E-learning Package for Grape & Disease Analysis

Akash Pimpalkar[1], Pradumna Patki[2], Sonali Patil[3], Dr.Sushopti Gawade[4]

[1,2,3]B.E students, Department of Information technology, Pillai College of Engineering, New Panvel, Maharashtra – 410206

[4]Professor, Department of Computer Engineering, Pillai College of Engineering, New Panvel, Maharashtra – 410206

Abstract— Classification of grape leaf disease is the main purpose to prevent the losses and quality of the agricultural product. In India, grapefruit crops are extensively grown. So disease detection and classification of the grape leaf is very crucial for sustainable agriculture. It's not possible for farmers to continuously observe grape disease manually. It requires excessive processing time, a large amount of work, and some expertise in the grape leaf diseases. To detect and classify the grape disease we need a fast automatic process so we use CNN technique. It involves the following steps in that, image acquisition, image pre-processing, features extraction, and neural network-based classification. The developed algorithm's efficiency can successfully detect and classify the examined disease with an accuracy of 91%. This paper is proposed to benefit in the detection and classification of grape leaf disease using CNN(Convolutional neural network).

Keywords: Image processing, detection, classification, neural network, CNN.

1. INTRODUCTION

India is an agricultural country.70% of the population depends on agriculture. A farmer has a wide range of diversity to select proper fruit and vegetable crops. Plant disease is gaining importance as it can cause a vital reduction in both qualities & gaining quality of the agricultural product. So, research on the detection of plant disease is gaining attention nowadays, which may prove useful in monitoring large fields and thus automatically detection symptoms as they appear on the plant. Grapes (Vitis vinifera)are a major fruit crop in India. Grapes are popularly consumed as fresh fruit in India. It is also used for producing raisins, wine, juice, juice concentrate, squash, beverages, jams, and marmalades.

Grapefruit enjoys a pre-eminent status among all cash crops in a country and is a principal raw material for the flourishing wine industry. It also provides livelihood to about 65 million people and is an essential agricultural commodity providing remunerative income to millions of farmers in developed as well as in the developing country. About 60% of grapes cultivated in India are under rainfed condition. Water stressed seed or plant will cause reduced growth leading to low yield as well as exposure to disease Due to disease on the plant there is a loss of 10-30 % of the crop. Farmers do the naked eye observation and judge the diseases by their experience. But this is not an accurate and precise way. Sometimes farmers want to call the experts for identifying the diseases but this also a time-consuming way. Most of the disease on the plant is on their leaves and on the stem of the plant. The diseases are categorized into viral, bacterial, fungal, diseases due to insects, rust, nematodes, etc. on the plant. Early detection of diseases is a major challenge in horticulture/agriculture science.

Computer vision systems will help to tackle the problem. Computer vision systems developed for agricultural applications, specifically detection of weeds, sorting of fruits in fruit processing, classification of grains, identification of food products in food processing, medicinal plant identification, etc. In all these techniques, digital images are taken in a given domain using digital cameras and image processing techniques are implemented on these images to extract useful features that are necessary for additional analysis.

2. LITERATURE SURVEY

Agricultural plant leaf disease detection using image processing [1]. This paper describes that there are mainly four steps in developed processing scheme, out of which, first one is, for the input RGB image, a color transformation structure is formed because this RGB is used for color formation and modified or converted image of RGB, that is, HSI is used for the color descriptor. In the second step, by using a threshold value, green pixels are masked and removed. In third, by using the pre-computed threshold level, removing green pixels and masking is done for the segments that are obtained first in this step, while the image is segmented and in the last or fourth main step, the segmentation is done.

Detection of unhealthy regions of plant leaves and classification of plant leaf diseases using texture features[2]. This paper demonstrates the disease

identification process include some steps out of which four main steps are as follows: first, for the input RGB image, a color transformation structure is taken and then using a particular threshold value, the green pixels are masked and removed, which is further followed by segmentation process, and for getting useful segments the texture statistics are computed. At last, the classifier is used for the features that are extracted to classify the disease. The robustness of the suggested algorithm is proved by using experimental outcomes of about 500 plant leaves in a database.

Image processing techniques for the detection of leaf disease [3]. The state of the art review of different methods for leaf disease detection using image processing techniques is presented in paper[3]. The present methods studies are for boosting throughput and reduction subjectiveness which happens due to naked eye observation through which identification and detection of plant diseases are done.

Advances in image processing for the detection of plant diseases[4]. According to [4] histogram matching is used to identify plant disease. In plants, the disease appears on leaves therefore the histogram matching is done on the basis of edge detection technique and color feature. Layers separation technique is used for the training process which encompasses the training of these samples which separate the layers of RGB image into red, green, and blue layers and edge detection technique that identifies edges of the layered images. Spatial Gray Level Dependence Matrices are applied for improving the color co-occurrence texture analysis method.

A survey of plant leaf disease detection techniques[5]. The author of the paper explains the different symptoms for different types of plant diseases along with the technology that is being developed to make this process easy. This paper also highlights the different types of techniques that are currently available and are used for the purpose of disease detection as early as possible.

Usability improvement with crop disease management as a service [6]. This paper gives the reader information about how the digital space in the technology can be used to detect and manage different plant diseases. The major focus of this paper is to improve usability services in the agriculture sector by providing better tools.

Detection of plant leaf diseases using image segmentation and soft computing techniques[7]. This paper explains an algorithm for image segmentation technique which is developed solely for the purpose of automatic plant disease detection. The paper also covers surveys on different disease classification techniques that can be used for plant leaf disease detection.

Plant disease recognition based on image processing techniques[8]. The author of this paper explains the multiple linear regression techniques in depth. This paper also highlights how multiple linear regression can be used to make the system more accurate, efficient and intelligent

3. PROPOSED SYSTEM ARCHITECTURE

The main objective behind creating such an intelligent system is to avoid heavy agricultural losses that are faced by the farmers every year. The system architecture is designed in such a way that efficiency is maximum. The system basically uses the Convolution neural network algorithm to compare the image uploaded with the image present in the database. The comparison is done on the basis of the features extracted using different image processing techniques. The steps for the above-mentioned process are given below along with their specific explanation and how this helps to solve the aforementioned problem.

After study several literature reviews, there is a need to develop a real-time system that will efficiently use to detect diseases on the grape plant. The task of plant disease classification and classification is of greater importance in the field of agriculture. Therefore, developing automated techniques for plant disease classification has got much interest in the field of research nowadays. To diagnose the disease, an image processing system has been developed to automate the identification and classification of various diseases.

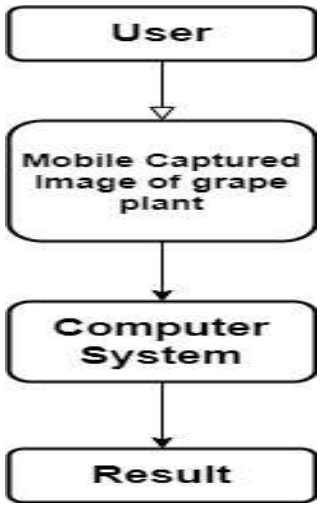

Fig 3.1: Overall structure of the system

We introduce an image-processing-based solution for automatic leaf disease detection and classification. We test our solution on three diseases which affect the plants; they are Black rot, Black Measles, and Leaf blight(Isariopsis_Leaf_Spot). Firstly, the digital images are

taken from the environment using a digital camera. Then image-processing techniques are used to the acquired images to extract useful features that are required for further analysis. After that, several analytical distinguishing techniques are used to classify the images according to the specific problem at hand fig.2 depicts the basic procedure of the proposed vision-based detection algorithm in this research.

3.1 Description of the overall system

1) **User**: Users who want to know the kind of disease on the grape leaf will capture the image and sent it to the computer system.

2) **Computer System**: The actual trained model which classifies the disease is stored in the PC. The disease affected leaf to be tested using the CNN model in the PC which gives the more accurate results and displays the result.

3.2 System Algorithm

Basic steps for describing the proposed system are as follows:

1. Acquire an image from a farmer.

2. Give image input to the system.

3. Image Pre-processing

4. Segmentation

5. Extract the features.

6. Apply classifier.

7. Get result.

3.3 Software architecture

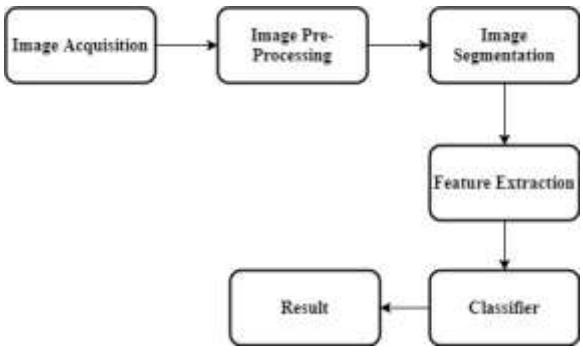

Fig 3.2: Steps for leaf disease detection

1) Image acquisition:

Firstly, the images of several leaves taken using a digital camera with the required resolution for better quality. After that sample images are obtained or collected from the farm of grape using different mobile cameras with different resolutions that are used to train the system. Collected images cover the healthy leaf as well as affected leaf by different diseases like black rot, Black Measles, and Leaf blight(Isariopsis_Leaf_Spot), etc.

2) Image pre-processing:

In the second step, this image is pre-processed to enhance the image Pre-processing covers color conversion, histogram, and histogram equalization. Color conversion and histogram equalization are used to improve the quality and clarity of images. The histogram equalization enhances the contrast of images by changing the intensity values. Colour conversion of RGB to Gray image is done using the following equation:

f (X) = r*0. 2989+ g*0. 5870+b*0.114

3) Segmentation:

It means the representation of the image in a more meaningful and easy to analyze. In segmentation, the digital image is partitioned into multiple segments can be defined as super-pixels.

4) Feature extraction:

Extracting the important data from the input image is the process of feature extraction. Also converting the input data into the set of features is called feature extraction. There are several types of features of leaf images such as color, texture, shape, and edges, etc. so in this proposed system color and texture features are selected to get good results and accuracy.

5) Classification:

The classification technique is used for both the training and testing process. This is the last and final step of the system. The features obtained from training leaves are matched with features extracted from testing leaves. Then the images are classified or identified based on the matched features. So the CNN(Convolutional neural network) model is used for the classification of leaf disease. This excludes the need for manual feature extraction. The features are not trained! They're learned while the network trains on a set of images. This delivers deep learning models extremely accurate for computer vision tasks. CNNs learn feature detection through tens or hundreds of hidden layers. Each layer enhances the complexity of the learned features.

4. RESULT

The goal of the proposed approach was to analyze and predict the disease of the grape leaf.

Fig 4.1: Web GUI

Fig 4.2: Web GUI after giving input(Black rot)

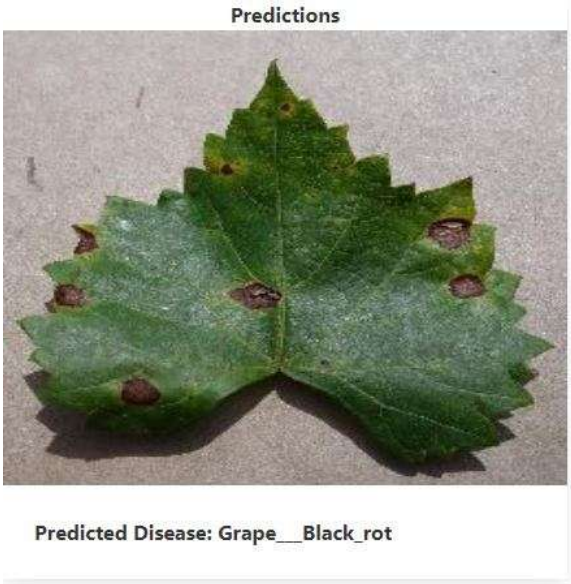

Fig 4.3: After prediction

Fig 4.4: Predictions with remedies

Fig 4.5: prediction(Healthy Leaf)

5. CONCLUSION

We have developed leaf disease detection and analysis system with the help of CNN model which is capable of detecting disease on leaves. A set of features was chosen to be extracted using the feature extraction phase, and those features were collected in the feature database, which is designed for this purpose. The captured leaf image

parameters were correlated with the parameters of healthy leaf and disease was identified. The classification rate is above 93.32% In the experiments, the purposes for misclassification of the plant disease are concluded as follows: the indications of the texture of diseased plant leaves vary at the beginning. To improve the plant disease classification rate at various stages, we need to grow the training samples and extract the effective features from leaf texture.

ACKNOWLEDGMENT

It is our privilege to express our sincerest regards to our supervisor Dr. Sushopti Gawade for the valuable inputs, able guidance,encouragement, whole-hearted cooperation and constructive criticism throughout the duration of this work. We deeply express our sincere thanks to our Head of the Department Dr. Satishkumar Varma and our Principal Dr. Sandeep M. Joshi for encouraging and allowing us to present this work.

6. REFERENCES

[1]Sujatha R* , Y Sravan Kumar and Garine Uma Akhil,"Leaf disease detection using image processing ", Journal of Chemical and Pharmaceutical Sciences,January - March 2017.

[2] Vijai Singh, A.K. Misra, "Detection of plant leaf diseases using image segmentation and soft computing techniques", Information Processing In Agriculture 4 (2017) 41–49

[3]Naikwadi Smita, Amoda Niket. Advances in image processing for detection of plant diseases. Int J Appl Innov Eng Manage 2013;2(11).

[4]Rathod Arti N, Tanawal Bhavesh, Shah Vatsal. "Image processing techniques for detection of leaf disease". Int J Adv Res Comput Sci Softw Eng 2013;3(11).

[5]Komal Raikar, Sushopti Gawade, Varsha Turkar. "Usability improvement with crop disease management as a service". 2017 International Conference on Recent Innovations in Signal processing and Embedded Systems (RISE).

[6]Nivedita.R.Kakade , Dnyaneswar. D.Ahire. "Real time grape leaf disease detection", IJARIIE-ISSN(O)-2395-4396 (Vol-1 Issue-4 2015).