Plant Leaf DISEASE Detection Using Image Processing

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ABSTRACT

As we all known that India being an agricultural country it predominantly depends on the growth of agricultural fields. The emerging research field in detecting the leaf disease by the image processing technique and has helped in growth of crops in agriculture field. Nowadays technology is improved a lot and framers are willing to use those technologies. As a result, we analyze the various related attributes such as disease name, remedy solution, soil moisture are considered. Later all the above attributes are analyzed and then trained using various machine learning algorithm such as machine learning algorithm for creating the model. Finally, the model is to be precise and accurate in detecting the disease name of the leaf and also the remedy solution for that disease. Here we are developing a twilo application for the sake of farmers where applications used to send the alert message to farmers. This application is very helpful in increasing their yield

Keywords: Leaf disease detection, Image processing, Machine learning algorithm, Twilio,

I. INTRODUCTION

As we all know that Indian Economy is mainly depend on the Agriculture and about 70% of the Indian population depend on the agriculture. But in recent years due to the various reasons like lack of knowledge about the diseases in leaves and lack of fertilizers. One of the main reasons for the drastic decrease in the production rate is diseases in leaves. So here is the major aim is to introduce the fundamental approach of image processing system in the agricultural process.

As this mainly helps the farmers in getting better in their yield and increasing their revenue Indian farmers also grow Sugarcane, and non-food items like coffee, tea, cotton, rubber, all these crops grow based on strength of the leaves and roots. There are things that lead to disease for the plant leaves, which spoiled the crop and it will affect the farmer this cause the big losses in economy of our country. In rural area, farmers get more difficulties in finding the reason for the decrease's in their yield due to the lack of knowledge and they are unable to take precaution. Leaves being the main part of plants show disease symptoms at the earliest. The crops need to be monitored against disease from the very first stage of the time when they are ready to be harvested Farmers are need fast and efficient techniques to detect all types of diseases of plants that can save their time. These systems can reduce efforts and use of pesticides.

Generally, use can observe the symptoms of disease on leaves, stems, flowers. Here we use leaves for identification of disease affected plants. These are the numbers of diseases affected to plants some of those are bacterial, virus, yellow curl, , changes in soil, climate, temperature also causes the disease in leaves. The challenge is to build the model that gives the accurate pesticide solution for the disease. The main aim of the paper is to improve the crop yield which decrease the disease affected in leaves and recommended suitable pesticide and sent alert message to the farmer. We have mainly focused on the active utilization of Image processing and Machine learning algorithms and its quantification that helps farmer in identifying, comparing the predicted result of the different algorithms and determining the suitable approach is more satisfactory.

II. LITERATURE SURVEY

Gittaly Dhingra [10] describes application of agriculture using computer vision technology to recognize and classify disease of plant leaf. The paper deals with correlation between disease symptoms and impact on product yield. It also deals with increase the number of training data and testing to accomplish better accuracy.

Shitala Prasad [11] proposed mobile based client-server design for leaf disease detection using Gabor wavelet transom (GWT). In this system first carried out color conversion from the device dependent to colour space model. Mobile pre-processing can be done after acquiring leaf and converting color space. For human vision system Human perception*a*b colour space was designed. Making human perception of lightness more accurate by changing output curves in a & b components. To perform analysis of leaf image, K-means unsupervised algorithm was used. To perform feature extraction Gabor wavelet conversion was used. Author of this paper experimented with homemade dataset. In future proposing efficiently processing of Captured Leaf images in a complex background with different lightening condition.

Shanwen Zhang[12], discussed hybrid clustering method. Leaf segmentation is important in detection of plant diseases which affects reliability of feature extraction. Author used super pixel clustering in which neighboring pixels with some feature with respect to brightness, texture, color are grouped into homogeneous regions. This can reduce complexity of images from more pixels. Author suggest that Expectation maximization (EM) algorithm may be good approach for color image segmentation.

Keyvan Asefpour Vakilian[13] demonstrate that detect two types of fungus in cucumber plant leaves. ANN model with 3 layers were utilized to identify P.cubensis and S.fuliginea infection. Author has taken real time germinated seeds of cucumber on moist paper which is at degree c for 3 days. Further research is needed to increase the ability of farmers assisted robots in real time detection of fungal and viral disease.

Mohammed Brahimi [14] proposed deep learning method to create classifier for detection of disease. Also proposed the occlusion concept to localize the disease regions & help to understand the disease. Author uses datasets which is published in good fellow, Bengio etc, further research is need to reduce the computation & size of deep models for small machine like mobiles.

H.Al-Hiary[15],proposed detection of plant diseases using automation and classify its diseases. Here pixels are grouped on set of feature into total k classes. When leaf has more than one disease then there is more clusters that cause disease. ANN is used to detection and classification of disease. Further research need to increase the accuracy ofdetection.

Yuanyuan Shao[16] discussed multi feature and genetic algorithm BP neural network. Otsu method were used for segmentation & extraction. Practically in real time tobacco disease can be identified through mobile client and server can make a diagnosis on diseases which were uploaded by user. Here Otsu method was used to extract spot disease. Genetic algorithm can reduce training times and improve recognition accuracy. Further research needs other method describe tobacco disease feature and to improve accuracy.

Vijai Singh[17] presented an algorithm for segmentation of plant leaf image. Author proposed image recognition and segmentation process. First, devices were used to capture image of different types and applied different segmentation method to process image. The author taken image of size m*n & every pixel has R,G,B components.

Color co-occurrence method was used for feature extraction. Above experiments are done in MATLAB. Author demonstrates the results only for beans, leaf, lemon and banana leaf. Further research is needed for all types of leaves.

Shanwen Zhang[18] proposed method for recognizing disease for cucumber leaves. Due to irregular shapes, complexity, shadows existing classifiers are not suitable for detection. From image of leaf, Author proposed a method using combined shape and color features. Author performed region.

segmentation from diseased image using K-means clustering algorithm. First system can collect images from data set. Image are converting from Red, Green, Blue space to Luminance*a*b* color model. Then classify color using kmeans clustering. Here each image is processed using techniques of smoothing, enhancing, denoising, alignment and segmented by k-means clustering techniques.

Amar Kumar Dey[19] used image processing algorithm for betel vine to detect leaf rot disease. They proposed vision based method to detect and observe peripheral disease features. Based on color feature of rotted leaf area disease are identifying. Author chooses Bangla desi varieties of betel vine. They used cannon scanner with 300 PPI resolutions for detection. A leaf disease severity can be identified as leaf total area calculation and percentage diseased area. Author used Otsu thresholding method for segmenting leaf rot diseases.

Srdjan Sladojevic [20] used deep convolution network approach for leaf disease recognition using classification method. Researcher proves that climate change can alter stage and pathogen development rate. Trained deep neural network to differentiate surrounding of leaves. To highlight region of interest all images are cropped manually by making square around the leaves. Author applied augmented process to increase dataset. Augmentation includes rotations, transformation and affine transformation. This paper presented caffe as a deep CNN framework.

Manisha Bhangea [21] designed modern techniques which is web based tool for identifying disease from the image. In this techniques, first uploaded image in the web portal is resized and extracted image feature such as color, morphology etc. Author uses K-means for clustering and for classification SVM was used. In this paper farmers need to upload the plant leaf for disease detection in real time. Proposed framework that maintains two image databases for disease detection. One for training and other for testing. Author used erosion morphology techniques for description and representation of region shape. Author categorizes three stages for infection such as infected first stage, second stage, and Third stage. The paper presented for bacterial blight disease in pomegranate fruit. Further research is improving system performance to detect disease in large dataset.

Usama Mokhtar[22] presented Gabor wavelet transform techniques to extract tomato leaf feature. They used SVM to detect leaf diseases. For experiments considering real sample images of tomato leaf and author observing two types of disease in tomato leaves including early blight and powdery mildew. In preprocessing phase images are resized to 512*512 resolutions to deduce the computational time. Applied background subtraction method to remove background of image. In the classification, using of kernel function the SVM was trained and tested.

III. PROPOSED METHODOLOGY

Digital camera is used to take images of leaves of different types, and then those are used to identify the affected area in leaves. Then different types of image processing techniques are applying on them, to process those images, to get different and useful features needed for the purpose of analyzing.

1) Image acquisition is the very first step that requires capturing of the image with the help of the digital camera

2) Preprocessing of input to improve the quality of image and to remove the undesired from the image.

3) Mostly green colored pixels, in the step, are masked, In, this we computed a threshold value that is used for these pixels. Then in the following way mostly green pixels are masked.

4) In the infected clusters, inside the boundaries, remove the masked cells.

5) Obtain the useful segments to classify the leaf diseases.

IV OBJECTIVES

1) Image processing and Machine learning are used to identify the plant leaf disease.

2) Training and testing are done

3) Leaf disease can be detected

4) Alerts are sent to farmers through SMS.

V BLOCK DIAGRAM

The Fig. 1 shown below

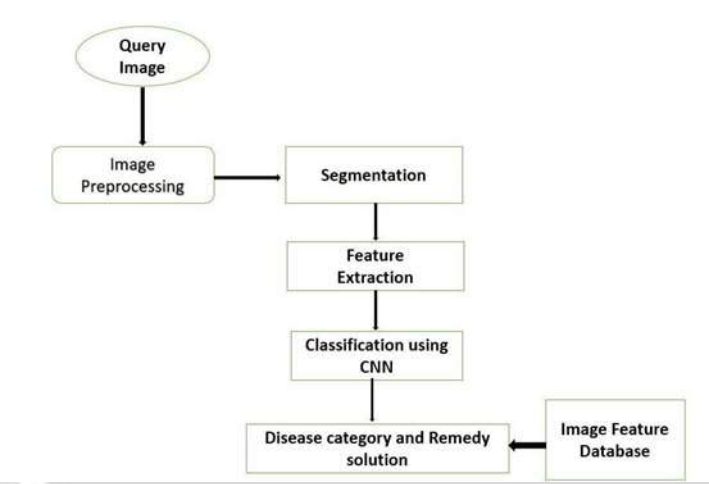

Fig-1: Block Diagram of the model

a) Query Image:

Extract one image that image will be display.

b) Image Pre-Processing:

In general the raw data may be incomplete, inconsistence or empty. Thus pre-processing includes data cleaning, integration, transformation and reduction. Data anomalies are not taken into account for future classification and prediction calculation[4]. Here all the string values get converted to the integer values. So, that the data is easily understandable by machine. In this pre-processing, we use label encoder for converting all the labels like state name, district name, season and crop name to integer values.

Then these data will be moved further and are divided into the train and the test data. For this splitting of the data into train and test we need to import train_test_split through the scikit- learn this will help the pre-processed data to split into train and test according to the given weights.

c) Image Segmentation

Partition or sub dividing the image into its constituents' parts or object ts.A good segmentation procedure helps to successful identification of object in an image.

d) Feature extraction

Extracting the piece of information about the content of the image features maybe specific structures in the image such as points, edges, or objects.

e) Classification using CNN

CNN is applied to analyze the visual imaginary the trained set data can compared with this image features gives the result. If its match to unhealthy then result is unhealthy and also gives remedies. If its match to healthy leaf result will display healthy.

VI DATA FLOW DIAGRAM

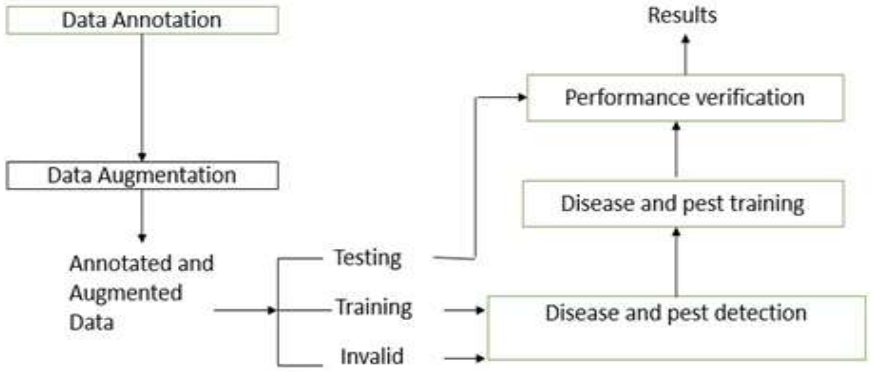

Fig-2: Data Flow Diagram

Testing

The testing is a dataset utilized to provide an impartial final design fit evaluation on the training set of data. In this stage, we use the groups that were trained in the previous step that was trained in CNN, and the features were extracted by learning the network when the data set passes from plant leaf diseases on this network, we used 70% of the data for testing.

Training

Training a network is a procedure of obtaining kernels in convolution layers and weights in fully connected layers that reduce differences on a training dataset between output predictions and specified ground truth labels. In our work, we used 70% of the data for training, through this stage so that the network that has been built learns by extracting features from plant leaf disease images in order to learn from these features for each image to be distinguished on its basis.There two different conditions for training and testing. One is under the lab conditions, which means that the model is tested with the images from the same dataset from which it is used for both training

and testing. The final accuracy obtained through this algorithm other condition is that field condition; this means that our model has tested with the images taken from the real world conditions (land). Since the lighting conditions and background properties of the images are totally different when we take samples from the real field, there is a chance that our model to produce a very low accuracy, when comparing to the accuracy values acquired during the lab conditions. So, to overcome this impact, we had an idea of having a mixed variety of images during the training phase.

VII RESULT ANALYSIS

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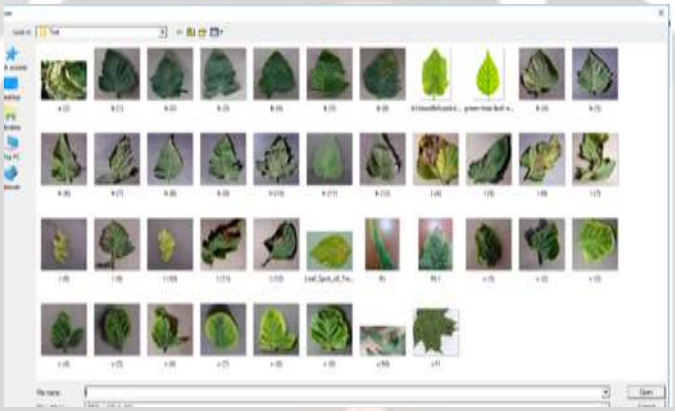

Fig-3: Collection of Leaves Considered In The Dataset

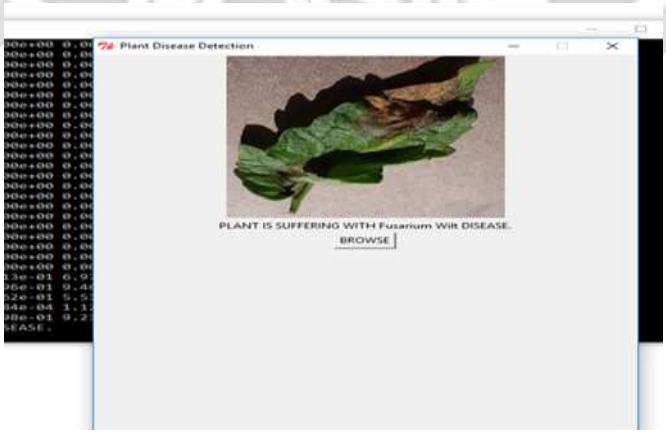

Fig-4: Disease Name Identification

VIII CONCLUSION

Thus, an application built for the identification of disease affected plants and healthy plants is done and this proposed work is focuses on the accuracy values during the real field conditions, and this work is implemented by having several plant disease images. Overall this work is implemented from scratch and produces a decent accuracy. The future work is to increase the number of images present in the predefined database and to modify the architecture in accordance with the dataset for achieving better accuracy.

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