim is an improvement of the image data that suppress undesired distortions or enhances some image features important for further processing. Image enhancement is done to improve the contrast, for that RGB images are converted into gray images using the following equation
f(x)=0.2989*R + 0.5870*G + 0.114.*B

C.IMAGE SEGMENTATION

Image segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.
There are three general approaches to segmentation, termed thresholding, edge-based methods and region-based methods.

D.THRESHOLD BASED

Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images. Segmentation is done through adaptive thresholding. The gray level points where the gradient is high, is then added to thresholding surface for segmentation. Threshold based technique works on the assumption that the pixels falling in certain range of intensity values represents one class and remaining pixels in the image represents the other class. Thresholding can be implemented either locally or globally. The pixels satisfying threshold test are considered as object pixels with binary value '1' and other pixels are treated as background pixels with binary value '0'.

$$g(x,y) = \begin{cases} 1, f(x,y) \geq T \\ 0, Otherwise \end{cases}$$

Where T is the predefined threshold.
Steps for thresholding are:

- Divide the captured image into subparts. Select local threshold for each subpart of image.
- Compare the pixels for individual subpart and segment the region.
- Repeat the process for each subpart and stop when all subparts are
- Segmented.

E.EDGE BASED

Segmentation can also be done by using edge detection techniques. In this technique the boundary is identified to segment. Edges are detected to identify the discontinuities in the image. Edges on the region are traced by identifying the pixel value and it is compared with the neighboring pixels. For this classification they use both fixed and adaptive feature of Support Vector Machine (SVM) .In this edge based segmentation, there is no need for the detected edges to be closed.

F.REGION BASED

In this technique pixels that are related to an object are grouped for segmentation. The thresholding technique is bound with region based segmentation. The area that is detected for segmentation should be closed. Region based segmentation is also termed as "Similarity Based Segmentation".

III REGION BASED SEGMENTATION

In region based segmentation regions are constructed by associating or dissociating neighbor pixels. It works on the principle of homogeneity, by considering the fact that neighboring pixels inside a region posses similar characteristics and dissimilar to the pixels in other regions. Each pixel is compared with its neighboring pixel for similarity check such as grey level, color,texture, shape. If the result is positive then that particular pixel is added to the pixel to grow the region.If complete image is denoted as region *R,* then for segmentation compose it into *n* disjoint regions *S1, S2, S3,……., Sn* such that

$$\left.\begin{array}{l} \cup S_i = S, \quad S_i \cap S_j = \emptyset, \quad if\ i \neq j \\ Prop\,(S_i) = True, \quad if\ i = 1,2,3,\ldots,n \\ Prop\,(S_i \cup S_j) = False, if\ i = 1,2,3,\ldots,n \end{array}\right\}$$

Where (Si) is defined in terms of feature values over region *R.* These regions are connected disjoint and homogeneous in nature .Region based method is classified in two categories such as region growing and region split and merge.

Region Growing Method

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In this method pixels in a region are labeled with a unique label which is different from the labels of other regions . This method can further be classified as Seeded Region Growing (SRG) and Unseeded Region Growing(UsRG). SRG is semiautomatic method and UsRG is fully automatic method.

Seeded Region Growing (SRG)

It is proposed by R. Adam. SRG is robust, rapid and is free from tuning parameters. The process starts by selecting a seed pixel within the image.The proper choice of seed is very crucial in this method, since it is concerned with overall segmentation quality. General steps in SRG algorithm are: Select seed pixel within image to start segmentation process.

- Decide criteria to grow the region.
- Include pixel in the region if it is connected to at least one of the pixel in the region.
- Label all the regions, after testing all the pixels
- Merge regions if two different regions get same label.

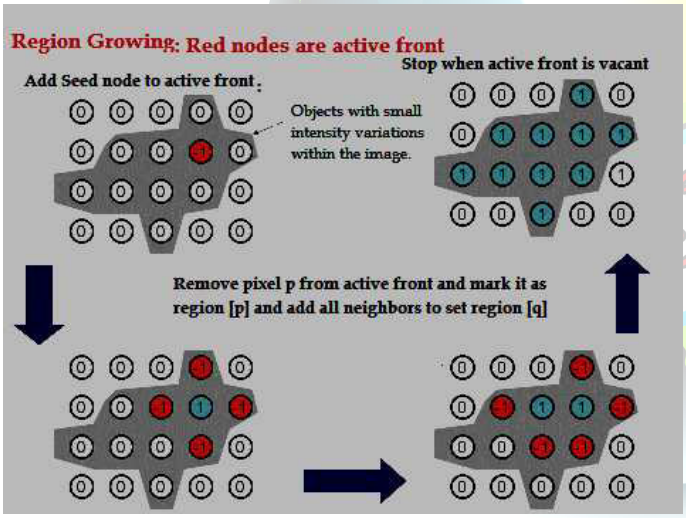

Fig. 2. Seeded Region Growing

Unseeded Region Growing (Usrg)

This method is based on pixel similarities within the region. UsRG is flexible, fully automatic and does rely on tuning parameters. General steps in UsRG algorithm are:

- Initialize segmentation process with region *S1* containing single pixel and eventually results in *S1, S2, …, Sn* regions after completion.
- For pixel allocation, difference measure of the test pixel with the mean value of the statistics is considered.
- Allocate the pixel to the specific region say *Si*, if difference value is less than certain threshold; otherwise allocate the pixel to new region *Sj*.
- Repeat above steps for all remaining pixels.

REGION SPLIT AND MERGE METHOD

This method proposed by B. Penetal works on the basis of quad tree with main objective to distinguish the homogeneity of the image. In this method entire image is considered as one single region and then divide the image into four different quadrants based on certain predefined criteria. Fig. 3 illustrates the method.

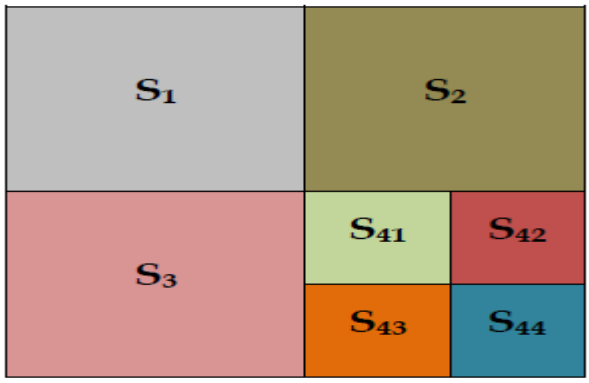

Fig.3. Region Split and Merge method

GENERAL STEPS IN THIS METHOD ARE

- Define homogeneity condition.
- Create pyramid data structure for image.
- Form a quad tree with level numbers
- Form fragment number at node
- Repeat the process until no more splitting or
- Repeat the process until no more merging

DISCONTINUITY

Segmentation by this method is based on the principle of intensity variations among the pixels. Object boundaries leads to formation of edges. The significant sudden changes in the intensity levels among neighboring pixels in certain direction are termed as edges and results in the discontinuity in the pixels. Smoothing, detection and localization are the steps involved in edge detection. Edges are usually found by applying masks over the image. Edges in the given image are detected by using gradient or the zero crossing technique. The convolution between mask and the image determines the edge set for image. Edge detection operators are first derivative operator and second derivative operator .Gradient for first derivative operator is

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$$\nabla f = G[f(u,v)] = \begin{bmatrix} \frac{\partial f}{\partial u} \\ \frac{\partial f}{\partial v} \end{bmatrix}$$

direction of gradient is = tan where is measured with respect to *X* –axis. Operators used in this type are Robert's operator, Prewitts operator, Sobels operator etc. Second order derivative operator works on zero crossing detection, gradient for this operator is

$$\nabla^2 = \frac{\partial^2 f}{\partial u^2} + \frac{\partial^2 f}{\partial v^2}$$

where $\frac{\partial^2 f}{\partial u^2} = f(u, v+1) - 2f(u,v) + f(u, v-1)$

$$\frac{\partial^2 f}{\partial v^2} = f(u+1,\ v) - 2f(u,v) + f(u-1, v),$$

operators used in this type are Laplacian of Gaussian and Canny Edge operator

FEATURE EXTRACTION

Feature extraction plays an important role for identifying an object .In many application of image processing feature extraction is used .Color ,texture, morphology, edges etc .Are the features which can be used in plant disease detection. Texture means how the color is distributed in the image, the roughness, the hardness of the image. It can also be used for detection of affected plant areas. The methods used in this feature extraction are Color co-occurrence Method, Leaf color extraction using H and B components. The leafs are classified Using ANN, Back propagation.

IV CONCLUSION

The accurately detection and classification of the plant disease is very important for the successful cultivation of crop and this can be done using image processing. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaf and the classification of plant diseases. From these methods, we can accurately identify and classify various plant diseases using image processing techniques. The usage of seeded growing and unseeded growing regions in region growing techniques and the use of merge and split algorithm helped us to identify the diseases in leafs .

REFERENCES

[1].Dr.K.Thangadurai, K.Padmavathi, "Computer Visionimage Enhancement For Plant Leaves Disease Detection", 2014 World Congress on Computing and Communication Technologies. [3] Monica Jhuria, shwani Kumar, and Rushikesh Borse, "Image Processing For Smart Farming: Detection Of Disease And Fruit Grading", Proceedings of the 2013 IEEE Second International Conference on Image Information Processing (ICIIP-2013)

[2]. H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z. ALRahamneh, "Fast and Accurate Detection and Classification of Plant Diseases", International Journal of Computer Applications (0975 – 8887) Volume 17– No.1, March 2011

[3]. Zulkifli Bin Husin, Abdul Hallis Bin Abdul Aziz, Ali Yeon Bin Md Shakaff Rohani Binti S Mohamed Farook, "Feasibility Study on Plant Chili Disease Detection Using Image Processing Techniques", 2012 Third International Conference on Intelligent Systems Modelling and Simulation.

[4].Chunxia Zhang, Xiuqing Wang, Xudong Li, "Design of Monitoring and Control Plant Disease System Based on DSP&FPGA", 2010 Second International Conference on Networks Security, Wireless Communications and Trusted Computing.

[5]. A. Meunkaewjinda, P. Kumsawat, K. Attakitmongcol and A. Srikaew, "Grape leaf disease detection from color imagery using hybrid intelligent system", Proceedings of ECTI-CON 2008.

[6]. Santanu Phadikar and Jaya Sil, "Rice Disease Identification using Pattern Recognition", Proceedings of 11th International Conference on Computer and Information Technology (ICCIT 2008) 25-27 December, 2008, Khulna, Bangladesh.

[7]. Mrunalini R. Badnakhe, Prashant R. Deshmukh, "Infected Leaf Analysis and Comparison by Otsu Threshold and k-Means Clustering", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 3, March 2012

[8]. Wenjiang Huang, Qingsong Guan, Juhua Luo, Jingcheng Zhang, Jinling Zhao, Dong Liang, Linsheng Huang, and Dongyan Zhang, "New Optimized Spectral Indices for Identifying and Monitoring Winter Wheat Diseases", IEEE journal of selected topics in applied earth observation and remote sensing,Vol. 7,No. 6, June 2014

[9]. K.Gowthami, M.Pratyusha, B.Somasekhar, B.Hemanth, Nag(Assistantprofessor),"Detection of Diseases in Different Plants Using Digital Image Processing", International Journal of Scientific Research in Engineering, Vol. 2, Issue 2, March –April 2017, pp.18-23.