INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume3, Issue2)

Image Processing System for Plant Disease Identification by Using FCM-Clustering Technique

Megha .S
Department of Information Science and Engineering East West Institute of Technology Bangalore, India

Niveditha C. R
Department of Information Science and Engineering East West Institute of Technology Bangalore, India

SowmyaShree .N
Department of Information Science and Engineering East West Institute of Technology Bangalore, India

Vidhya .K
Assistant Professor, B.E, M.tech (Ph.D.) Department of Information Science and Engineering East West Institute of Technology Bangalore, India

Abstract: Our paper focuses on providing information about plant diseases and prevention methods. Plants have become an important source of energy, and are a fundamental piece of the puzzle to solve the problem of global warming. There are many types of diseases which are present in plants. Diseases weaken trees and shrubs by interrupting chemical change, the method by that plants produce energy that sustains growth and defense systems and influences survival. This paper presents an improved method for plant disease detection using an adaptive approach. This approach helps to increase the accuracy of the disease level, it provides various prevention method (type and amount of pesticides to be used), the level of destruction and helps to check whether the disease spreads or not.

Keywords: FCM Clustering, Automatic Recognition, SVM, Plant Leaves Diseases, Symptom, Prevention, Image Segmentation.

I. INTRODUCTION

The external appearance of agricultural products is the main quality attribute. The outer appearance greatly affects their scale value and customer's buying behaviour. Therefore, the quality inspecting and grading systems are essential in agricultural field to cultivate good healthy plants. Plant diseases have turned into a major problem as it can cause significant reduction and losses in both quality and quantity of agricultural products. A vast majority of the growing national population depends on agriculture yields. But the cultivation of these crops for optimum yield and quality produce is highly technical & challenging. It can be improved by the aid of technological support and mechanized farming. Many authors have worked on the development methods for the automatic detection and classification of leaf diseases based on high resolution multispectral, hyperspectral and stereo images. The philosophy behind precision agriculture is not only including a direct economical optimization of agricultural production, it also stands for a reduction of harmful outputs into the environment and non-target organisms. In particular, a contamination of water, soil, and food resources with pesticides has to be as minimal as possible in crop production. Machine learning-based detection and recognition of plant diseases can provide extensive clues to identify and treat the diseases in its very early stages. Comparatively, visually or naked eye identification of plant diseases is quite expensive, inefficient, inaccurate and difficult. Automatic detection of plant diseases is very important to research topic as it may prove the benefits in monitoring large fields of crops, and thus automatically detect the symptoms of diseases as soon as they appear on plant leaves. Therefore looking for fast, automatic, less expensive and accurate method to detect plant disease cases is of great realistic significance. Machine learning-based detection and recognition of plant diseases can provide extensive clues to identify and treat the diseases in its very early stages. Without accurate disease diagnosis, proper control actions cannot be used at the appropriate time. Image Processing is one of the widely used technique for plant leaf diseases detection and classification. Our paper provides a survey to study different image processing techniques used for studying leaf diseases.

II. LITERATURE REVIEW ON FCM-CLUSTERING TECHNIQUE AND SVM CLASSIFIER

The present application uses image techniques and Support Vector Machine (SVM) for detecting plant diseases. Leaf disease spots were segmented and their shape and texture features were extracted. Because the color features are influenced largely by outside light, shape and color texture features of disease spot are selected as characteristic values of classification. The SVM method was

employed to classify plant diseases. The results showed that SVM could effectively detect and classify these diseases to high accuracy, fast & accurate detection of plant diseases. The algorithm presented used to pre-process, segmentation and extract information from the segmented image. The segmentation is done by using FCM clustering technique. The texture, shape and color features are extracted from the affected region and pass to the SVM classifier. In this work, we adopt other relevant features in order to obtain a higher recognition rate. We use SVM method for classification instead neural networks, because of its simplicity in the use, and it also gives significant results. The combination of classifiers technique is adopted in order to reduce the classification problems that experienced by the individual classifiers. These problems are due to the complexity of the diseases system, in which some classes can have similar characteristics. In this work, the combination of two classifiers allows differentiating between some classes depending on their colors and between others depending on their textures and shapes.

III. EXISTING SYSTEM

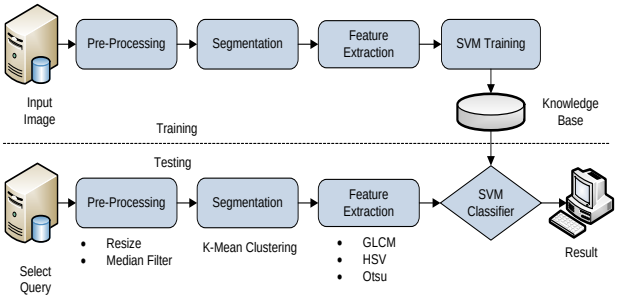

Figure 2: Existing system architecture

The current system recognizes the plant leaf disease from the images obtained. Here the K-means clustering is used. This system is based on two SVM classifiers. The proposed method represents the other relevant features in order to get high recognition. They used SVM for classification instead of neural networks because of its simplicity also gives an accurate result.

Firstly classifier is used for the color to classify the images with the same or nearest color belonging to the same class. Then the classifier is used to differentiate between the classes with the same color according to the texture and shape features. The test of this study is carried out in different classes of disease including various pest insect's damages and few forms of pathogens symptoms. The different diseases are caused due to fungal infections, bacterial and viral attacks.

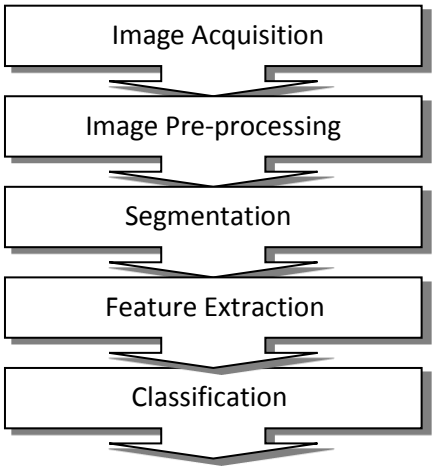

Figure 1: Block diagram of Existing system

IV. PROPOSED SYSTEM

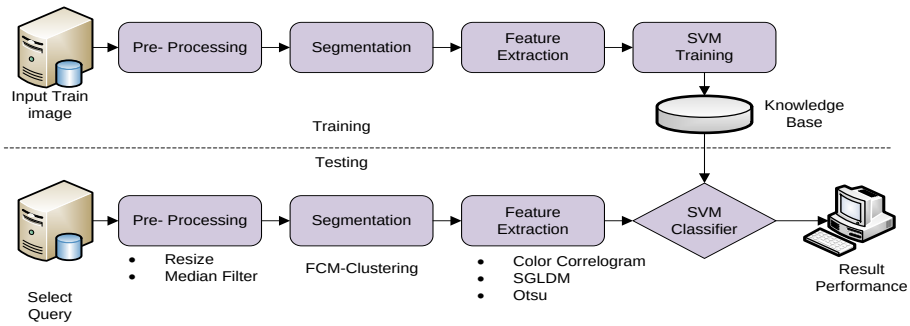

Figure 3: Proposed system architecture

The proposed system architecture flow is shown in figure 3.
Here the K-means clustering is replaced by FCM-clustering technique. The architecture of the system consists of two phases such as training and testing.

The training phase has several steps:

- Initially, the infected Plant leaf images are taken as input image and image is passed to pre-processing step, to resize the image and remove the noise content by using a median filter.
- At the next stage, the pre-processed image is passed to the segmentation for partitioning into clusters. FCM clustering technique is used for segmentation which is very fast, flexible and easy to implement than others.
- Further, the segmented image extracts the features of an image by using methods like color correlogram, SGLDM, and Otsu methods.
- Finally, the classifier is used for classification and recognition of plant disease. One of the best classifiers is SVM, which is more accurate than others and then it is stored in the knowledge base.

Similarly in testing phase pre-processing, segmentation and feature extraction step are performed and then a feature vector of the test image is classified by comparing with the knowledge base. Finally, the plant is identified the disease.

V. METHODOLOGY

1. Procuring the input image

In this method, diseased images of plants are captured through the high-resolution camera to create the required database. This database has different types of plant diseases and images are stored in **jpeg** format. These images are then read in mat lab using read command.

2. Pre-processing the image

Input image should be pre-processed on performing following steps:

- RGB to Grayscale
  In RGB each pixel is made up of 3 components i.e., red, green, blue. So more space and time is required for RGB. That's why RGB is converted to grayscale image.
- Resizing of image
  Images are resized according to the need. For resizing of images nearest neighbour interpolation is used.
- Image filtration
  This is the process of cleaning up of an image i.e., removal of noises and highlighting some information. Median filters are used.

3. Image Segmentation

According to the region of interest, the image will be divided into different parts. By this segmentation representation of the image becomes easier to analyse. FCM clustering technique is used, which is very fast and flexible than others.

4. Feature extraction

In feature extraction method, various attributes of the segmented image are extracted. Features like color, shape, and texture are extracted using Colour correlogram, spatial gray dependency matrix [SGDM]. Color correlogram is used to extract color feature. Correlogram is an image of correlation statistics. SGDM is used to extract texture feature like contrast, energy, local homogeneity, and correlation are computed for the hue content of the image. Otsu is used to extract shape features.

5. Classification of diseases

Classification technique is used for training and testing to detect the type of leaf disease. Classification deals with associating a given input with one of the distinct class. In the given system support vector machine [SVM] is used for classification of leaf disease. The classification process is useful for early detection of disease, identifying the nutrient deficiency.

Based on classification leaves are mainly affected with fungal, bacterial and viral. The following describes common symptoms of fungal, bacterial and viral plant leaf diseases.

a) Bacterial disease symptoms:

The disease is characterized by yellowish green spots which come into view as water-soaked. The lesions amass and then appear as dry dead spots as specified in figure 4.

Figure 4: bacterial affected leaf

b) Viral disease symptoms:

Among all plant leaf diseases, those caused by viruses are most complicated to diagnose. All viral disease presents some degree of reduction in virus-infected plants. The production length of such infected is usually short. This virus looks yellow or green stripes or spots on foliage. Leaves might be wrinkled, curled and growth may be stunned as depicted in figure 5.

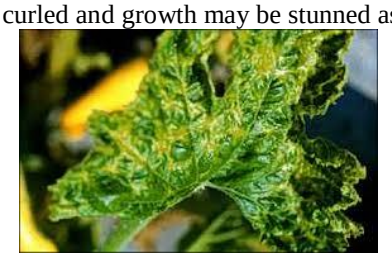

Figure 5: Viral affected leaf

c) Fungal disease symptoms:

It is a type of plant pathogen, they are responsible for serious plant diseases. They damage plants by killing cells. It disseminates through the wind, water, and movements of contaminated soil, animals, birds etc. In the initial stage, it appears on older leaves as water-soaked, gray-green spots. Later these spots darken and then white fungal growth forms on the undersides as shown in figure 6.

Figure 6: fungal affected leaf

CONCLUSION

In our paper, we would like to conclude that this is an efficient and accurate technique for a detection of plant diseases. In our research, plant disease is detected by SVM classifiers. The SVM classifiers are based on color, texture and shape features. The algorithm in the proposed approach uses image segmentation and classification technique for the detection of plant disease. The FCM clustering technique is used to segment the diseased area. Finally, SVM classifiers technique is used to detect the type of plant diseases. In proposed algorithm few species of plants on are tested including 3 types of pests and 3 forms of pathogens symptoms. The optimum results were obtained with very less computational efforts. The results obtained helps farmers in making effective decision .so it provides decision support system in diagnosis phase. We even detect prevention methods for the diseases.

FUTURE ENHANCEMENT

1. Using this method the plant disease can be identified at an early stage. The result can be delivered in very short time.
2. This method mainly focuses on large databases and advance feature of color extraction that provides the better result of detection.
3. The suitable prevention measures are provided to the farmers on the basis of detection of disease.
4. Training samples have been increased to improve the efficiency of disease detection.
5. We have used fuzzy logic artificial neutral network and SVM classifier algorithm to improve recognition rate in the final classification process.

REFERENCES

[1] Renuka Rajendra Kajale, "Detection & Reorganization of Plant Leaf Diseases using Image Processing and Android O.S.", International Journal of Engineering Research and General Science, Vol. 03, No. 02, 2015.

[2] Mr. Sachin B. Jagtap and Mr. Shailesh M. Hambarde, "Agricultural Plant Leaf Disease Detection and Diagnosis Using Image Processing Based on Morphological Feature Extraction", IOSR Journal of VLSI and Signal Processing, Vol. 04, No. 05, 2014.

[3] Sushil R. Kamlapurkar, "Detection of Plant Leaf Disease using Image Processing Approach", International Journal of Scientific and Research Publications, Vol. 06, No. 02, 2016.

[4] Arti N. Rathod, Bhavesh Tanawal, and Vatsal Shah, "Image Processing Techniques for Detection of Leaf Disease", International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 03, No. 11, 2013.

[5] Prof. Sanjay B. Dhaygude and Mr.Nitin P.Kumbhar, "Agricultural Plant Leaf Disease Detection using Image Processing", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 02, No. 1, 2013.

[6] Y.Sanjana, Ashwath Sivasamy, and SriJayanth, "Plant Disease Detection using Image Processing Techniques", International Journal of Innovative Research in Science Engineering and Technology, Vol. 04, No. 06, 2015.

[7] Surender Kumar and Rupinder Kaur, "Plant Disease Detection using Image Processing- A Review" International Journal of Computer Applications, Vol. 124, No.16, 2015.

[8] Prakash M. Mainkar1, Shreekant Ghorpade2, Mayur Adawadkar, "Plant Leaf Disease Detection and Classification Using Image Processing Techniques", International Journal of Innovative and Emerging Research in Engineering, Vol. 02, No. 04, 2015.

[9] Nikos Petrellis, "Plant Disease Diagnosis Based on Image Processing, Appropriate for Mobile Phone Implementation", 7th International Conference on Information and Communication Technologies in Agriculture (HAICTA), pp. 238 - 246, 2015.
[10] Savita N. Ghaiwat and Parul Arora, "Detection and Classification of Plant Leaf Diseases Using Image processing Techniques: A Review", International Journal of Recent Advances in Engineering and Technology (IJRAET), pp. 2347 – 2812, 2014

Megha S (BE)
1EW13IS069
Information Science and Engineering Department, East West Institute of Technology, #63, Magadi Main Road, Vishwaneedam post, Bangalore 560091 Karnataka.

Niveditha C R (BE)
1EW13IS053
Information Science and Engineering Department, East West Institute of Technology, #63, Magadi Main Road, Vishwaneedam post, Bangalore 560091 Karnataka.

Sowmyashree N(BE)
1EW13IS083
Information Science and Engineering Department, East West Institute of Technology, #63, Magadi Main Road, Vishwaneedam post, Bangalore 560091 Karnataka.

Vidhya K
Assistant Professor, B.E, M.tech(Computer Networks), (Ph.D. in Image Processing)
Department of Information Science and Engineering, East West Institute of Technology, #63, Magadi Main Road, Vishwaneedam post, Bangalore 560091 Karnataka.

