Review: Detection and Classification of Plants Leaf Diseases

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***Abstract*: The aim of this project is to design, implement and evaluate an image processing software based solution for automatic detection and classification of plant leaf disease. We present fast, automatic, cheap and accurate image processing based solution. This solution is composed of four main phases. First the digital images are acquired from the field or environment using digital camera. Image preprocessing technique noise is removed by filtering technique. Next, in the second phase, the images are segmented using the K-means clustering technique. In the third phase, we calculate the texture features for the segmented infected objects. Finally, in the fourth phase the extracted features are passed through a pre-trained neural network.**

***Keywords:* Segmentation, neural network, feature extraction, plant leaf disease, K-means Method.**

1. INTRODUCTION

India is an agricultural country, where most of the people depend on agriculture. Farmers have wide range of diversity to select suitable crop. Diversity in crops causes various diseases which restrict the growth of the plants, quality, quantity and productivity of plants. In order to obtain more good products, a product quality control is basically mandatory. Diseases in plants caused by infectious organisms, can damage the normal state of plants leaves. The diseases may cause by pathogen such as fungi, viral, bacterial and environmental condition. Therefore, the early stage diagnosis of plant disease is an important task. Sometimes farmers call the experts for detecting the diseases but this also time consuming and expensive. Accuracy and patience needed, manually it is a combustive process. Automate diagnosis of diseases reduces a lot of work and makes it reliable too. The main aim of this paper is to design, implement and evaluate an image processing based software solution for detection and classification of plant leaf disease. And the main objectives of this paper is to collect image data sets of various common leaf diseases, to identify the various plant leaf diseases, and to classify the various type of diseases after identifying it. The methodology of the proposed solution is image-processing-based and is composed of four main phases; the first phase is image preprocessing. It is the technique of enhancing data images prior to computational processing. Pre-processing image commonly involves removing low frequency background noise. For removing the noise we use median filter. The second phase is image segmentation, in which the image segmented using the K-means clustering technique. The third phase is feature extraction, in which we calculate the texture features for the segmented infected objects. Finally the fourth phase in detection and classification, in which to detect and classify the disease we use the neural network.

2. LITERATURE REVIEW

Some papers are describing to detecting leaf disease using various methods

suggesting the various implementation ways as illustrated and discussed here:

[2] "Leaf Disease Detection Using Image Processing and Neural Network" by Arty N. Rathod, Bhavesh A. Tanawala, Vatsal H. Shah. This paper consists of six phases to identify the affected part of the disease. Firstly images collected from various sources like digital camera, various referring sites etc. this phase is known as an Image Acquisition phase after that image preprocessing phase was started, in this phase median filter was used for removing noise. It's best in moving salt and pepper noise and impulse noise. Median filter erases black dots called the pepper and fills in the white holes in the image, called salt. After that, the image at hand is segmented using K-medoids .This step are determined the infected object(s) and identify the mostly green colored pixels. these mostly green pixels are masked as follows: In k-medoids first calculate total cost of swapping newly selected medoids object and compare with old-medoids object ,this cost is calculate by Manhattan distance. The pixels with zeros red, green and blue values and the pixels on the boundaries of the infected cluster were completely removed. Next in the infected cluster was then converted from RGB format to HIS format and SGDM matrices the texture statistics for each image were generated. The texture features for the segmented infected object in this phase are calculated. Finally, the classification process was performed to the extracted features through a pre-trained neural network. In this phase two main dataset were generated 1)training texture feature data2)testing texture feature data .the training texture features set which are used to train the NN model whereas a testing features sets are used to verify the accuracy of the trained using the feed-forward back propagation network. In the training part, connection weights were always updated until they reached the defined iteration number or suitable error.

[1] "An Overview of Research on Plant Leaves Disease Detection Using Image Processing Technique" proposed the diagnosis system for leaf diseases by Ms. Kiran R. Gavhale[1], Prof. Ujawalla Gawande[2]. In the first step i.e. in image preprocessing uses the color space conversion technique which convert the RGB image into color space representation, the purpose of color space specification is to convert it into standard accepted way. In second step i.e. in image segmentation uses the various techniques for segmentation viz. Region based, Edge based, Threshold based, and Feature based clustering and model based segmentation. In the third step i.e. in Feature extraction uses the two methods first is texture analysis method, which focus on individual pixels divided into four categories viz. statically, structural, fractal and signal processing. And second is Texture feature extraction methods are used for extracting the relevant feature from inputted image. The popular feature extraction techniques are color co-occurrence method, Gabor filter, Wavelets transform and principal component analysis. And the fourth step is classifier in which training and testing performed via neural network classifier.

[3] "Statistical Methods for Quantitatively Detecting Fungal Disease from Fruits' Images", Jagadeesh D.Pujari1, Rajesh Yakkundimath, Abdulmunaf S.Byadgi . In this paper, they have proposed statistical methods for detecting and classifying fungal disease , they have worked on fungal disease symptoms affected on fruits. Proposed methodology for enhancing the effected fruit image are image acquisition, Image preprocessing, feature extraction and classification. In image acquisition the single fungal affected fruit image is captured by analog camera. The preprocessing is done in two phases. The first is binarization and second is noise removal. Both this techniques are implemented using median filter. They used statistical based feature extraction methods for detection of fungal affected fruit. Statistical features using block wise, Gray Level Co-occurrence Matrix (GLCM), Gray Level Run-length Matrix (GLRM) are extracted from these images and for classification they used Nearest Neighbor classifier in this classifier Euclidean distance is used to classify images as partially affected, moderately affected, severely affected and normal

[4] "Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features" by S. Arivazhagan, R. Newlin Shebiah, S. Ananthi, S. Vishnu Varthini[3]. This proposed system is for detecting and classifying the plant leaf diseases. This proposed system consists of four main steps first a color transformation structure for the input RGB image is created, then the green pixels are masked and removed using specific threshold value followed by segmentation process, the texture statistics are computed for the useful segments; finally the extracted features are passed through the classifier. First, the RGB images of leaves are converted into HSI color space representation. HSI (hue, saturation, intensity) color model is a popular color model because it is based on human perception. In masking green pixels, we identify mostly the green pixels. This is done because the green colored pixels mostly represent the healthy areas of the leaf and they do not add any valuable weight to disease identification. For image segmentation, the image is segmented into number of patches of size 32*32 to extract the useful information. The next step is the feature extraction. The texture statistics are computed for the useful segments, finally the extracted features are passed through the classifier. For classification they used svm classifier.

[5] "Recognition of Greenhouse Cucumber Disease Based onImage Processing Technology" by Dong Pixia , Wang .This paper mainly studies the disease of cucumber downy mildew, powdery mildew and anthracnose leaf image processing and recognition technologies. In this paper, image preprocessing done using graying and smoothing. In gray level transformation, weighted average method is which takes the average of R,G,B components. Image smoothing is done using neighborhood average and median filter technique. Neighborhood average method does not prevent blurring of edges, so we use median filter for noise removal. It replaces each pixel with median of neighborhood pixels. After that, image segmentation is done using lesion segmentation , for that here we have chosen ten images to identify lesion in R,G,B values. In feature extraction, we calculate the feature values based on morphological feature extraction that has four characteristics: complexity, roundness , long axis ratio, degree of rectangular. In color feature extraction, we calculate the feature value of lesion area and average of that R,G,B values. In texture feature extraction, we use GLCM- grey level co-occurrence matrix. Various parameters are: energy, entropy and contrast. Finally disease identification is done using characteristic parameters and standard centre distance.

3. METHODOLOGY

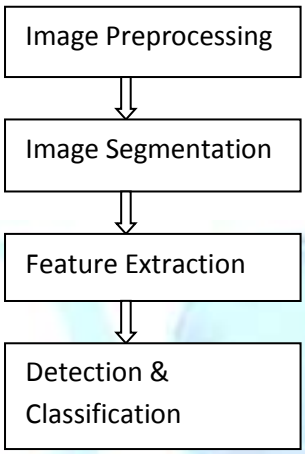

Fig. Workflow

Image preprocessing : The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhance some image feature important for further processing. The major objectives of preprocessing stage can be to reduce the amount of noise present in the document and to reduce the amount of data to be retained. This noise can be removed through median filter. The median filter causes the removal of corners and threads and may cause blurring of text.

Image segmentation : Image segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and change the representation of an image into something i.e. more meaningful and easier to analyze. The result of image segmentation is a set of a segment i.e.

collectively cover the entire the image or set of contour extracted from the image. The main idea of the image segmentation is to group pixels in homogeneous regions and the usual approach to do this is by 'common feature. Image segmentation is the process of dividing the given image into regions homogenous with respect to certain features for image segmentation we are use K-means clustering technique. Clustering refers to the process of grouping samples so that the samples are similar within each group. The groups are called clusters. K-Means clustering generates a specific number of disjoint, flat clusters. K-Means method is numerical, unsupervised, non-deterministic and iterative.

Feature Extraction : The aim of feature extraction is to find out and extract features that can be used to determine the meaning of given sample. The features should carry enough information about the image and should not require any domain-specific knowledge for their extraction. They should be easy to compute in order for the approach to be feasible for large image collection and rapid retrieval.

Detection and Classification : In this phase to detect and classify the plant leaf diseases, we are use the classifier i.e neural network, A Neural Network is an interconnected assembly of simple processing elements, units or nodes Neural Network classifier consisting of three layers namely input layer, a hidden layer, and an output layer is used.

4.CONCLUSION

This paper provides the survey of different techniques for leaf disease detection. There is main characteristics of automatic disease detection are speed and accuracy. Hence there is working on development of automatic, efficient, fast , reliable and accurate. which is use for detection disease on unhealthy leaf. This paper shows that many paper used neural network classifier for classification .

5. REFERENCES

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