International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 10; Issue 05 (D); May 2021; Page No.24478-24481
DOI: http://dx.doi.org/10.24327/ijcar.2021.24481.4857

Research Article

IDENTIFICATION LEAF DISEASES IN PEPPER PLANTS USING MATLAB

Savitha S., Chougule D. G and Mali A. S

Department of Electronics Engineering, Shree Warana Vibhag Shikshan Mandal's Tatyasaheb Kore Institute of Engineering & Technology, Warananagar, Taluka Panhala, District Kolhapur, Maharashtra, India 416113

A R T I C L E I N F O

Article History:
Received 4th February, 2021
Received in revised form 25th March, 2021
Accepted 23rd April, 2021
Published online 28th May, 2021

Key words:
k-means clustering, artificial neural network, GLCM, image processing, image segmentation etc.

A B S T R A C T

Images convey relevant data and information in biological sciences. Digital image processing and the image analysis technology have a vital role in biology and agricultural sectors. Automatic detection of plant diseases and cultivation of healthy plants is of great importance. In the case of a plant, the term disease is defined as any impairment happening to the normal physiological function, producing characteristic symptoms. The studies of plant diseases refer to studying the visually observable patterns of a particular plant. The identification of plants, leaves, stems and finding out the pests or diseases, or its percentage is found very effective in the successful cultivation of crops. The naked eye observation is the approach adopted by many of the farmers for the detection and identification of plant diseases. It requires continuous monitoring and found less useful on large farms. Also, the farmers are unaware of non-native diseases. With the aid of imaging technology the plant disease detection systems automatically detect the symptoms that appear on the leaves and stem of a plant and helps in cultivating healthy plants in a farm. These systems monitor the plant such as leaves and stem and any variation observed from its characteristic features, variation will be automatically identified and also will be informed to the user. This paper provides an evaluative study on the existing disease detection systems in plant.

INTRODUCTION

India is a cultivated country and about 70% of the population depends on agriculture. Farmers have large range of diversity for selecting various suitable crops and finding the suitable pesticides for plant. Disease on plant leads to the significant reduction in both the qualityand quantity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants. Monitoring of health and disease on plant plays an important role in successful cultivation of crops in the farm. In early days, the monitoring and analysis of plant diseases were done manually by the expertise person in that field. This requires tremendous amount of work and also requires excessive processing time. The image processing techniques can be used in the plant disease detection. In most of the cases the disease symptoms are seen on the leaves, stem and fruit. The plant leaf for the detection of disease is considered which shows the disease symptoms [1,2].

The image processing could be used in the field of agriculture for several applications. It includes detection of diseased leaf, stem or fruit, to measure the affected area by disease, to determine the color of the affected area. Pepper cultivation is one of the most remunerative farming enterprises in India.

Corresponding author:* **Savitha S
Department of Electronics Engineering, Shree Warana Vibhag Shikshan Mandal's Tatyasaheb Kore Institute of Engineering & Technology, Warananagar, Taluka Panhala, District Kolhapur, Maharashtra, India 416113

Black pepper is the most commonly used spice in the world. Its successful growth was reported in areas where the temperature ranges from 15-400ºC. The pepper plants give the better cultivation if sufficient requirement is provided [2,3]. Plant disease is one of the main causes which degrade the quantity and quality of the product. The naked eye observation by the experts is approach usually taken in identification and detection of plants [4,5]. This approach is time consuming in huge farms or land areas. This paper discusses the importance of image processing techniques in detection and identification of plant diseases in the earlier stages and thereby the quality of the product could be increased.

System Design

The Fig1 gives the general description of system block diagram in which each block has following description.

This system is divided in to 5 sections as follows.

- ***Image Acquisition:*** We are taking pepper plant leave images from Google search engine, those images are used as input images for image pre-processing.
- ***Image Processing:*** Image Processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics or feature associated with that image.

- ***Image Segmentation:*** It is the process of partitioning a digital image in to multiple segments (sets of pixels, also known as image objects).The goal of segmentation is to simplify or change the representation of an image in to something that is more meaningful and easier to analyze.
- ***Feature Extraction:*** Feature extraction is the process of defining a set of features, or image characteristics, which will most efficiently or meaningfully represent the information that was important for analysis and classification. Feature extraction involves reducing the amount of resources required to describe a large set of data.
- ***Disease Detection:*** Using above mentioned procedures, we are going to find the disease.

Working

The proposed system implement by using MATLAB software, figure 1 shows the complete architecture of the proposed system. There are two phases namely testing phase and training phase, in both the phases input is pepper plant leaves we are taken.

Contrast enhancement: It is a process that makes the image features stand out more clearly by making optimal use of the colours available on the display or output device, contrast manipulations involves changing the range of values in an image in order to increase contrast.

K-means clustering color based Segmentation

K means clustering is a method through which a set of data points can be partitioned in to a several disjoint subsets where the points in each subset are deemed to be 'close' to each other (according to some metric). A common metric at least when the points can be geometrically represented, is your bog standard Euclidean distance function. The 'K' just refers to the number of subsets desired in the final output. In turns out this approach is exactly what we need to divide our image in to a set of colors.

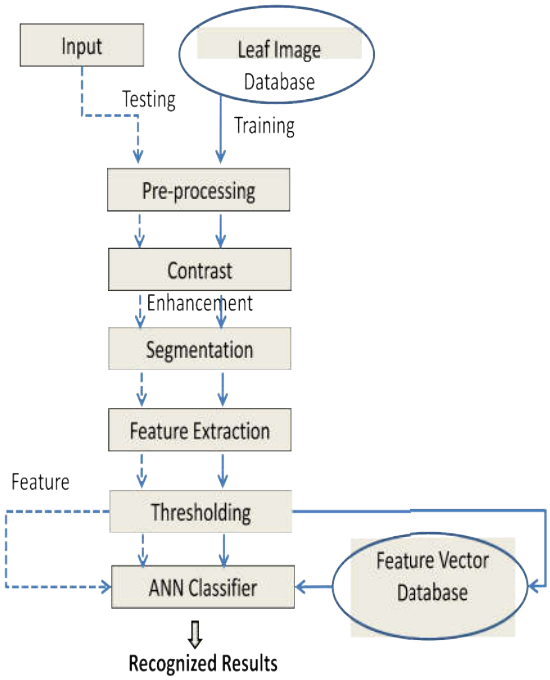

Figure 1 Block diagram showing the complete architecture of the project

In this case the data points are colors and the distance function is some measure of how different two colors are, our task is to group these colors in to a given number of sets and then calculate the mean color of each set.

The most common algorithm used for k-means clustering is called k-means algorithm. We are going to create a set of objects called centroids, each of which defines a single unique cluster.

Feature vector database contains the features of the leaves getting while training phase.

System Requriment Analysis

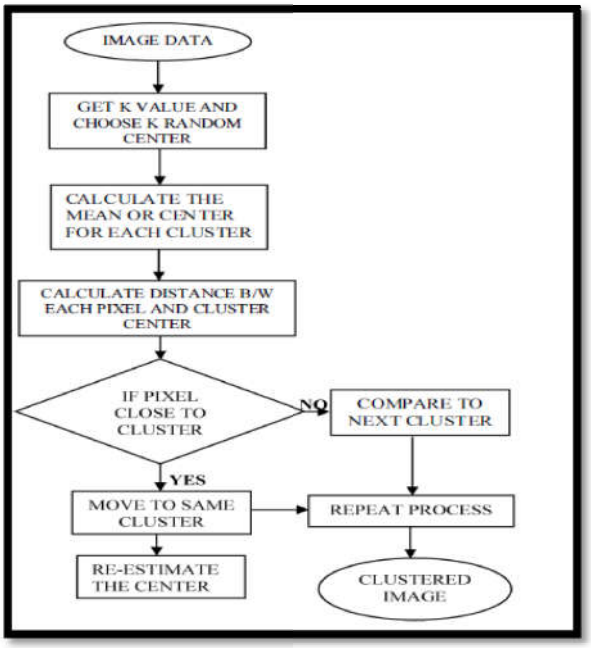

Fig 2 Flow chart for K means cluster

1. Give the no of cluster value as k.
2. Randomly choose the k cluster centers
3. Calculate mean or center of the cluster
4. Calculate the distance b/w each pixel to each cluster center
5. If the distance is near to the center then move to that cluster.
6. Otherwise move to next cluster.
7. Re-estimate the center.
8. Repeat the process until the center doesn't move

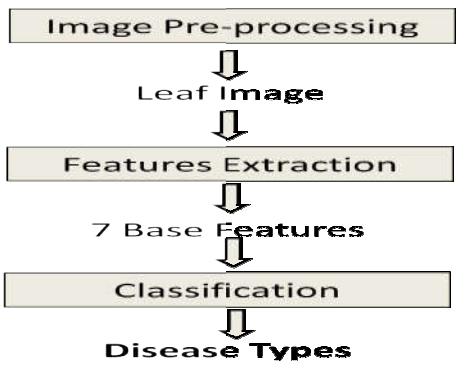

Fig 3 Flow chart of Artificial Neural Network

A classification problem deals with associating a given input pattern with one of the distinct classes. Patterns are specified by a number of features (representing some measurements made on the objects that are being classified) so it is natural to think of them as d-dimensional vectors, where d is the number of different features. This representation gives rise to a concept of feature space. Patterns are points in this d-dimensional space and classes are sub-spaces. A classifier assigns one class to each point of the input space. The problem of classification basically establishes a transformation between the features and the classes. The optimal classifier is the one expected to produce the least number of misclassifications.

- Image acquisition and Pre Processing – Pre-processing is done by Contrast Stretch.
- Segmentation - is carried out by advanced K means for color images
- Feature Extraction - Feature extraction is by color co-occurrence method for generation of statically features (GLCM)
- Classification: Classification is done by ANN.

RESULTS

The system will divided in to 5 main sections, they are image acquisition, image processing, image segmentation, feature extraction and disease detection. Image acquisition is the input part here will take the input images from database. Image processing will extract some useful information from input image. Processing of image will convert color image to grey images like Hue, Saturation a

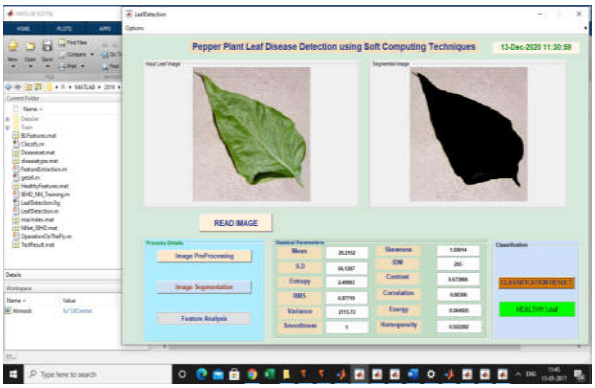

Fig 4 Input and Output Images of Pepper Leaf and Output is Healthy Leaf

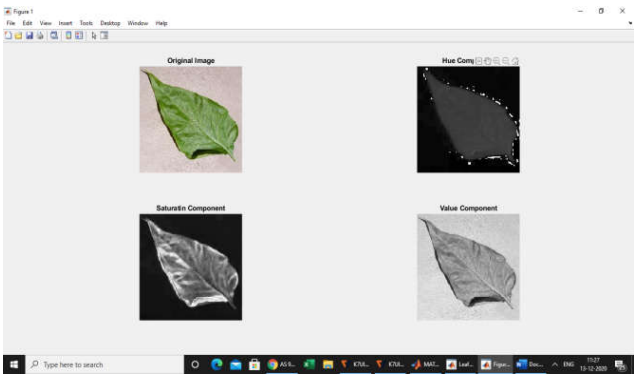

Fig 5 Processed Images of pepper leaf

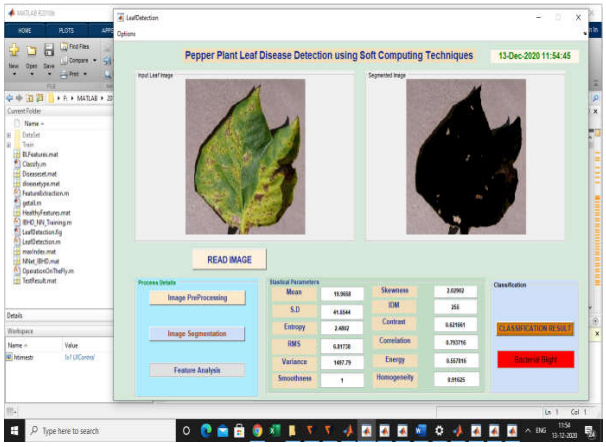

Fig 6 Input and Output Images of Pepper Leaf and Output is Bacterial Blight

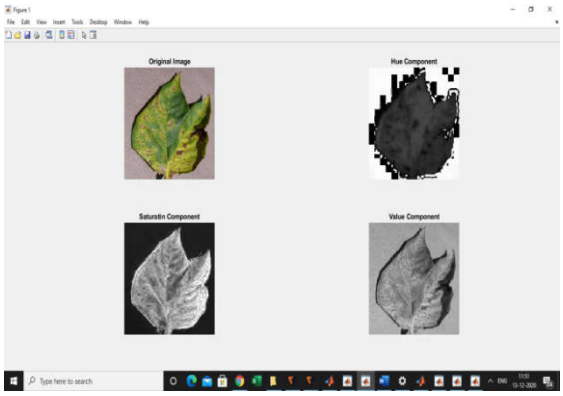

Fig 7 Processed images of pepper leaf

Table No 2 The Plant Pepper Healthy and Diseased Leaves

Sr. No	Leaf number	Results
1	Leaf 5	Healthy Leaf
2	Leaf 11	Healthy Leaf
3	Leaf 9	Healthy Leaf
4	Leaf 13	Healthy Leaf
5	Leaf 28	Bacterial Blight disease
6	Leaf 22	Healthy Leaf
7	Leaf 32	Bacterial Blight disease
8	Leaf 45	Bacterial Blight disease
9	Leaf 44	Bacterial Blight disease
10	Leaf 12	Healthy Leaf
11	Leaf 30	Bacterial Blight disease
12	Leaf 26	Bacterial Blight disease
13	Leaf 38	Bacterial Blight disease
14	Leaf 1	Healthy Leaf
15	Leaf 18	Healthy Leaf
16	Leaf 48	Bacterial Blight disease
17	Leaf 39	Bacterial Blight disease
18	Leaf 12	Healthy Leaf
19	Leaf 8	Healthy Leaf
20	Leaf 10	Healthy Leaf

CONCLUSION

An image processing algorithm is considered for detection and identification of disease in pepper plant leaves. The set of pepper plant leaves are taken to find out the disease. The algorithm gives better results and healthy and unhealthy plants can be differentiated with the help of this algorithm. This algorithm helps in identifying the presence of diseases by observing the visual symptoms seen on the leaves of the plant. The MATLAB software is used to develop the proposed algorithm, the software helps farmers to identify disease in early stage or later stage, with help of this, farmers can identify disease and by applying proper medicines, they can improve

their quantity of yields as well as quality. This also helps farmers to avoid the diseases for further spreading.

Acknowledgment

We are greatly indebted to my guide Prof D.G. Chougule and Prof.A.S.Mali for his unstained support and valuable suggestions. We are grateful to them not only for the guidance but also for their unending patience and keeping our spirits high thought. We express my sincere thanks to our beloved Head of the Department Prof. C.P Shinde and Principal Dr.S.V.Anekar for being source of inspiration and providing.

References

1. Badnakhe MR, Deshmukh PR. 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 - No.3, 2012.
2. Al-Hiary H, Bani-Ahmad S, Reyalat M, Braik M, ALRahamneh Z. Fast and Accurate Detection and Classification of Plant Diseases. *International Journal of Computer Applications* (0975 – 8887), Volume 17-No.1, March 2011.
3. Zhang C, Wang X, Li X. Design of Monitoring and Control Plant Disease System Based on DSP&FPGA. 2010 Second International Conference on Networks Security, Wireless Communications and Trusted Computing.
4. Husin ZB, Abdul Aziz AHB, Md Shakaff Rohani AYB, Mohamed Farook BS. Feasibility Study on Plant Chili Disease Detection Using Image Processing Techniques. 2012 Third International Conference on Intelligent Systems Modelling and Simulation.
5. Meunkaewjinda A, Kumsawat P, Attakitmongcol K, Srikaew A. Grape Leaf Disease Detection from Color Imagery using Hybrid Intelligent System. Proceedings of ECTI-CON 2008.
6. Huang W, Guan Q, Luo J, Zhang J, Zhao J, Liang D, Huang L, Zhang D. New Optimized Spectral Indices for Identifying and Monitoring Winter Wheat Diseases. IEEE *Journal of Selected Topics in Applied Earth Observation and Remote Sensing*. Volume 7 - No.6, 2014.
7. Thangadurai K, Padmavathi K. Computer Vision Image Enhancement for Plant Leaves Disease Detection. 2014 World Congress on Computing and Communication Technologies.
8. Jhuria M, Kumar A, Borse R. 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).

How to cite this article:

Savitha S *et al* (2021) 'Identification Leaf Diseases in Pepper Plants Using Matlab', *International Journal of Current Advanced Research,* 10(05), pp. 24478-24481. DOI: http://dx.doi.org/10.24327/ijcar.2021. 24481.4857

****