Early Detection of Plant Disease using Machine Learning

D.Femi, T.Danush Chowdary, Nallanukala Anilkumar

Abstract: ***India's economy highly depends on agricultural yield and it is somewhat on which economy greatly depends. In agricultural field implementing computer technology is a difficult task because still most of the major tasks are done manually. Disease detection in plant life plays a significant part in cultivation field which enhances the quality and production. The proof of identity of infection happening in the plant may be a vigorous main to stop an important damage of harvest and also the amount of farming goods. The indications are often ascertained on the essentials of the plant life like leaf, shoots, and fruitlets. The leaf shows lesions like change in colour, spots etc. This recognition is done by manually which can consume more time and it's costly because it requires more man power. To avoid manual method we are going to automate a system which identifies the plant disease as soon as they appear on the leaf, stem and fruits. A Gradient Anisotropic diffusion Image Filter is used for pre-processing, segmentation is done using Region based segmentation algorithms, feature values are extracted using GLCM and recognizing the disease is done using support vector machines.***

Index Terms: gradient anisotropic diffusion, region based, gray-level co-occurrence matrix, support vector machine

I. INTRODUCTION

Machine learning may be a sort of AI (AI) that has computers with the power to find out while not being specifically programmed. Machine learning focuses the event of computer programs which will teach themselves to grow and alter once exposed to new knowledge. The goal of machine learning, closely plus the goal of AI, is to realize an intensive understanding regarding the character of learning method (both human learning and alternative types of learning), regarding the procedure aspects of learning behaviours, and to implant the training capability in computer systems.In this modern era agriculture field plays a significant role because it is a nurturing source in today's world. Indian economy is highly reliant on farming productivity. Therefore recognition of bug in plants shows a vigorous role. To sense a plant disease in exact early stage, usage of automated bug recognition technique is valued. Nowadays, a novel idea of smart farming has been presented where the field situations are measured and observed using automatic systems. The system is designed in such a way it identifies the disease based on the symptoms which appear on the plant regions like leaf, stem and fruits. The information about the sickness existence could be speedily and correctly provided to the agriculturalists which decreases the observing of huge field by humans. The extraction of features plays a vital role in identification of unhealthy region. Rendering to the disease the structures may vary. The structures that are taken from the image are colour, figure, surface etc. The features are extracted based on contrast, correlation, homogeneity and energy. This paper recommends a scheme which can offer more precise outcomes associated to the recognition of plant bug. It avoids the manual work done by humans to certain level. Now, the taken image is primarily preprocessed to resize it and formerly it is changed to gray scale and a region based segmentation is done to extract the data from the affected area. The structures such as dissimilarity, connection, similarity and dynamism from the image. In the last step, these features are given to the SVM classifier to categorize the bug happened on the leaf.

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II. RELATED WORK

The related work discuses about the previous work and also discusses on research work carried on agricultural image processing.Konstantinos P. Ferentinos [1] Proposed convolution neural network for recognition of leaf disease. Training of the models was performed with the employment of AN open info of eighty seven, 848 images, containing twenty five totally different plants in an exceedingly set of fifty eight distinct categories of plant, disease combos, together with healthy plants. Numerous model designs were trained, with the simplest performance reaching a ninety nine. 53% attainment degree in characteristic the matching plant disease or well plant.
Sushil R. Kamlapurkar [2] proposed a model which classifies Powdery Mildew, Downey Mildew disease found in grape fruit. The proposed method extracts the features of leaf using Gabor filter method i.e. major and minor axis and this is given as the input to the ANN classifier which then classifies the disease based on the feature value extracted i.e. Powdery Mildew or Downy Mildew. Sachin B. Jagtap, Shailesh M. Hambarde [3] have proposed a system which consist of four stages it uses HIS and histogram for adjusting the intensity and this adjusted image is given as the input for segmentation which uses fuzzy c-means algorithm and from the segmented image structures like color size and shape are removed which is then trained using the neural network for organization of leaf disease.
Vijai Singh, A.K. Misra [4] Recognition of bug through some spontaneous technique is useful because it cuts huge work

of observation in huge farms of crops, and at horribly opening stage itself it notices the indications of bugs i.e. when they seem on plant leaves. This paper offers a procedure for image division method which is employed for programmed discovery and organisation of plant leaf bugs. It also covers study on totally different diseases classification methods that may be used for plant leaf bug recognition. Image segmentation, that is a very important side for malady detection in plant disease, is finished by exploitation genetic algorithm.

Sujatha R, Y Sravan Kumar and Garine Uma Akhil [5] this paper uses image processing techniques which is used for identification of leaf illness are k-means clustering, SVM. This style can suggestively care an exact discovery of leaf disease. It uses image acquisition, image pre-processing, segmentation, feature extraction, classification for leaf disease identification.

III. PROPOSED WORK

In this paper the plant disease is recognized by means of using support vector machine to classify the disease. The leaf image is read and pre-processed using anisotropic diffusion image filter. The image is then segmented using region growing algorithms and feature values are obtained using GLCM and values are optimized using linear discriminant analysis and then the values are trained and the leaf disease are classified using the classifiers. The proposed model is shown in figure 1.

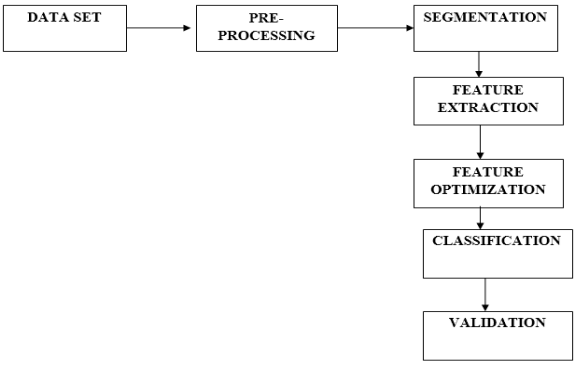

Figure 1 System Architecture

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A. DATA SET

In this module, collection of normal and infected plant leaf, stem and fruit is collected for analysis to recognize and identify plant disease.

Normal Leaf

Abnormal Leaf

B. PRE-PROCESSING

It is the process of eliminating image noise, alteration and improves the image. Gradient Anisotropic diffusion Image Filter is used to decrease image noise without eliminating significant parts of the image i.e., edges, lines or other particulars that are main for understanding of the image. Anisotropic diffusion is used to eliminate noise from images deprived of changing boundaries.

It validates whether the intensity is in correct direction i.e. north, south, west, and east and finally returns the maximum information view of the given input image. The preprossed image is shown in figure 2.

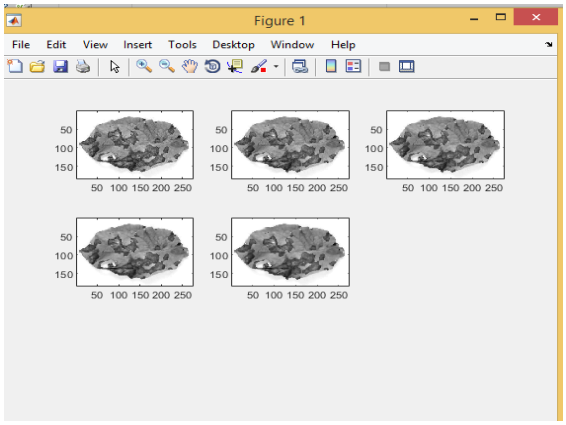

Figure 2 Pre processed image

C. SEGMENTATION

In our work, Region based segmentation is used to divide an image based on similarity of intensity values between neighbouring pixels. Region growing is a method which uses regions. It is too named as pixel-based image segmentation system because it selects the initial seed points. This technique of segmentation checks near pixels of initial seed points and defines whether the pixel nearby should be additional to the region. The procedure is continued on, which is like to data clustering algorithms. The figure 3 shows the segmented image obtained after applying segmentation of region growing algorithm on pre-processed image.

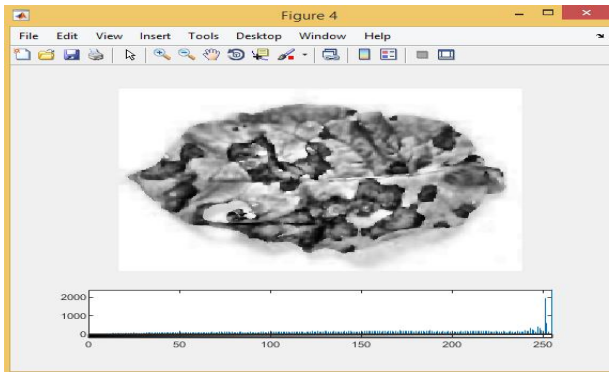

Figure 3 Segmented image

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D.FEATURE EXTRACTION

After segmentation is done on the leaf, stem and fruit0 region, the features can be obtained from it for determining and detecting the plant diseases. The technique GLCM is used here to extract the feature value. The co-occurring values are obtained in the form matrix for the given image. The features are mined based on contrast, correlation, homogeneity and energy. The extracted features is compared with the trained set of feature values. Figure 4 shows the features obtained for the segmented image i.e contrast, correlation, homogeneity and energy.

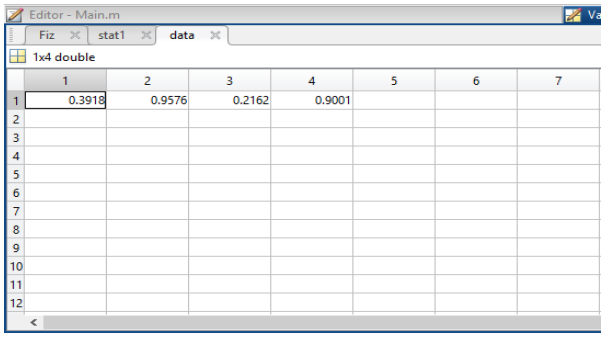

Figure 4 feature values

E. FEATURE OPTIMIZATION

In machine learning, feature selection method is known as variable selection, is the method of selecting related features from entire set of feature values. In our work, we use Linear Discriminant Analysis (LDA) selects features based on the arithmetical approach. Based on trial and error, a threshold is been set, from which features that have highest value are selected.

F. CLASSIFICATION

In this module it classifies the whether the plant normal and abnormal i.e. whether it is affected by disease or not. In this paper SVM is used in classification.

A support vector machine is a classifier strictly well-defined by splitting hyper plane. In other words, given characterised training data (supervised learning), the algorithm outputs a best hyper plane which categorizes normal and affected plants.

G. VALIDATION

The feature value obtained is compared with the trained value and it predicts whether the plant is normal or abnormal.

IV. CONCLUSION

The diseases are classified by pre-processing using gradient anisotropic diffusion image filter, region based division, feature extraction, feature optimization, selection and grouping are done in order to identify whether the plant is normal are affected. In future work many features can be extracted using other extraction technique algorithms for accurate and better experimental results.

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