ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 9, Issue 6, June 2022

A Novel Computer Vision Based Neutrosophic Approach for Leaf Disease Identification and Classification

SNEHA A[1] NIVETHA E[2] SONIYA D[3] MONISHA S[4]
Department of Electronics and communication Engineering
Bharathiyar Institute of Engineering for Women, Deviyakurichi
sneha2022a@gmail.com[1] nivet280@gmail.com[2]
soniya11be@gmail.com[3]kveeramanis77@gmail.com[4]

RAGHAPRIYA NR[4] AP/ECE
AP/ Department of Electronics and communication Engineering,
Bharathiyar Institute of Engineering for Women, Deviyakurichi.
raghapriyarajendran@gmail.com[4]

ABSTRACT
Natural products are inexpensive, non-toxic, and have fewer side effects. Thus, their demand especially for herbs-based medical products, health products, nutritional supplements, cosmetics, etc. is increasing. The quality of leaves defines the degree of excellence or a state of being free from defects, deficits, and substantial variations. Also, the diseases in leaves possess threats to the economic, and production status of the agricultural industry worldwide. The identification of disease in leaves using digital image processing decreases the dependency on the farmers for the protection of agricultural products. So, leaf disease detection and classification is the motivation of the proposed work. In this paper, a novel fuzzy set extended from the neutrosophic logic-based segmentation technique is used to evaluate the region of interest. The segmented neutrosophic image is distinguished by three membership elements: true, false, and intermediate region. Based on segmented regions, new feature subsets using texture, color, histogram, and disease sequence region are evaluated to identify leaf as diseased or healthy. Also, 9 different classifiers are used to monitor and demonstrate the discrimination power of combined feature effectiveness, where random forest dominates the other techniques. The proposed system is validated with 400 cases. The proposed technique could be used as an effective tool for disease identification in leaves. A new feature set is promising and 98.4% classification accuracy is achieved.

Keywords: leaf diseases, classification, Random Forest, GLCM.

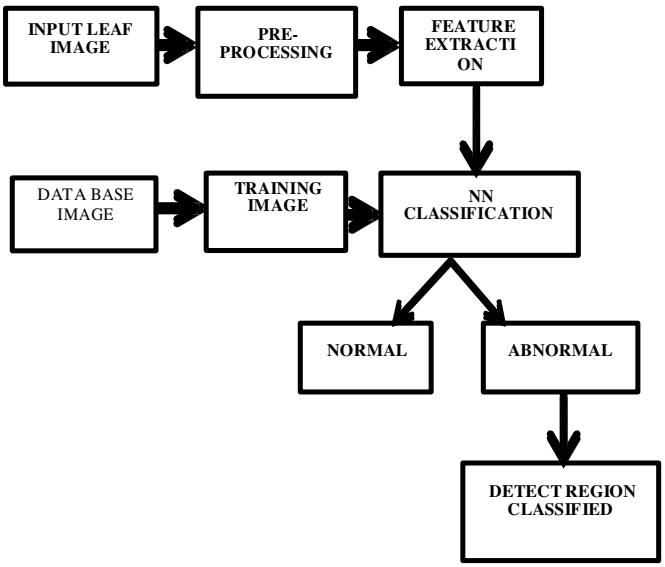
1.INTRODUCTION

Leaves are the major ingredients in traditional medicinal drugs. World Health Organization (WHO) has estimated that approximately 80% of the world population still relies on traditional Medicines, which are mostly plant-based drugs. Although researchers have worked intensively to identify the diseases of plant leaves using various techniques like DNA/RNA symptoms of diseases in medicinal plant leaves still remains less explored. The objective of this paper is to present a computer vision-based approach for detecting basil leaf healthy or disease. Basil, an ancient and popular herbal plant is characterized by significant health-benefiting phytonutrients. Basil has a profound significance in medicine and religious perspective. Swiss Federal Institute of Technology observed the existence of high quantities of (E)-beta-caryophyllene (BCP) in basil, which is believed to be helpful in the treatment of arthritis and inflammatory bowel diseases. Basil is indigenous to the countries of Iran, India as well as other tropical regions of Asia, and contains another phase that describes new feature extraction methods. [3] proposed a system, in which a predicate is defined for measuring the evidence for a boundary between two regions using Geodesic Graph-based representation of the image. The algorithm is applied to image segmentation using two different kinds of local neighborhoods in constructing the graph. Liver and hepatic tumor segmentation can be automatically processed by the Geodesic graph-cut based method. The database for the proposed system contains healthy and infected basil leaf images.

2.PROPOSED METHOD

This paper is to detect plant diseases and provide the solutions to recover from the leaf diseases. We planned to design our project with a voice navigation system so that a person with lesser expertise in software should also be able to use it easily. This paper proposed a system we are providing a solution to recover from the leaf diseases and also show the affected part of the leaf by image processing technique. The existing system can only identify the type of diseases which affects the leaf. We will provide a result within a fraction of seconds and guide you throughout the project. We briefly explain the experimental analysis of our methodology. Samples of 75

images are collected that comprised of different plant diseases like Alternaria Alternate, Anthracnose, Bacterial Blight, Cercospora leaf spot, and Healthy Leaves. A different number of images is collected for each disease that was classified into database images and input images. The primary attributes of the image are relied upon the shape and texture-oriented features. The sample screenshots display the plant disease detection using a color-based segmentation model.



3.MODULE

Image pre-processing
Image segmentation
Image Extraction
Image classification

Image Acquisition

Pre-processing is a common name for operations with the images at the lowest level of abstraction both input and output is the input images. The aim of pre-processing is an improvement of image data that suppress unwanted image data distortions or enhance the some image features important for the further processing. Four categories of image pre-processing methods according to the size of pixel neighborhood that is used for the calculation of new pixel brightness: Pixel brightness transformations, Geometric transformations Pre-processing methods that use a local neighborhood of the processed pixel, Image restoration that requires knowledge about the entire image.

Segmentation of leaf

Leaf segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super-pixels). 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. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images.

Image Extraction

When the input data to an algorithm is too large to be processed and it is suspected to be redundant (e.g. the same measurement in both feet and meters, or the repetitiveness of images presented as pixels), then it can be transformed into a reduced set of features (also named a feature vector). Determining a subset of the initial features is called feature selection.

Image classification

In order to classify a set of data into different classes or categories, the relationship between the data and the classes into which they are classified must be well understood To achieve this by computer, the computer must be trained Training is key to the success of classification. Classification techniques were originally developed out of research in Pattern Recognition field Computer classification of remotely sensed images involves the process of the computer program learning the relationship between the data and the information classes.

4. rgb2gray Mat Lab

rgb2gray can be used to change a color image into a gray scale image. The class of the new image is the same as that of the color image.

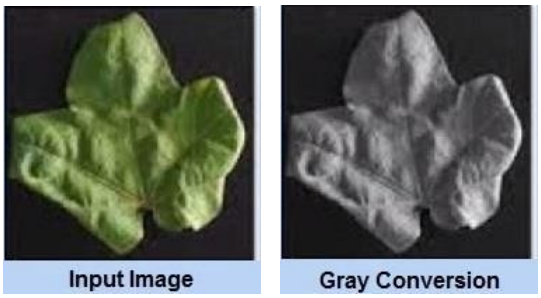
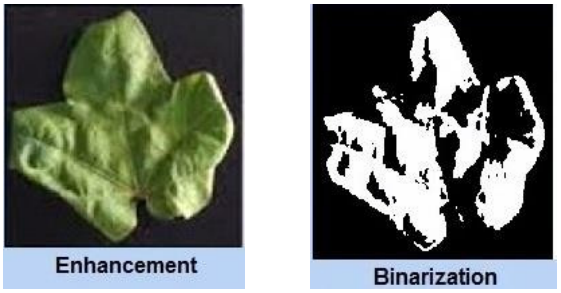


Fig IV (a) Fig IV (b)

Edge detectors are very useful for locating objects within images. There are many different kinds of edge detectors, but we will concentrate on two: the Sobel edge detector and the Canny edge detector. The Sobel edge detector is able to look for strong edges in the horizontal direction, vertical direction, or both directions. The Canny edge detector detects all strong edges plus it will find weak edges that are associated with strong edges. Both of these edge detectors return binary images with the edges shown in white on a black background.



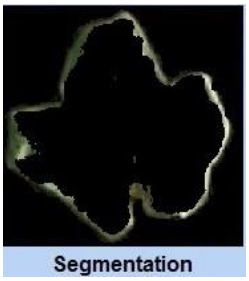


Fig IV(C) Fig IV (d) Fig IV (E)

5. TECHNIQUES AND ALGORITHMS:

CLAHE (Contrast Limited Adaptive Histogram Equalization) is a variant of AHE (Adaptive Histogram Equalisation) which takes care of over amplification of contrast.Histogram Equalisation is an image processing technique for adjusting the image's intensity which enhances the image contrast.CLAHE operates on small regions in the image, called tiles, rather than the entire image. The neighbouring tiles are then combined using bilinear interpolation to remove the artificial boundaries. CLAHE is used for improve the visibility level of foggy image or video. CLAHE uses two phase Detection phase (detect more object, more useful to up sample the image) Recognition phase (it can visually aid them in performing the task better).

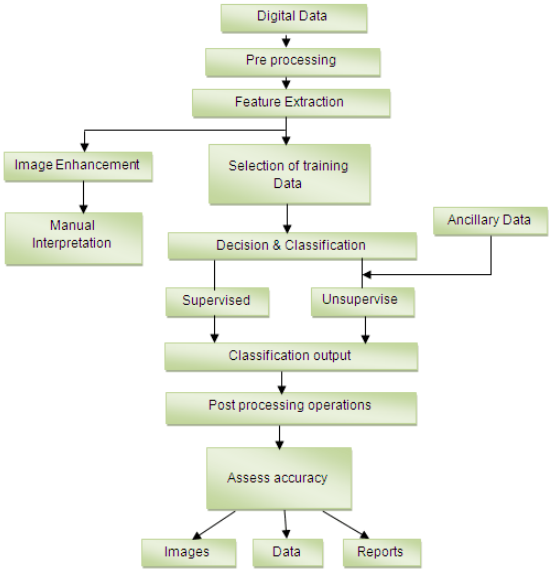


Fig V(a)

6. CONVOLUTION NEURAL NETWORK:

In machine learning, a convolutional neural network (CNN, or ConvNet) is a class of deep, feed-forward artificial neural networks that has successfully been applied to analyzing visual imagery. CNNs use a variation of multilayer perceptrons designed to require minimal preprocessing. They are also known as shift invariant or space invariant artificial neural networks (SIANN), based on their shared-weights architecture and translation invariance characteristics. Convolutional network were inspired by biological processes in that the connectivity pattern between neurons resembles the organization of the animal [4] proposed a system, this system has concentrated on finding a fast and interactive segmentation method for liver and tumor segmentation. In the pre-processing stage, Mean shift filter is applied to CT image process and statistical thresholding method is applied for reducing processing area with improving detections rate. In the Second stage, the liver region has been segmented using the algorithm of the proposed method. Next, the tumor region has been segmented using Geodesic Graph cut method.

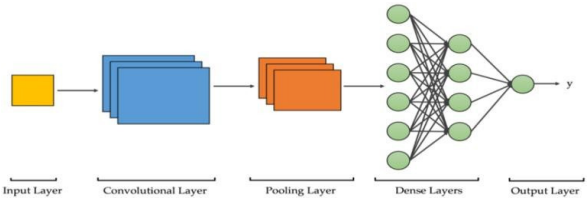


Fig VI (a)

7. DISEASE PREDICTION

In the field of crop production, plant disease is significant factor that degrades the eminence and quantity of the plants. The common approach followed in plant diseases are the classification and detection model. Both the classification and detection model are widely studied by the Engineering and IT fields. A bacterial disease is generally referred as the "Bacterial leaf spot". It is initiated as the small, yellow green lesions on young leaves which usually seen as deformed and twisted, or as dark, water-soaked, greasy -appearing lesions on older foliage. All viral disease presents some degree of reduction in production and the life of virus infected plants is usually short. The most available symptoms of virus-infected plants are frequently appear on the leaves, but some virus may cause on the leaves, fruits and roots. The Viral disease is very difficult to analyze. Leaves are seen as wrinkled, curled and growth may be undersized due to the virus. Fungal disease can influence the Contaminated seed ,soil, yield, weeds and spread by seasoned clears out as water-soaked, gray-green spots. Afterward these spots are obscure and at that point white fungal development spread on the undersides. In wool buildup yellow to white streak on the upper surfaces of more seasoned clears out happens. It spreads outward on the leaf surface causing it to turn yellow.

Fig VII (a)

8. RANDOM FORESTS

Random forests or random decision forests is an ensemble learning method for classification, regression and other tasks that operates by constructing a multitude of decision trees at training time. For classification tasks, the output of the random forest is the class selected by most trees.

For regression tasks, the mean or average prediction of the individual trees is returned. Random decision forests correct for decision trees habit of over fitting to their training set. Random forests generally outperform decision trees, but their accuracy is lower than gradient boosted trees. However, data characteristics can affect their performance. Random forests or random decision forests is an ensemble learning method for classification, regression and other tasks that operates by constructing a multitude of decision trees at training time. For classification tasks, the output of the random forest is the class selected by most trees. For regression tasks, the mean or average prediction of the individual trees is returned. Random decision forests correct for decision trees' habit of over fitting to their training set. Random forests generally outperform decision trees, but their accuracy is lower than gradient boosted tree. However, data characteristics can affect their performance.After training, predictions for unseen samples x' can be made by averaging the predictions from all the individual regression trees on x':

$$\hat{} = \frac{1}{B}\sum_{=1}^{B} f (')$$

This bootstrapping procedure leads to better model performance because it decreases the variance of the model, without increasing the bias. This means that while the predictions of a single tree are highly sensitive to noise in its training set, the average of many trees is not, as long as the trees are not correlated. Simply training many trees on a single training set would give strongly correlated trees (or even the same tree many times, if the training algorithm is deterministic); bootstrap sampling is a way of de-correlating the trees by showing them different training sets.Additionally, an estimate of the uncertainty of the prediction can be made as the standard deviation of the predictions from all the individual regression trees on x':

$$\sigma = \sqrt{\frac{\sum_{=1}^{B}(f(') - \hat{})^2}{-1}}$$

The number of samples/trees, B, is a free parameter. Typically, a few hundred to several thousand trees are used, depending on the size and nature of the training set.

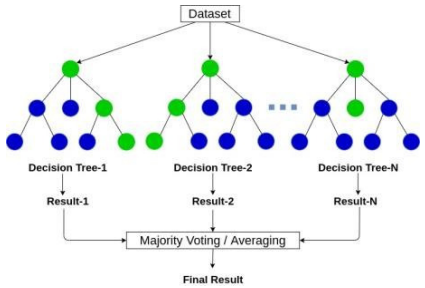


Fig VIII (a)

9.RESULT & CONCLUSION

The matching image, we have found the value of z in each stage and compare those with the dataset images and We have segmented an image by using k-clustering algorithm using cluster to generate the initial centroid and the final segmented result is compare with k-means clustering algorithm and we can conclude that the proposed clustering algorithm has better segmentation and after formation of clusters apply the deep learning algorithm to find out the value having less z value will be the final value. Deep learning algorithm gives the appropriate result of the diseases and takes less amount of time for detection than other methods. The test set consisted of 20 images which were showing symptoms of plant disease in different crops used in the study. To create the manually segmented set of images, agrid was overlaid on the image and each position was then evaluated the white colourand black colour. White colour (1)depicted the pixel having diseased symptomswhereas the black (0) for non-diseased region.To evaluate the algorithm, original images were automatically segmented. The outputwhich was produced was a binary image where 1 represented a pixel classified asdiseased and 0 as non diseased.

REFERENCE

[1]. R.Meena Prakash Associate Professor, Department of Electronics and Communication Engineering V.P.M.M.Engineering College for Women Krishnankoil, India, 2017.

[2]. G.P.Saraswathy, G.Ramalakshmi, K.H.Mangaleswari, T.Kaviya, Department of Electronics and Communication Engineering V.P.M.M.Engineering College for Women Krishnankoil, India, 2017.

[3]. Christo Ananth, D.L.Roshni Bai, K.Renuka, A.Vidhya, C.Savithra, "Liver and Hepatic Tumor Segmentation in 3D CT Images", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Volume 3,Issue-2, February 2014,pp 496-503.

[4]. Christo Ananth, D.L.Roshni Bai , K.Renuka, C.Savithra, A.Vidhya, "Interactive Automatic Hepatic Tumor CT Image Segmentation", International Journal of Emerging Research in Management &Technology (IJERMT), Volume-3, Issue-1, January 2014,pp 16-20.

[5]. J. G. A. Barbedo, L. V. Koenigkan, and T. T. Santos, "Identifying multiple plant diseases using digital image processing," Biosystems Engineering, vol. 147, pp. 104–116, 2016.

[6]. V. Singh and A. Misra, "Detection of plant leaf diseases using image segmentation and soft computing techniques," Information Processing in Agriculture, 2016.