Leaf Disease Detection and Pesticide Spraying

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Abstract **-** Plant disease diagnosis is an art as well as science. The diagnostic process (i.e. recognition of symptoms and signs), is inherently visual and requires intuitive judgement as well as the use of scientific methods. India is a cultivated country and about 70% of the population depends on agriculture. Disease on plants leads to the significant reduction in both the quality and quantity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants. Monitoring of disease on plants plays an important role in successful cultivation of crops in the farm. In the early days, the monitoring and analysis of plant diseases were done manually by the experts in that field. This requires a large amount of work and also requires excessive processing time. The image processing techniques can be used in plant disease detection. The detection and classification of leaf disease with fertilizers specifications accurately is the key to prevent agricultural loss. Different plant leaves bear different diseases. There is a list of methods and classifiers to detect plant leaf disease with fertilizers specifications. The considered methods for plant leaf disease with fertilizers specification detection with fertilizers specification are explained.

Index Terms – Leaf Images, Grayscale conversion, feature extraction, Disease detection, Fertilizer specification.

I. INTRODUCTION

India is a cultivated country and about 80% of the population depends upon agriculture. Farmers have a large range of differences for selecting various acceptable crops and finding the suitable herbicides and pesticides for plants. Disease on plants leads to the convincing reduction in both the quality and productivity of agricultural products. The studies of plant disease refer to the studies of visually observable patterns on the plants. Then we use K Means Algorithm to identify all possible subsets. Support Vector Machines (SVM) classification approaches are proposed. Health of plant leaves and disease on plant leaves plays an important role in successful cultivation of crops in the farm. In the early Days, analysis of plant diseases was done manually by the expert in that field only. This requires a huge amount of work and also requires excessive processing time. The image processing techniques can be used. In most of the cases disease symptoms are seen on the leaves, stem and fruit. Mostly image processing includes regarding images as signals while applying signal processing methods, it is among very quickly growing technologies today, its applications in various aspects of a business. Image Processing is a core research area within engineering and computer science regulation too. Image processing basically contains the following three steps:

a) Importing the image with an ocular scanner or by digital photography.

b) Analysing and handling the image which includes data condensation and image enhancement and spotting patterns that are not to human eyes like satellite photographs.

c) Output is the last stage in which result can be changed image or report that is based on image analysis

II. METHODOLOGY

The proposed method starts with the collection of leaf images and send it to the IP (Internet protocol) server through File transfer protocol (FTP) to the python engine. Then it acquires the image and pre-process it, after pre-processing the image it will convert into grayscale image and grayscale image is converted into Binary data which is followed by the segmentation of image using k-means clustering method, then the portion of leaf image will be detected using ROI(Region of interest),after this features will be extracted from the leaf image i.e.(colour, shape,s ize, pixel ,gradient, texture etc) and finally the classification of disease using SVM algorithm and performing automatic image threshold using “OTSU” method and therefore the disease is detected. The detected disease is then passed to NodeMCU which it activates the motor (DC pump) for spraying of the pesticides.

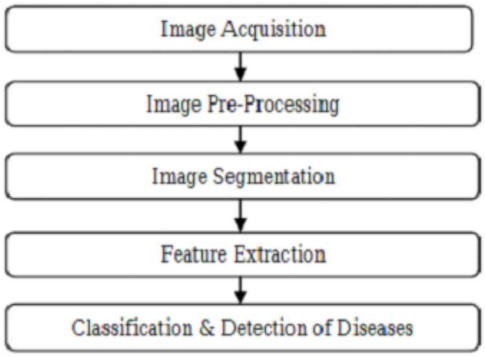


Fig 1. Implementation Methodology

Step1: Acquisition of Image

In this conceptual approach, this stage indicates the input. The images are retrieved from different sources. The leaf image is extracted and gets saved in the database for further process. The real time images are fed to the system. For further analysis, proper visibility and easy analysis of images, white background is created because most of leaves colour varies from red to green for exact segmentation.

Step2: Image Pre-processing

● Image pre-processing is required to resize captured image from high resolution to low resolution. The image resizing can be done through the process of interpolation.

● In this stage the noise removal and data normalization are used as pre-processing model in which all features are normalized from vector to unit space.

● For filtering the noise in the image, we use a Gaussian filter.

● Then we place the image for the scaling process. Captured input image is being converted into a grayscale image using colour conversion by the equation

● Image = 0.3R + 0.59G + 0.11B

● The captured image placed in white background results in large differences between grey values of object and background.

Step3: Image Analysis

In this step, segmentation of images is done to find the region of interest. Disease Segmentation is an important step to make something that is more meaningful and easier to analyse. The goal of segmentation is to simplify or change the representation of an image into multiple segments for further analysis. In segmentation, the technique used is region-based segmentation which separates healthy and diseased regions of the plant leaf by using the colour of the leaf. The features extracted from the image include colour, texture and shape. Colour feature contains information about boundary, spot and broken area. Likewise, the shape attribute includes percentage of lesion and its type. Texture feature contains uniformity, contrast, probability, variance and correlation. With the identified features, the database is divided into two sets of images for training and testing.

Step4: Feature Extraction

Feature Extraction is one of the most interesting steps of image processing to reduce the efficient part of an image or dimensionality reduction of interesting parts of an image as a compact feature vector. Feature reduction representation is useful when the image size is large and required to rapidly complete the tasks such as image matching and retrieval.

Other common feature extraction techniques include:

◆ Histogram of oriented gradients (HOG)

◆ Speeded-up robust features (SURF)

◆ Local binary patterns (LBP)

◆ Haar wavelets

◆ Colour histograms

Step5: Comparison

Training images are used to build deep convolutional neural net-work to extract the macro information about the image. The structure of convolutional neural network model contains convolutional layer, pooling layer, activation function and SoftMax layer is used to compare and detect the disease in the plant.

Step6: Disease Identification in Leaf

Each leaf is detected by many different types of plant pathogens, causing different diseases and some of them are significant and occur most widely around the world. Blast, Anthracnose, Bacterial Leaf Blight, Brown spot, Sheath Blight and False smut are main diseases found in rice, whereas the important diseases of wheat are Rust, Loose smut, Karnal bunt and spot blotch

K Means

K Means algorithm is an iterative algorithm that tries to partition the dataset into K is pre-defined distinct non-overlapping subgroups (clusters) where each data point belongs to only one group. It tries to make the inter-cluster data points as similar as possible while also keeping the clusters as different (far) as possible. It assigns data points to a cluster such that the sum of the squared distance between the data points and the cluster's centroid (arithmetic mean of all the data points that belong to that cluster) is at the minimum. The less variation we have within clusters, the more homogeneous (similar) the data points are within the same cluster.

K means is an iterative clustering algorithm that aims to find local maxima in each iteration. This algorithm works in these 5 steps:

● Specify the desired number of clusters K

● Randomly assign each data point to a cluster

- Compute cluster centroids
- Re-assign each point to the closest cluster centroid
- Re-compute cluster centroids

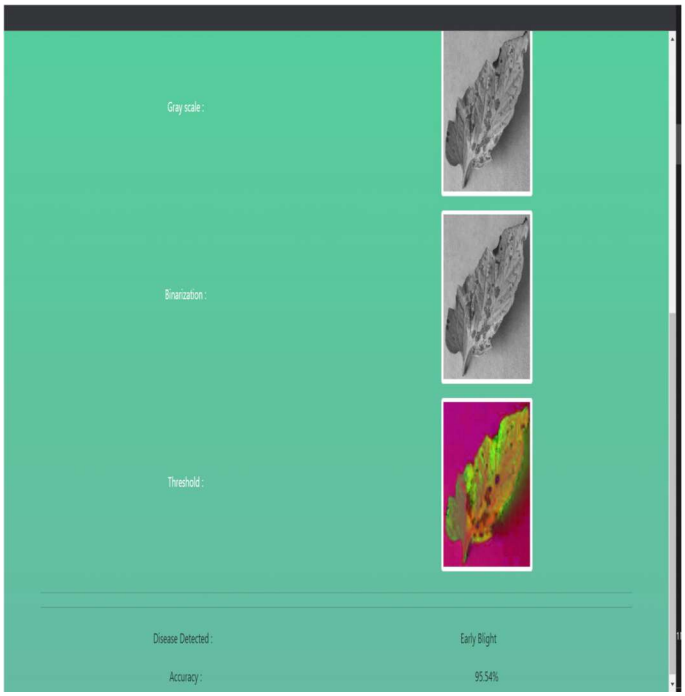
Support Vector machine (SVM)

The method uses many colour representations throughout its execution. The separation between leaves and background is performed by an MLP neural network, that is including a colour library designed a priori by suggests that of an unsupervised self-organizing map(SOM).the colours gift on the leaves are then clustered by suggests that of an unsupervised and undisciplined self-organizing map .A genetic algorithmic program determines the quantity of clusters to be adopted in every case. A Support Vector Machine separates morbid and healthy regions.

RESULTS

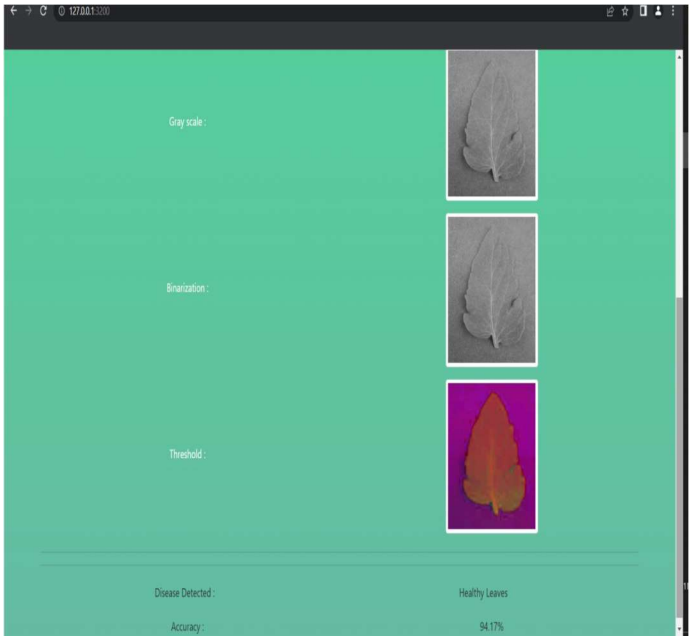
RESULT ANALYSIS

1. EARLY BLIGHT:



2. LATE BLIGHT

3. HEALTHY LEAF



development of hybrid algorithms & neural networks in order to increase the recognition rate of the final classification process. Further needed to compute the amount of disease present on the leaf.

Web-Interface Enhancements:

The whole project can be put up on the internet and users can simply sit at home and use the system to detect the disease and spray the required disinfectant. The IoT enhancements can also be implemented using the web interface and just by clicking on the button the user will be able to spray the medicines.

The interface will connect with the internet and then to the database.

CONCLUSION

The work prevails over an automatic pesticides management mechanism that reduces human intervention within the cultivation. It prevents the adverse effects of over usage of pesticides that results in reduction in crop cultivation. This successfully applied to attain great results with most varieties of crops. The goal of this project is implementation of controlled irrigation techniques using some principles. In the future, alternative image processing techniques may be used to modify the detection and extraction more efficiently and accurately.

FUTURE ENHANCEMENT

This work provides the survey of different techniques for leaf disease with fertilizers specification detection. The main characteristics of disease detection are speed and accuracy. Hence there is working on development of automatic, efficient, fast and accurate which is used for detection of disease on unhealthy leaves. Work can be extended for

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