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Automatic Plant Disease Detection using Image Processing – A Review

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ABSTRACT: This paper holds a survey on plant leaf diseases classification using image processing. Digital image processing has three basic steps: image processing, analysis and understanding. Image processing contains the pre-processing of the plant leaf as segmentation, color extraction, diseases specific data extraction and filtration of images. Image analysis generally deals with the classification of diseases. Plant leaf can be classified based on their morphological features with the help of various classification techniques such as PCA, SVM, and Neural Network. These classifications can be defined various properties of the plant leaf such as color, intensity, dimensions. Back propagation is most commonly used neural network. It has many learning, training, transfer functions which is used to construct various BP networks. Characteristics features are the performance parameter for image recognition. BP networks shows very good results in classification of the grapes leaf diseases. This paper provides an overview on different image processing techniques along with BP Networks used in leaf disease classification.

I. INTRODUCTION

Agriculture is the main source of the income in India. Almost 70 percent of the population in India depends on farming. Over 58 percent of the rural people depend on farming as it is an essential mean of livelihood. Sometimes farmers are unable to pay attention to the diseases or face difficulty in identifying the diseases, which lead to loss of the crop. Every disease has a different remedy to work out. For example, fungi-based disease can be prevented by disrupting the life cycle of the pathogen. The current approach of disease detection is manual, which means farmers mainly depend on the guide books or use their experiences to identify the diseases. Each plant disease has different stages of growth. Whenever the disease occurs on a plant, farmers have to keep eyes on the infection.

This approach of disease detection is time-consuming and require some precaution during the selection of pesticides. Plant diseases cause major production and economic losses in agriculture and forestry. For example, soybean rust (a fungal disease in soybeans) has caused a significant economic loss and just by removing 20% of the infection, the farmers may benefit with an approximately 11-million-dollar profit. The bacterial, fungal, and viral infections, along with infestations by insects result in plant diseases and damage. This model gives the proper prediction in less time, this is helpful for most of the farmers in India. Dataset present in this model is capture from diseases present in India, so that any farmer can get the prediction proper. Thus, by using this model we can predict actual

diseases and get the proper precaution for the disease.

II. LITERATURE REVIEW

Paper [1] presents classification and detection techniques that can be used for plant leaf disease classification. Here, pre-processing is done before feature extraction. RGB images are converted into white and then converted into grey level image to extract the image of vein from each leaf. Then basic Morphological functions are applied on the image. Then the image is converted into binary image. After that if binary pixel value is 0 its converted to corresponding RGB image value. Finally, by using Pearson correlation and Dominating feature set and Naïve Bayesian classifier disease is detected.

In paper [2] there are four steps. Out of them the first one is gathering image from several part of the country for training and testing. Second part is applying Gaussian filter is used to remove all the noise and thresholding is done to get the all-green color component. K-means clustering is used for segmentation. All RGB images are converted into HSV for extracting feature.



The paper [3] presents the technique of detecting jute plant disease using image processing. Image is captured and then it is realized to match the size of the image to be stored in the database. Then the image is enhanced in quality and noises are removed. Hue based segmentation is applied on the image with customized thresholding formula. Then the image is converted into HSV from RGB as it helps extracting region of interest. This approach proposed can significantly support detecting stem-oriented diseases for jute plant.

In paper [4] detection of unhealthy plant leaves includes some steps are RGB image acquisition. Converting the input image

from RGB to HSI format. Masking and removing the green pixels. Segment the components using Ostu's method. Computing the texture features using color- co-occurrence methodology and finally classifying the disease using Genetic Algorithm.

III. EQUATIONS

Precision for Imbalanced Classification:

In an imbalanced classification problem with two classes, precision is calculated as the number of true positives divided by the total number of true positives and false positives.

$$\text{Precision} = \text{TruePositives} / (\text{TruePositives} + \text{FalsePositives})$$

The result is a value between 0.0 for no precision and 1.0 for full or perfect precision. Let's make this calculation concrete with some examples. Consider a dataset with a 1:100 minority to majority ratio, with 100 minority examples and 10,000 majority class examples. A model makes predictions and predicts 120 examples as belonging to the minority class, 90 of which are correct, and 30 of which are incorrect. The precision for this model is calculated as:

$$\text{Precision} = \text{TruePositives} / (\text{TruePositives} + \text{FalsePositives}) \text{ Precision} = 90 / (90 + 30)$$

$$\text{Precision} = 90 / 120$$

$$\text{Precision} = 0.75$$

Consider the same dataset, where a model predicts 50 examples belonging to the minority class, 45 of which are true positives and five of which are false positives. We can calculate the precision for this model as follows:

$$\text{Precision} = \text{TruePositives} / (\text{TruePositives} + \text{FalsePositives}) \text{ Precision} = 45 / (45 + 5)$$

$$\text{Precision} = 45 / 50$$

$$\text{Precision} = 0.90$$

IV. PROBLEM SPECIFICATION

The overall concept that is the framework for any vision related algorithm of image classification is almost the same. First, the digital images are acquired from the environment using a digital camera. Then image-processing techniques are applied to the acquired images to extract useful features that are necessary for further analysis. After that, several analytical discriminating techniques are used to classify the images according to the specific problem at hand. Figure 1 depicts the basic procedure of the proposed vision-based detection algorithm in this research.

1. Image Acquisition:

The initial process is to collect the image data which are used as input for further processing. The input of image data should be in .bmp, .jpg, .png, .gif format. We need to prepare image database by our own, which requires image acquisition from live farm. In this process, images are captured from the farm using a digital camera to get them directly in digital form with numerical values so that digital image processing operations can be applied.

2. Image Pre Processing:

Pre-processing techniques are applied to improve the image data such as image cropping technique to change the image size and shape, image smoothing for filtering of noise and image enhancement to enhance contrast and colour conversion of images. For getting better results in further steps, image pre-processing is required



because dust, dewdrops, insect's excrements may be present on the plant; these things are considered as image noise. Furthermore, captured images may have distortion of some water drops and shadow effect, which could create problems in the segmentation and feature extraction stages. Effect of such distortion can be weakened or removed using different noise removal filters.

3. Image Segmentation:

Image segmentation can play a vital and important role in plant disease detection. Image segmentation means to divide the image into particular regions or objects. The primary aim of segmentation is to analyze the image data so one can extract the useful features from the data. Segmentation of leaf image involves partitioning of image into different parts of same features.

4. Feature Extraction:

The feature extraction aspect of image analysis focuses on identifying inherent characteristics or features of objects present within an image. These features can be used to describe the object. Generally, features under following three categories are extracted: color, shape, and texture. Texture means how the color is distributed in the image, the roughness, the hardness of the image. Morphological feature extraction is better than color and texture feature for detecting leaf diseases. The color is an important feature because it can differentiate one disease from another. Furthermore, each disease may have different shape; thus, system can differentiate diseases using shape features. Some shape features are area, axis, and angle.

5. Classification:

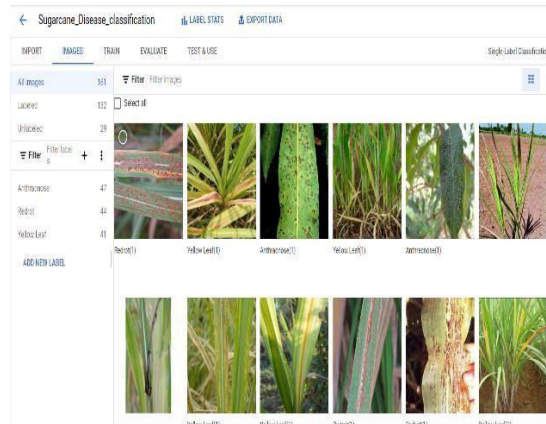
Classification maps the data into specific groups or classes. Classification is usually called as supervised learning approach. Classification is a two-step process: First the classifier model is generated which describes predefined set of classes. This step is called as learning phase (Training step), where classification algorithm develops the classifier by "learning from" the data with their specific class labels. In the second step, the model, which is generated in first step, is used for classification. In other words, test data is used to estimate the accuracy of the trained model by evaluating how good it performs on the test data. In the plant disease classification, the diseases are classified according to the features extracted from the images. Different classification models are support vector machine, neural network, nearest neighbour, and rule-based classifier.

6. Remedies:

Prevention and remedies are been given according to the plant disease. Proper pesticides and prevention techniques are been provided along with proper amount of ratio. These remedies help to cover the diseases present on the plants. Also, at last for future scope the referential video links are provided for farmers.

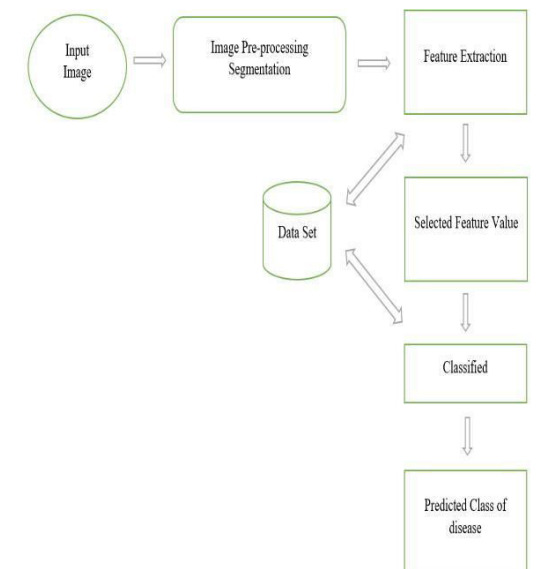
V. DATA GATHERING

The computer vision used in this project mainly depends on the images of the leaves. So, we decided to capture few images of leaves and utilize them to make a model facilitates in discovery of plant disease. The images are caught manually and also downloaded from internet using a camera of 13MP. Each image contains only one leaf. A total of about 300 images of leaves are captured which are used for training and validating the model. A total of 150 images are used for testing the model which was built using the training data. Two main diseases of the sugarcane namely Redrot and Yellow Leaf.



VI. IMAGE PROCESSING

Digital signal processing is the methodology to achieve fast and accurate result about the plant leaf diseases. It will reduce many agricultural aspects and improve productivity by detecting the appropriate diseases. For disease detection, an image of an infected leaf should be examined through a set of procedures. As Fig 1 shows, the input image should be pre-processed, then its features should be extracted according to the dataset. After that, some classifier techniques should be used to classify the diseases according to the specific data set. Image Acquisition is the process in which an image is acquired and converted to the desired output format. For this application, an analog image is first captured and then converted to a digital image for further processing. Pre-processing Segmentation contains the process for image segmentation, image enhancement, and color space conversion. Firstly, a digital image is enhanced by a filter. A leaf image is filtered from the background image. Then, the filtered image's RGB colors are converted into color space parameters. Hue Saturation Value (HSV) is a good method for color perception. Further, the image is segmented into a meaningful part which is easier to analyze. Any of the model-based, threshold-based, edge-based, Region-based, and feature-based segmentation has been done on the images.



Feature extraction is the process done after segmentation. According to the segmented information and predefined dataset, some features of the image should be extracted. This extraction could be any of statistical, structural, fractal, or signal processing. Color co-occurrence Method, Grey Level Co-occurrence Matrices (GLCM), Spatial Gray-level Dependence Matrices (SGDM) method, Gabor Filters, Wavelets Transform, and Principal component analysis are some methods used for feature extraction.



Classifiers are the software routine written on the platform to define certain features for classification of the images. Knearest neighbor, Radial basis function, Probabilistic Neural Network (PNN), Convolutional neural network, Support vector machine and Back propagation network are the some linear and nonlinear classifier for image classification. Any platform such as MATLAB can be used to train and test these classifiers.

VII. CONCLUSION

This project proposed a leaf image pattern classification to identify disease in leaf with a combination of texture and color feature extraction. Initially the farmers send a digital image of the diseased leaf of a plant and these images are read in python and processed automatically based on Tensorflow and the results were shown. The results of this project are to find appropriate features that can identify leaf diseases of certain commonly caused disease to plants. Firstly, normal and diseased images are collected and pre- processed. Then, features of shape, color and texture are extracted from these images. After that, these images are classified by support vector machine classifier. The final result of this model gives proper output along with the correct prevention techniques.

REFERENCES

1. Savita N. Ghaiwat, ParulArora, "Detection and Classification of Plant Leaf Diseases Using Image processing Techniques: A Review", International Journal of Recent Advances in Engineering and Technology, ISSN: 2347-2812, Volume 2, Issue 3, 2014.
2. 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, Volume 2, Issue, 2013.
3. Mr. Pramod and S. landge, "Automatic Detection and Classification of Plant Disease through Image Processing", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 7, ISSN: 2277 128X, 2013.
4. Anand H. Kulkarni and Ashwin Patil R. K, "Applying image processing technique to detect plant diseases", International Journal of Modern Engineering Research (IJMER), Volume 2, Issue.5, pp-3661-3664 ISSN: 2249-6645, 2012
5. Haiguang Wang, Guanlin Li, Zhanhong Ma, Xiaolong Li, "Image Recognition of Plant Diseases Based on Back propagation Networks", 5th International Congress on Image and Signal Processing (CISP), 2012
6. Piyush Chaudhary Anand K. Chaudhari, Dr. A. N. Cheeranand Sharda Godara "Color Transform Based Approach for Disease Spot Detection on Plant Leaf", International Journal of Computer Science and Telecommunications, Volume 3, Issue 6, 2012.
7. M. Egmont-Petersen, "Image processing with neural networks", Elsevier, Volume 35, Issue 10, October 2002, Pages 2279–2301 2002
8. Muhammad Faisal Zafar, Dzulkifli Mohamad, Muhammad Masood Anwar "Recognition of Online Isolated Handwritten Characters by Back propagation Neural Nets Using Sub- Character Primitive Features", IEEE Multitopic Conference, 2006.
9. Jayme Garcia, ArnalBarbedo, "Digital image processing techniques for detecting, quantifying and classifying plant diseases", Springer Plus, 2013.
10. SmitaNaikwadi, NiketAmoda, "Advances in Image processing for detection of plant disease", International Journal of Application or Innovation in Engineering & Management, Volume 2, Issue 11, 2013.
11. Ms. Kiran, R. Gavhale, Prof. Ujwalla Gawande, "An Overview of the Research
12. on Plant Leaves Disease detection using Image Processing Technique" IOSR Journal of Computer Engineering (IOSR- JCE) e-ISSN: 2278-0661, p- ISSN: 2278-8727Volume 16, Issue 1, PP 10-16, 2014.



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