Smart Agriculture: Detection of Disease in Plants using Image Processing

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***Abstract*— The yearly production of crops is largely destroyed due to the plants getting affected by the pathogens like fungal, bacterial and viral. These pathogens highly effect the growth and quality of plants. As we all know the region of plant affected by disease cannot be seen with naked eyes and even if we identify the disease we cannot accurately know what type of disease it is. This overall process is time consuming and nearly impossible to do it manually. So for this reason we have tried to make the process less time consuming and automatic for farmers. We will use image processing technique to identify the disease.**

Keywords—Region Growing; Median Filter;Genetic Algorithm; MATLAB

I. INTRODUCTION

In India, farming has its own importance. Because it is the field on which not only farmers but we also depend on. By farming we get food. But sometimes due to weather conditions, or natural calamities or other reason, plants get defected. So we need to focus to detect such diseases and to overcome from such problems, to remove diseases or precaution that should take place in order to detect disease infected plants and to save agricultural sector. Plant disease is one of the important factor which causes significant reduction in the quality and quantity of plant production. Accurate and timely detection of plant diseases will help to mitigate the worldwide losses experienced by the agriculture industries each year. Detection of disease automatically and water stress in plants is a developing area for the modern day agriculture industry. Agriculture is not just a sector supporting India economically but it is much more than that. When it comes to economy it is the major part of it. Although farmers do the agriculture efficiently but when it comes to the quality and the quantity part they majorly fails. The main reason for their loss in this sector is the disease that are affecting the growth. There are various types of disease that affect plant some which are visible to eyes and some which are not. Sometimes even if we see it we cannot treat it in the earlier stages. So we have proposed method to solve the problem faced by the farmers. Image processing is a technique which is now highly used for the day to day living. Image processing use image as the medium to solve many problems automatically.

II. LITERATURE SURVEY

Dr. Agrawal, Prof. Galande and Londhe had introduced a technique by using IOT. In this method it displays the detected disease in respective plant and reason behind the cause and also what method should be applied to control the disease. For example, It displays moisture, humidity, temperature etc of the leaf. It uses different sensors, MATLAB software, Arduino software and LCD display[1].

Bharwad and Dangarwala have done recent researches based on image processing techniques. which includes the same procedure as we are now following in our paper. Extraction was based on colour, shape and texture. And various algorithms are applied for different steps[2].

Bhange and Hingoliwala proposed a technique by image processing which detects disease in fruit plants. Support Vector Machine(SVM) was used and accuracy was 82 percent. It uses same methodology as we are going to use but other component in this technique was colour coherence vector, Intent search, Data set preparation, Morphology, etc to find result[3].

Jaymala Patil and Rajkumar have given advances to study and find diseases in plants. They have done literature survey of 24 papers and found different methods that were used to find diseases. Each time, a new technique was introduced with the different accuracies. For example: wavelet based technique, Stereomicroscopic method, Integrating image analysis, Artificial vision system etc [4].

In this paper S.E.A Raza and N.Rajput[5],develop a machine learning system to remotely detect infected plants with two types in the same image. Thermal imaging is a fast and non-destructive way of scanning plants for diseased regions. In this paper, they aim to combine information from stereo visible light images with thermal images to overcome problems like temperature variation, leaf angles, environmental conditions and present a method for automatic detection of disease in plants using machine learning techniques.

In this paper Patil and Chandavale [6] introduce two interesting topics which are Detection and classification. Detection and classification of plant diseases are important task to increase plant productivity and economic growth. To detect plant disease the image is processed with pre-processing, segmentation, feature extraction and classification processes and other different techniques. It classifies the data based upon selected features.

Rastogi, Arora and Sharma[7] proposed that the system is divided into two phases, in first phase the plant is recognized on the basis of the features of leaf, it includes pre-processing of leaf images, followed by Artificial Neural Network based training and classification for recognition of leaf. In second phase the disease present in the leaf is classified using K-Means based segmentation , extraction of

feature from defected portion and the ANN based classification of disease. Then the disease grading is done on the basis of the amount of disease present in the leaf.

Bed prakash and Amit yerpude have done a general survey on the methods that can be used to identify the leafs affected by disease. The various methods considered in this paper are Probabilistic Neural Network(PNN), Principle Component Analysis(PCA),Genetic Algorithm. They have concluded that PNN can give more accurate result in identifying the disease part [8].

Rajleen Kaur and Dr. Sandeep Singh Kang had used SVM classifier to detect the plant disease. There are two datasets which must be maintained. First it starts with original image capturing and then processing is done. Secondly it separates the hue part and saturation part of segmented image. Lastly diseased part of image is detected. This algorithm uses Enhanced SVM method and gives better accuracy than the previous methods [9].

Anand H Kulkarni and Ashwin Patil R. K had started the work with capturing the images. Filtered and segmented using Gabor filter. Then, texture and colour features are extracted from the result of segmentation. Filtration and Segmentation uses Gabor Filter.ANN gives better accuracy as it uses combination of features[10].

Dheeb Al Bashish , Malik Braik and Sulieman Bani-Ahmad had proposed a framework which is composed of the following main steps; in the first step the images are segmented using the K-Means technique, in the second step the segmented images are passed through a pre-trained neural network [11].

Sachin . D. Khirade and A.B.Patil had used boundary and spot detection, k-means clustering, otsu threshold algorithm for segmentation and CCM method for feature extraction and for classification they had used back propagation method of ANN[12].

III. PROPOSED METHOD

The main objective of our method is to build a system which can automatically identify the disease and detect the part of plant affected by it.

A. Capturing Image

The very first step is to capture the image of the plant of which disease needs to be detected. We can use Mobile with minimum 8 megapixel and digital camera.

B. Uploading Image

After first step the image which has been captured is then uploaded in the software whichever we will use to detect disease. i.e. MATLAB

C. Training Part

Genetic Algorithm use MATLAB Toolbox to build variety of matrix function. MATLAB works faster than any other traditional programming language.

1) *Preprocessing:* Different images is faded into software. In pre processing, it improves quality of the image so that we can clearly see the small objects which are present in the image. To remove noise from the images we use Median filters. Median filter preserves the useful information in the image and remove unwanted information.

2) *Local/Global Feature Extraction:* In this procedure, image is extracted and goes through different filters. Objects which looks like infected is then identified and clustered. Region Growing is used in segmentation and feature extraction. It is totally depend upon neighbouring pixels, because if there is no edge then this pixels are used. This uses functions which calculates values and repeat until there is no more value left.

3) *Dataset:* It stores entire data which has been uploaded or trained during training phase to obtain result. It is very important field because it is used in testing phase.

D. Testing Part

It follows the same procedure that is followed in testing phase. Basically it compares the image which we have captured and the image which is already present in the dataset.

E. Classification

This is the result which we obtain after going through various steps or procedure. We use Genetic Algorithm in classification of images. This algorithm is based on evolutionary ideas of natural selection and genetics. To solve problem it always takes population first then new population is formed. It always selects the fitness with highest value. This is repeated until we get best candidate. This algorithm is easy to understand, discover global optimum etc.

1) *Not Infected:* If we obtain result as Not infected then disease is not found in that plant.
2) *Infected:* If obtain Infected then disease is detected in the respective plant.

IV. CONCLUSION

Thus, we have designed such a system which detects disease in plants, which saves farmer's time and cost, which has more accuracy. It is more faster than other systems because of the different algorithms which are used to make it faster. We are using Genetic Algorithm which is relatively simple to implement and can be used in image segmentation, image classification and image reconstruction. It can work easily during the global optimization which poorly behave with the objective function.

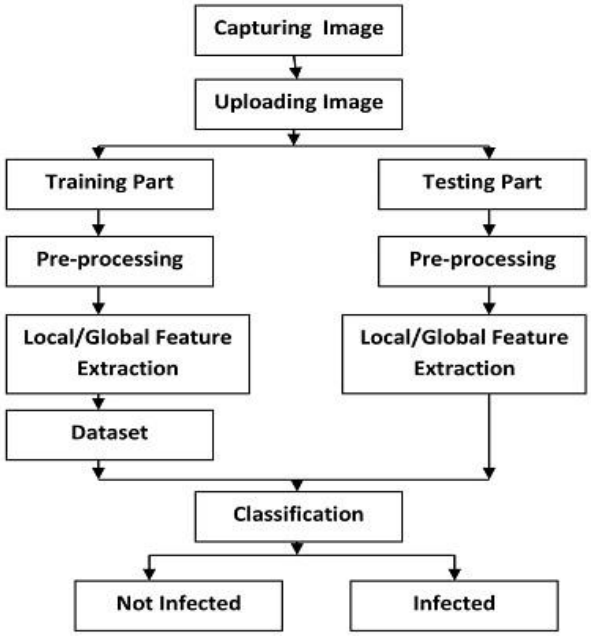

Fig 1. Flow Diagram of Disease Detection in plants

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