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Crop Disease Detection using Machine Learning

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ABSTRACT

Crop contaminations are a fundamental chance to nourishment security, in any case their expedient recognizing affirmation remains troublesome in different parts of the world since of the non interest of the imperative establishment. Machine learning. Bugs and Diseases come almost inside the destruction of crops or parcela. This paper makes utilize of Irregular Timberland in distinguishing between sound and unhealthy leaf from the information sets made. "Our proposed paper consolidates distinctive stages of execution to be particular dataset creation, highlight extraction, planning the classifier and classification". The made datasets of infected and sound clears out are collectively prepared beneath Irregular Woodland to classify the unhealthy and solid pictures.

Key words: Contaminated leaves, Bugs, Leaf Disease extraction, Classification.

INTRODUCTION

The agriculturist in common districts may think that it's difficult to distinguish the illness which may be accessible in their harvests. It's not direct for them to go to agribusiness office and find what the disease may be. Our guideline objective is to recognize the ailment present in a plant by observing its morphology by picture taking care of and machine learning. "Bugs and Contaminations come approximately inside the destruction of crops or parcel of the plant coming almost in decreased food era driving to food vulnerability.

Moreover, information around the bother administration or control and illnesses are less in different less created nations. Harmful pathogens, destitute illness control, extreme climate changes are one of the key variables which emerges in dwindled food production. Different advanced innovations have risen to play down postharvest handling, to brace rural maintainability and to maximize the efficiency. Different Research facility based approaches such as polymerase chain response, gas chromatography For illness identification, spectrometry, thermography, and hyper spectraltechniques have been used. However, these methods are inefficient and time-consuming. In recent years, a server-based and mobile-based strategy for disease identification has been used. The added advantages of various technologies, such as the high resolution camera high performance processing, and broad built-in accessories, result in automatic disease recognition.

To make strides the distinguishing proof rate and exactness of the comes about, cutting edge innovations such as machine learning and profound learning calculations have been utilized. Various studies in the field of machine learning for plant disease.

Pests and Diseases results in the destruction of crops or part of the plant resulting in decreased food production leading to food insecurity. Also, knowledge about the pest management or control and diseases are less in various less developed countries. Toxic pathogens, poor disease control, drastic climate changes are one of the key factors which arises in

dwindled food production. Various modern technologies have emerged to minimize postharvest processing, to fortify agricultural sustainability and to maximize the productivity. Various Laboratories based approaches such as polymerase chain reaction, gas chromatography, mass spectrometry, thermography and hyper spectral techniques have been employed for disease identification. However, these techniques are not cost effective and are high time consuming. In recent times, server based and mobile based approach for disease identification has been employed for disease identification. Several factors of these technologies being high resolution camera, high performance processing and extensive built in accessories are the added advantages resulting in automatic disease recognition. Modern approaches such as machine learning and deep learning algorithm has been employed to increase the recognition rate and the accuracy of the results. Various researches have taken place under the field of machine learning for plant disease detection and diagnosis, such traditional machine learning approach being random forest, artificial neural network, support vector machine (SVM), fuzzy logic, K-means method, Convolutional neural networks etc. Random forests are as a whole, learning method for classification, regression and other tasks that operate by constructing a forest of the decision trees during the training time. Unlike decision trees, Random forets overcome the disadvantage of over fitting of their training data set and it handles both numeric and categorical data. The histogram of oriented gradients (HOG) is an element descriptor utilized as a part of PC vision and image processing for the sake of object detection.

Here we are making utilization of three component descriptors: 1. Hu moments 2. Haralick texture 3. Color Histogram Hu moments is basically used to extract the shape of the leaves. Haralick texture is used to get the texture of the leaves and color Histogram is used to represent the distribution of the colors in an image.

LITERATURE SURVEY

"Classification of Pomegranate Diseases Based on Back Propagation Neural Network" which mainly works on the method of Segment the defected area and color and texture are used as the features. Here they used neural network classifier for the classification. The main advantage is it Converts to L*a*b to extract chromaticity layers of the image and Categorisation is found to be 97.30% accurate.

The main disadvantage is that it is used only for the limited crops. Cotton Leaf Disease Identification using Pattern Recognition Techniques" which Uses snake segmentation, here Hu's moments are used as distinctive attribute. Active contour model used to limit the vitality inside the infection spot, BPNN classifier tackles the numerous class problems. The average classification is found to be 85.52%. Leaf Disease Detection and Grading using Computer Vision Technology &Fuzzy Logic". K-means clustering used to segment the defected area; GLCM is used for the extraction of texture features, Fuzzy logic is used for disease grading. They used artificial neural network (ANN) as a classifier which mainly helps to check the severity of the diseased leaf. Godliver Owomugisha, John A. Quinn, Ernest Mwebaze and James Lwasa, proposed" Automated Vision-Based Diagnosis of Banana Bacterial Wilt Disease and Black Sigatoka Disease "Color histograms are extracted and transformed from RGB to HSV, RGB to L*a*b. Peak components are used to create max tree, five shape attributes are used and area under the curve analysis is used for classification. They used nearest neighbors, Decision tree, random forest, extremely randomized tree, Naïve bayes and SV classifier.

In seven classifiers extremely, randomized trees yield a very high score, provide real time information provide flexibility to the application. uanTian, Chunjiang Zhao, Shenglian Lu and Xinyu Guo," SVM-based Multiple Classifier System for Recognition of Wheat Leaf Diseases," Color features are represented in RGB to HIS, by using GLCM, seven invariant moments are taken as shape parameter. They used SVM classifier which has MCS, used for detecting disease in wheat plant offline.

PROPOSED METHODOLOGY

Certain processes must be taken in order to determine whether the leaf is infected or healthy. Pre-processing, Feature extraction, Classifier Training, and Classification are the steps involved. Pre-processing an image entail reducing the size of all the photos to a uniform size. The next step is to extract features from a pre-processed image, which is done using HOG. HoG [6] is an object detection feature descriptor. The appearance of the object and the shape of the image are characterized by the intensity gradients in this feature descriptor. One of the benefits of HoG feature extraction is that it works with the cells that have been produced. This is unaffected by any alterations. Three feature descriptors were used in this example. Moments of Hu: Moments in time that exemplify the fundamental aspects of the use of image pixels aids in the description of items. Hu moments are useful in characterizing the contour of a certain leaf. Only a single channel is used to calculate Hu moments. The Hu moments are determined after converting RGB to Gray scale in the first stage. An array of shape descriptors is returned

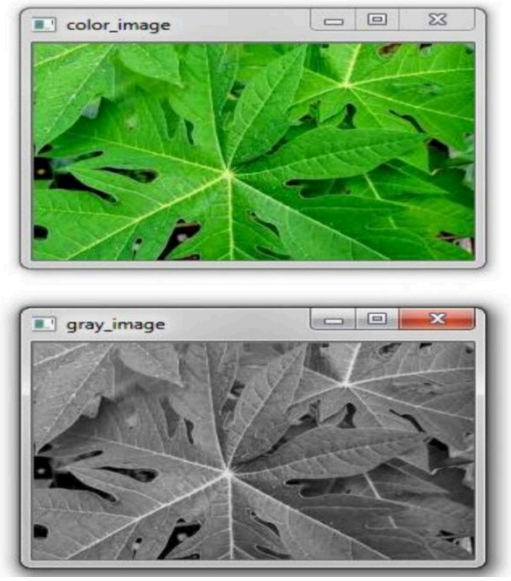


Fig. 1 RGB to Grey Scale conversion of a leaf

The image must be converted to grayscale before Hara lick texture can be calculated. Colour Histogram: A colour histogram shows how the colours in a picture are represented. The RGB colour space is first transformed to HSV colour system.

To find out whether the leaf is diseased or healthy, certain steps must be followed. i.e., Pre-processing, Feature extraction, Training of classifier and Classification. Preprocessing of image, is bringing all the images size to a reduced uniform size. Then comes extracting features of a preprocessed image which is done with the help of HOG. HoG [6] is a feature descriptor used for object detection. In this feature descriptor the appearance of the object and the outline of the image is described by its intensity gradients. One of the advantage of HoG feature extraction is that it operates on the cells created. Any transformations doesn't affect this. Here we made use of three feature descriptors.

Hu moments: Image moments which have the important characteristics of the image pixels helps in describing the objects. Here Hu moments help in describing the outline of a particular leaf. Hu moments are calculated over single channel only. The first step involves converting RGB to Gray scale and then the Hu moments are calculated. This step gives an array of shape descriptors

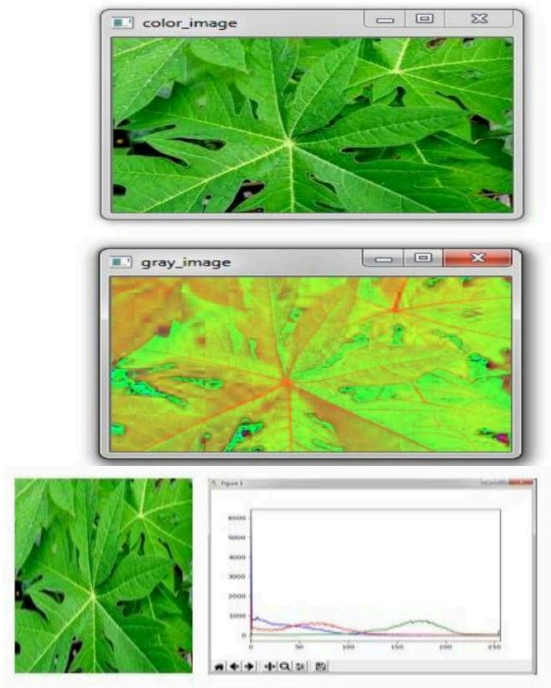
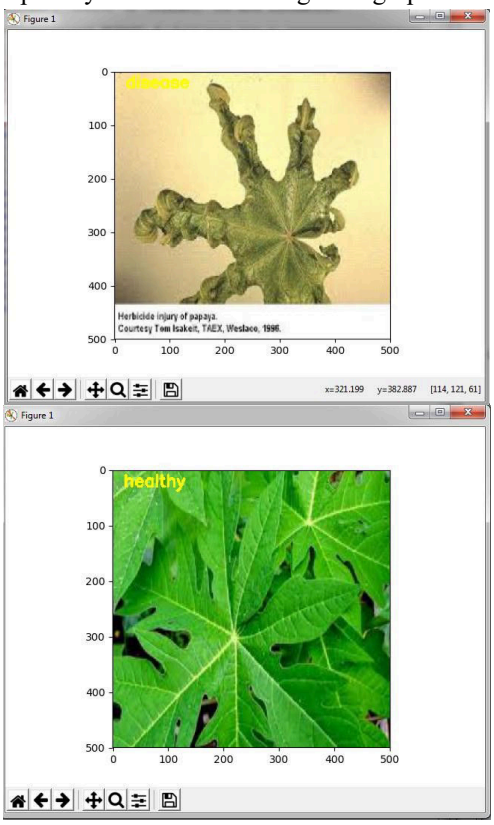


Fig. 2 RGB to HSV conversion of leaf

ALGORITHM DESCRIPTION

The random forests classifier is used to implement the algorithm. They are adaptable and can be used for both classification and regression methods. Random forests outperformed other machine learning approaches such as SVM, Gaussian Nave Bayes, logistic regression, and linear discriminant analysis using fewer picture data sets. "The engineering of our proposed strategy is portrayed within the taking after graph"



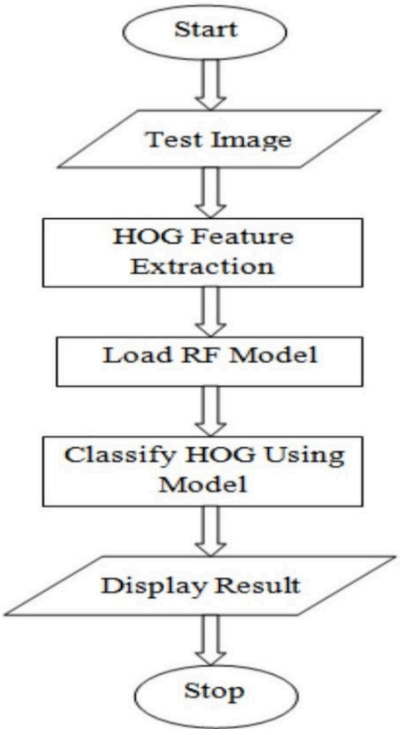


Fig. 3 Flow chart for classification

5. RESULT

First for any image we need to convert RGB image into Gray scale image. "This can be done fair since Hu minutes shape descriptor and Hara lick highlights can be calculated over single channel as it were.". "In this manner, it is fundamental to change over RGB to grey scale some time recently computing Hu minutes and Hara lick highlights.". As depicted in the figure 4. To calculate histogram the picture to begin with must be changed over to HSV (hue,

Various Machine learning models	Accuracy(percent)
Logistic regression	65.33
Support vector machine	40.33
k- nearest neighbor	66.76
CART	64.66
Random Forests	70.14
Naïve Bayes	57.61

Fig. 4 Table for comparison

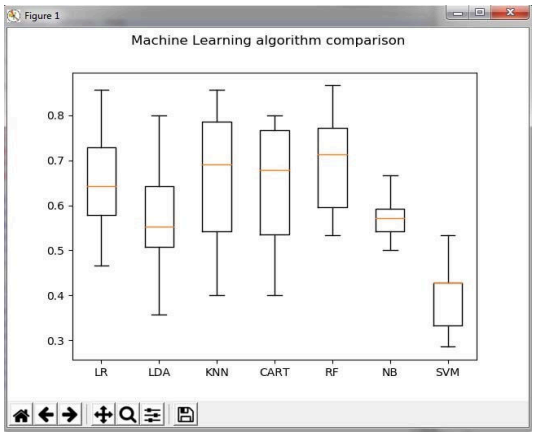


Fig. 5 Final output of the classifier

Finally, the main aim of our project is to detect whether it is diseased or healthy leaf with the help of a Random forest classifier which is as depicted in the “Fig. 5.”

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