AUTOMATIC DETECTION OF PLANT LEAF DISEASE USING K-MEANS CLUSTERING AND SEGMENTATION

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Abstract

At the point when plants are influenced by the ailments, it might influences the creation and additionally the economy of the nation. With a specific end goal to discover which sickness influence the plants, the agriculturist need to contact the master for the arrangement. The master give the proposals which depends on its learning and data though once in a while seeking the master recommendation is tedious, costly and might be not exact. Thusly to determine this issue, Image preparing systems gives the precise and quick arrangement. In this paper we propose a novel mechanism to detect plant leaf disease in combination of K-means clustering and Neural Network Algorithm. The proposed method effectively detect and classify the diseased plant leaves.

Keywords— *Feature Extraction, Dicot Plant Disease, Monocot Plant Disease, Pre-Processing, Segmentation, Classifier.*

I. INTRODUCTION

Plant disease is one of the essential issue which causes significant diminishment in the quality, development and amount of plant generation. Location and classification of plant diseases are basic undertaking to upgrade plant efficiency and financial development. Location and classification are one of the extremely intriguing points and also a great deal more talked about in building and IT fields.

There are assortment of strategies include which help to distinguish the plant disease, for example, thresholding, watershed, locale developing, grouping and so on. Henceforth, to recognize plant disease the picture ought to experience a few stages like pre-preparing, division, feature extraction and classification forms. The pre-preparing is an advancement procedure of picture information to stifle undesirable contortion or enhance some picture features imperative for additionally handling.

The division procedure is to subdivide a picture into its significant areas and it is essential process through which picture features are separated. There are assortment of features of a picture, for example, shape, profundity, movement, dim level, shading, texture, and so forth. Classification prepare is utilized to sort the given info information into number of classes and gatherings. It orders the information in view of chose features.

II. DISEASE CONCEPTS

A. What Is a Disease?

There are numerous approaches to characterize what a plant diseases is. In any case, basically, plant diseases include significant changes inside the host that cause an interruption of typical plant work. A good working meaning of a healthy plant is one that can do its physiological capacities to the best of its hereditary capacity.

B. Symptoms of Diseases

Manifestations are the obvious responses of a plant to a disease and may recommend a causal specialist. A testing of ailment side effects may incorporate wilting, putrefaction, unusual tinge, defoliation, natural product drop, anomalous cell development, or hindering of the tainted plant. In any case, it is vital to recall that distinctive illness operators can bring about comparable side effects on a similar host. A similarly critical indicate recall is that creepy crawly sustaining can likewise bring about ailment like manifestations on plants [5].

C. Indications of Diseases

Signs are the unmistakable parts of the pathogen or its items seen on the host that can be utilized to

distinguish the pathogen. Cases of regular illness signs include: the white covering of mycelium noticeable on fine mold tainted leaves, mushroom development on a tree appendage, beads of bacterial overflow running down an organic product tree twig, nematode sores on plant roots, or dull contagious fruiting bodies obvious in leaf injuries [6].

D. Factors Affecting Disease Occurrence

Diseases advancement is reliant upon three conditions: a susceptible have plant, a favorable domain, and a reasonable pathogen. Every one of the three of these elements must be available for ailment to happen.

III. BASIC TYPES OF PLANT FAMILY

A. Monocot Family Plant

Disease identification be determines on the basis of their type of plant family. There are mostly of two types of plant Monocot family plant and Dicot family plant. The Monocot family plant has various characteristics such as one seed leaf, leaf veins, seed leaf are straight and parallel, which are in absence of wood.

B. Dicot Family Plant:

Dicot family plant has significance such as two seed leaf, nested leaf veins and complex structured, woody as well as woodless. The examples of Dicot family plants are cotton, coffee, potatoes, tomatoes, beans, honeysuckle, roses, peppers, strawberry, etc. Cotton is selected to make textile products and yarn products in India. Different precautions and pesticides are available to control the cotton Diseases. The cotton plant diseases are mention in detail in the following section.

IV. LITERATURE SURVEY

Aakanksha Rastogi [1], focused in the present scenario it is very important to have an established approach for grading the defects on the plant leaves automatically. For this a system based on Machine Vision Technology and Artificial Neural Network (ANN) is of great use for automatically detecting the leaf plant as well as for leaf disease detection and grading.

These systems are going to be very helpful for agriculturist since it is efficient than the manual method. The proposed system uses Euclidean distance technique and K means clustering technique for segmentation of image to segment the leaf area, disease area and background area of the input leaf image in order to calculate the percentage infection of the disease in the leaf and to grade them into various classes.

Md. Nazrul Islam [2], focused on an experimental result indicates that the proposed approach is valuable, can significantly evaluate two classifiers GA and PNN to support an accurate detection of leaf diseases in a little computational effort where successful classification rate of GA is more than PNN.

Garima Tripathi [3], focused on an automatic image processing and neural network based approach has been studied and proposed for plant leaf disease detection. The color co-occurrence method has been applied for extracting set of color and texture features specific to the type of leaf diseases. The extracted set of features has been used as input to train a feed forward back propagation neural network and subsequent detection of leaf diseases. Based on proposed approach, an efficient, simple, fully automatic, cheap, fast and reliable system can be developed for detection and classification of plant diseases.

S. Arivazhagan [4], focused on an application of texture analysis in detecting and classifying the plant leaf diseases has been explained in this paper. Thus the proposed algorithm was tested on ten species of plants namely banana, beans, jackfruit, lemon, mango, potato, tomato, and sapota. The diseases specific to those plants were taken for our approach. The experimental results indicate the proposed approach can recognize and classify the leaf diseases with a little computational effort. By this method, the plant diseases can be identified at the initial stage itself and the pest control tools can be used to solve pest problems while minimizing risks to people and the environment.

K. Muthukannan [5], focused on the neural network algorithm is proposed for diseased plant leaf classification. The neural network techniques such as feed forward neural network (FFNN), learning vector quantization (LVQ) and radial basis function network (RBF) were tested for two different diseased leaf image classifications such as bean and bitter gourd leaves. The performance is measured using classification parameters such as Accuracy, Precision, Recall ratio and F measure.

With these four parameters the performance is analyzed and based on the analysis the FFNN classification approach provides better result.

V. METHODOOGY

This section discuss about the proposed work flow in detail. The fig. 8. Shows the proposed system architecture.

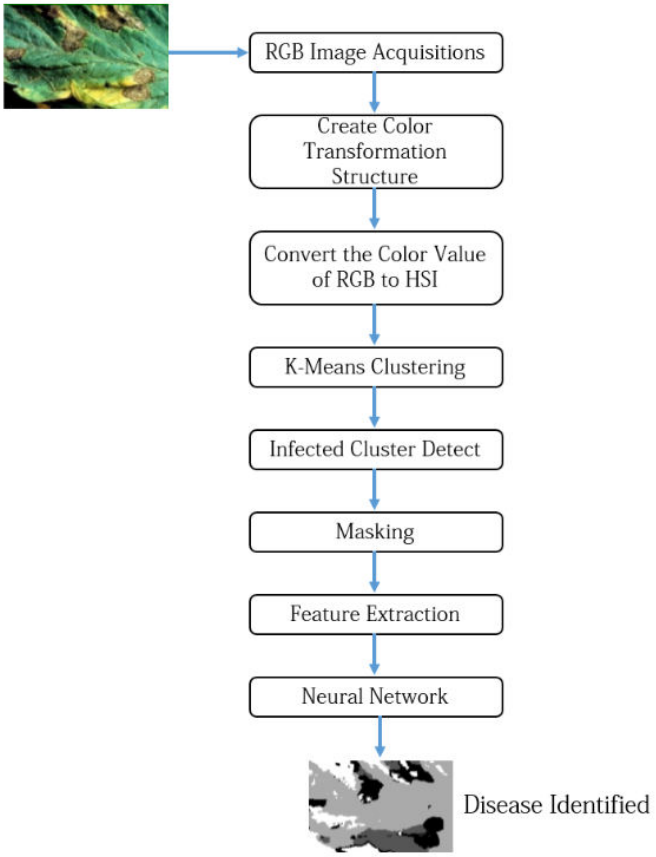

Fig. 1. Proposed workflow

A. *RGB Image Acquisition*

The image is taken as input. The image of various plant diseases are considered.

B. *Trasnformation*

The leaves image are transformed into HIS color space. The conversion can be done without any loss in the quality of image. It is transformed to HIS because it is based on human perception and system can effectively reads all the pixels in HSI space.

C. *Masking*

In this step the green pixels are extracted to detect diseases. If the green component is less in the leaves than the RGB component reset the pixels value to zero.

D. *K-Means Clustering*

The leaves are partitioned into 4 different clusters. It is useful when number of classes are known prior. The k-means extract and places the pixel information in the clusters. One of the cluster contains the infected leaf.

Algorithm: K-Means Clustering

Input: Leave Images

Output: 4 Cluster, with one as infected cluster

- Let features of image is denoted as X = {x1, x2… xn} are data And among these some of them are centroids.
- Initialize cluster k=4
- Randomly select 'c' centers
- Calculate the center using Euclidean distance formula for each data Point x1, x2 … and so on.
- $Euclidean\ Distance = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2}$
- Assign the data points who are nearer to the centers.
- Calculate the new centers.
- $New\ Centers\ (x, y) = \frac{x_1 - y_1}{2}, \frac{x_2 - y_2}{2}$
- Repeat the step until no centroid positions are changes. Otherwise proceed in calculation on Euclidean distance.

Fig.2. K-Means Algorithm

E. *Neural Network Recognization*

The neural network is used to find the infected leave and its type. ANN model can effectively process based on input parameters and produce output.

VI. RESULTS

In this section we present the results obtained from executing all the algorithms. To evaluate and simulate proposed mechanism MATLAB is used.

Step 01: Input Dataset

Fig. 3. Input Dataset

Step 02: Color Transformation

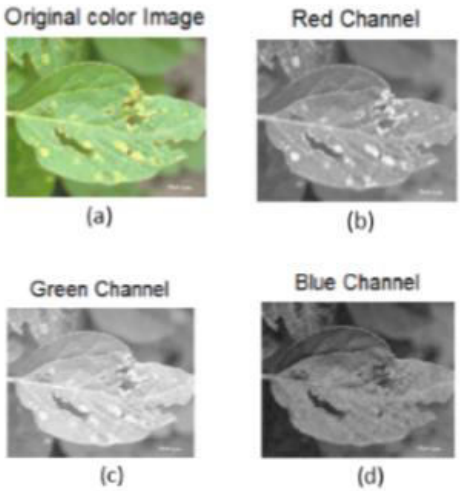

Fig. 4. RGB Color Image

The fig. 4. Shows different components of RGB space. The fig. 3. Is the input image. The input image is transformed to extract the RGB component information.

Fig. 5. Shows the transformation of RGB space to HIS space. Fig. 5 d, e, and f shows the Hue, Saturation and Intensities of Leaf.

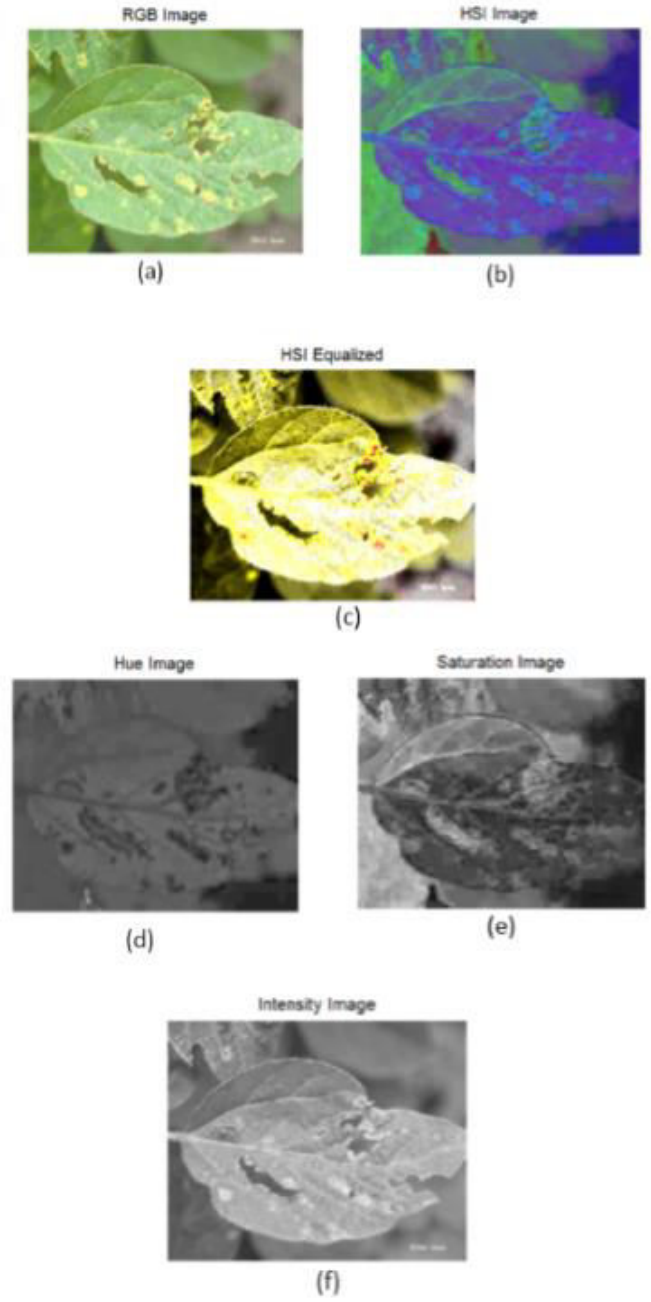

Fig. 5. RGB color space to HIS color space transformation (a) RGB Image (b) HSI Image (c) HIS Equalized Image (d) (e) (f) H, S and I output.

Step 03: K-Means Clustering

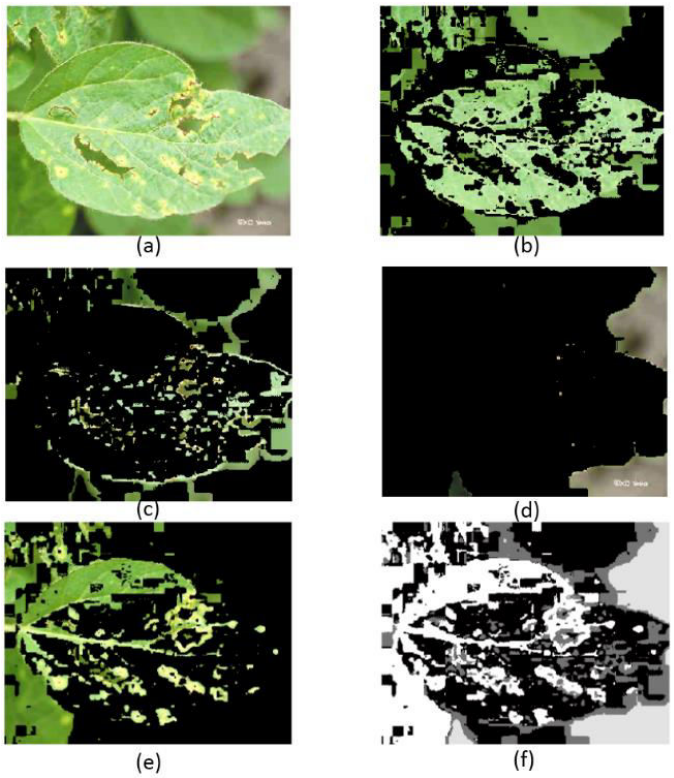

Fig. 6. K-Means Clustering Results

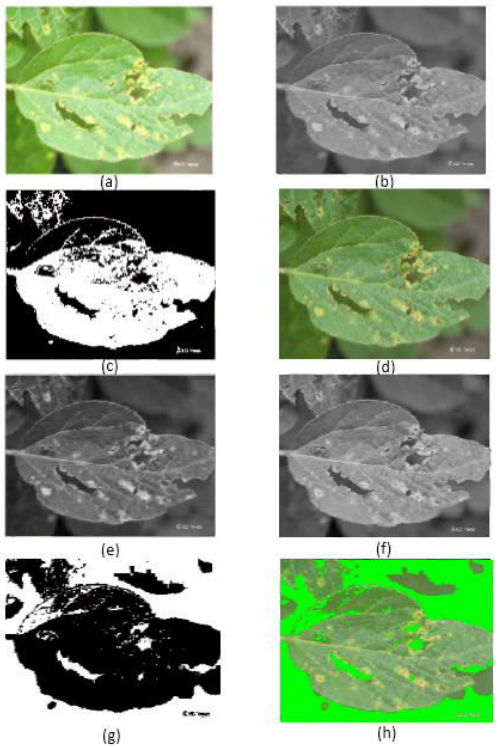

Fig. 7. Green Pixel Masking

Step 04: Detection of Infected Leaf

Fig. 8. Shows Detected Infected Leaf

VII.CONCLUSION

The techniques which are basically used for the detection and classification of leaf disease in plants which are K means clustering for segmentation, artificial neural network, Probabilistic Neural network and GLCM and SGLDM for texture analysis. There are some of the challenges appear in these techniques are, it require huge dataset for classification and diseased symptoms are varies.

The proposed method can effectively classify the infected plant with higher accuracy. The proposed method sues k-means clustering, Segmentation and Neural network algorithm.

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