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Detection and Identification of Rice Leaf Diseases using Multiclass SVM

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Abstract - *In India the economic, political and social stability rely directly yet as indirectly on the annual production of rice. 37% of the rice illness is because of disease as per the review and Analysis of IRRI (International Rice Research Institute), during this consequence, the farmer watch out of crop on-time with completely opposite treatments against disease. The diseases detection and identification in massive field through automatic technique is the helpful because it reduces the work of peoples or farmers, conjointly time and value for observation and analysis of un-wellness symptoms. This report contains approach for identification detection and of rice leaf diseases by multiclass SVM. The diseases classification is done by SVM classifier and therefore the detection accuracy is improved by optimizing the info exploitation. In this proposed system, we are using image processing techniques to classify diseases & quickly diagnosis can be carried out as per disease. This approach will enhance productivity of crops. It includes several steps viz. image acquisition, image preprocessing, segmentation, features extraction.*

Key Words: Disease detection, Image processing, SVM Classifier.

1. INTRODUCTION

India is that the country wherever the most supply of financial gain is obtaining from agriculture. Farmers grow a spread of crops supported their demand. Since the plants suffer from the illness, the assembly of crop decreases thanks to infections caused by many styles of diseases on its leaf, fruit, and stem. Leaf diseases square measure principally caused by microorganism, fungi, virus etc. Diseases square measure typically tough to manage. Designation of the illness ought to be done accurately and correct actions ought to be taken at the acceptable time. Image process is that the trending technique in classification detection and of plant's leaves disease. Detection of these diseases requires people to expert in addition to a set of equipment and it is expensive in terms of time and money Therefore, computer based system which help to detection the diseases of plants is very helpful for farmers As well as to specialists in the field of plant protection. The proposed plant disease detection system consists of two phases, Image Processing and SVM Classifier in a series of Image processing that include pre-processing techniques such cropping, resizing, fuzzy histogram equalization, feature extraction where set of color and texture feature and used to great the knowledge base that used as training data for support vector machine classifier. We use the classifier trained using the knowledge base for detection and diagnosis of plant leaf diseases. To create the knowledge base we used sample images and divided it by 80% training and 20% testing. Lastly, classification technique is applied in detection the sort of plant disease. [1].

2. LITERATURE REVIEW

In "Detection of unhealthy region of plant leaves using Image Processing and Genetic Algorithm" paper focused on different types of technique classification and identification of green foliage of plant described by author Savita N. Ghaiwat . For class estimation, they use k-nearest-neighbor technique is the best method. [3].

Author Y. J. Shang and L. Wang describes Scheme in their paper as using KNN classifier for plant disease identification and detection where the developed algorithm can work for five dissimilar varieties of maize diseases. In this paper they have taken the help of various temporal parameters to produce a feature set like tint level (using color moment method), outline and spatial based attributes [4].

From Paddy Plant Leaf Images authors K. Jagan Mohan, M. Balasubramanian, S. Palanivel, described Scale Invariant Feature Transform (SIFT) is used to get features for recognition and detection of Diseases. This feature is taken to recognize the image using SVM and KNN which is more helpful for classification, clustering of the data points [6].

Nonik Noviana kurniawati, Salwani Abdullah authors described their work in "Texture analysis for diagnosing Paddy disease" paper about Image acquisition, converting the RGB to gray scale images, Converting the gray scale to binary images with noise. They were used morphological algorithm to remove the noise [7].

Shenweizheng wcyachun described their work on the system which is proposed that the plant diseases are identified by calculating the ratio of two quantities to be divided of the disease spot and leaf area [8].

3. SYSTEM ARCHITECTURE

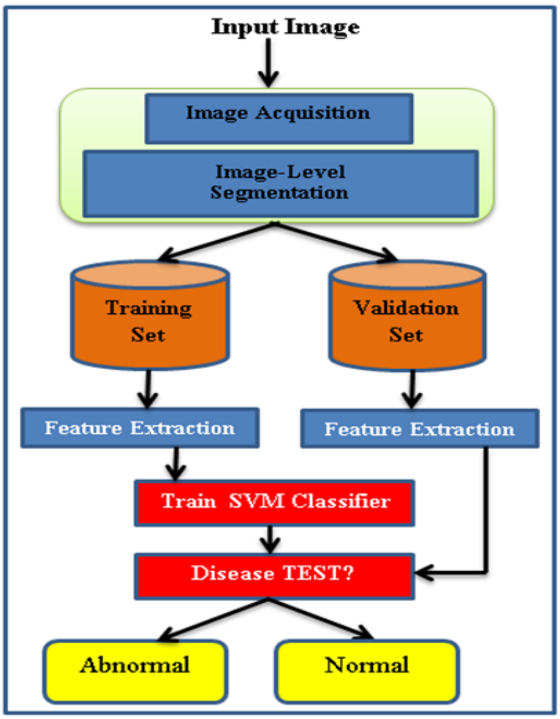

Fig -1: System Overview

The system model includes two parties: the user and the system server. In this module, user is the images of the plant leaf are taken from the system. After Image taking Image Processing is done in first phase as Pre-processing, Image Segmentation, Feature efficient communication, the server system is to seek and utilize Extraction, classification and treatment the image. Here, user uploads image then this analysis image and processing image is done through Image Processing. This proposed system that is plant disease detection system consists of two phases: in the first phase we establish the knowledge base and this by introducing a set of training samples in a series of processing that include first pre-processing of the image techniques such cropping, resizing, fuzzy histogram equalization and next is the extract a set of color and texture feature and used to great the knowledge base that used as training data for SVM (support vector machine) classifier. In the second phase of the work we use the SVM classifier that is trained using the knowledge base for detection and diagnosis of plant leaf diseases. To create the knowledge base we used sample images and divided it by 80% training and 20% testing. We have used each yield three diseases in addition to the proper state of each crop of leaf the accuracy of disease detection is done efficiently. Then system server is check the User upload image is disease oriented or not disease and its classification using SVM that shows the disease with name, affected region on leaf with accuracy result in percentage.

4. MODULES

4.1 Image Processing

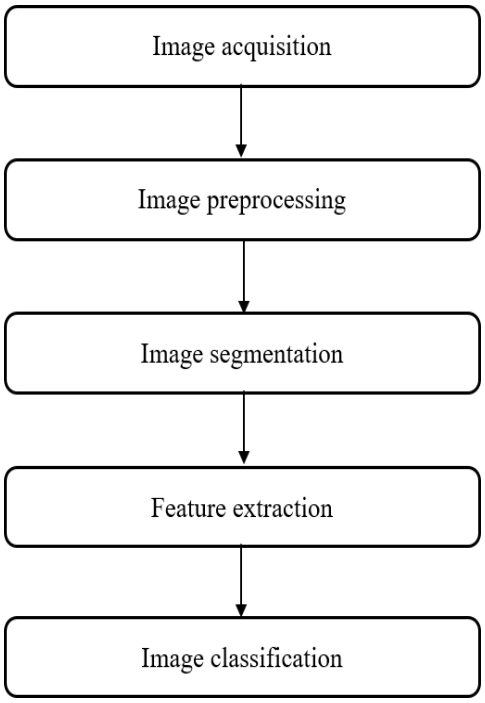

Fig -2: Image Processing

1. Image Acquisition

Image acquisition stage is the first stage of any vision system. Sample images are obtained or collected of the leaves using different mobile cameras with different resolutions, which are used to train the system for processing. These sample images are stored in standard format. All sample images are in Red, Green, and Blue (RGB) color form. Collected images may include the healthy leaf as well as affected leaf by different diseases like powdery mildew, rust, black, dark etc. Various methods of processing can be applied to the image to perform the many different vision tasks required.

2. Pre-processing

An input image has some unwanted noise as well as redundancy present in it. So pre-processing uses technique for noise removal, contrast enhancement and illumination equalization. To remove the background noise as well as to suppress the undesired distortion, this is present in it. These types of variations are occurred due to many reasons such as camera settings, variation in light etc. To overcome such kind of problems, input RGB image is converted to gray scale intensity image. Also it converts RGB to gray scale values by forming a weighted sum of the R, G and B.

3. Segmentation

The main goal of the segmentation is to be extract meaningful and useful information from the image with respect to certain feature. In present work histogram based method and thresholding is used for segmenting an image as per category.

In this stage, a histogram is computed from all of the pixels in the image, Color or intensity can be used by measure. To determine the most frequent color for pixel location the histogram can also be applied on an every pixel basis where the resulting information is used. In this technique, from a gray scale image, thresholding can be used to create binary images constant.

4. Feature extraction

Extracting the relevant information from the input image is called process of feature extraction. Also transforming the input data into the set of features data is called feature extraction. There are various types of attributes of leaves images such as color, texture, shape and edges etc. Leaves in context color and texture features are extracted to get good result and accuracy. Using GLCM Features Image analysis techniques are used to extract contrast, correlation and homogeneity of the image.

5. Classification

The classification technique is used for both training and testing process. This is the last stage of the system. The features extracted from training leaves are compared with features extracted from testing leaves. Then the images are classified based on the matched features. So the Support Vector Machine technique is used for classification of leaf disease. SVM is binary classifier which uses hyper plane this hyper plane is a line dividing a plane in two parts where in each class lay in either side. One class containing the target training vector which is labeled as „+1" and other class containing training vector which is labeled as „-1". Using this labeled training vector, SVM finds a hyper plane that will then maximizes the margin of separation of two classes.

4.2 Multiclass SVM (Support Vector Machine)

In machine learning concept, SVM (support-vector machines) is supervised learning method with associated learning algorithms that will help to analyze data used for clustering, classification and regression analysis. In which, given a set of training data set to SVM, each marked as belonging to one or the other of two categories, SVM training algorithm builds a model that assigns new data examples to one category or the other called clustering by category, making it a non-probabilistic binary . An SVM model is a representation of the examples as points in space mapped so that the examples of the separate categories are divided by a clear or more gaps that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on the side of the gap on which they fall in particular section or part [2].

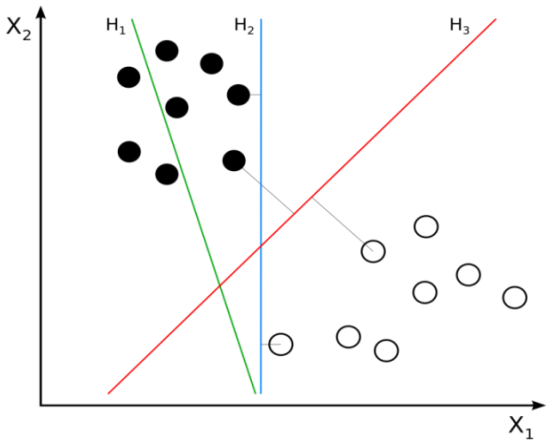

Fig -3: Support Vector Machine

A support vector machine is a type of model used to analyze the data and discover patters of analysis in regression classification. When your data has exactly two classes Support vector machine (SVM) is used. An SVM classifies the data by finding the best hyper plane in data points that separates all data points of one class from the other class. The larger margin between the two classes of data points, the better the model is. A margin must have no points in its interior region. The support vectors are the data points that on the boundary of the margin. SVM is based on mathematical functions and used to model complex, and real world problems. SVM performs well on data sets that have many attributes. SVM Classifies data points into two classes as per their same attributes, color or size and shape of the object or data points. In this developed system we use SVM for segment leaf image to identify affected region of the from non-affected region of the leaf.

5. RESULTS

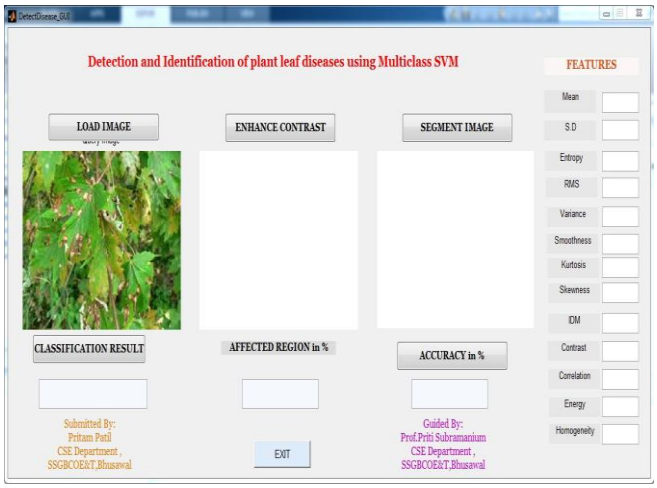

Fig-4: Leaf Image Upload

Above figure shows display after running the project in which we have to upload an image of the plant leaf to identify disease or not in leaf by clicking on load image button from our system. After uploading image it shows the

leaf image contains diseases or not in output. Initially it process the image by Images processing is done where pre-process, resizing, color extracting is done. After processing image it goes to the SVM. SVM segment this image as per same features, color and shape of the image region affected. Enhance contrast box shows the clearer image than real image. In which we can see that the affected region area of leaf image. After that Segment image shows the image which is black and white, the black area is healthy and white dots shows the damage part of the leaf by diseases.

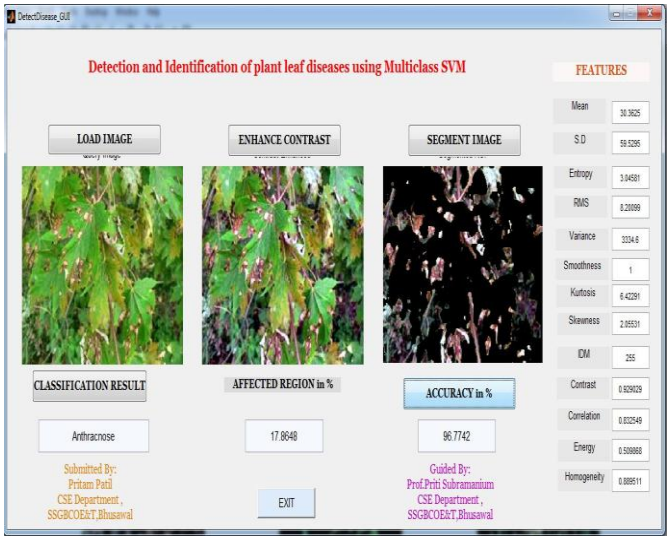

Fig-5: Disease detected with affected region

In this window shows final actual output with following fields:

1) Load Image: At initial stage we have to upload a plant's leaf image from your system.
2) Enhance Contrast: This shows image with the contrast after preprocessing of the image. In this image is having more clear color than real image here.
3) Segment Image: After clicking this button result in box image contain more clear segmentation of the dots or damaged or different part of the leaf. In above segmented image contain dots shows diseases in leaf.
4) Classification Result: This shows the actual name of the disease.
5) Affected Region in %: This shows how much diseases are on leaf.
6) Accuracy in %: This is the accuracy of the result.
7) Features: This is features of the disease and leaf.

6. APPLICATION

The image processing can be used in agricultural application for following purposes:

1. Detecting leaves with disease.
2. Quantify area that is affected.
3. Finding the shape of affected area.
4. Determine color of the affected area.
5. Texture analysis by determining size and shape of plant's leaf.

7. FUTURE SCOPE

SVM (Support Vector Machine) is very helpful to identify and detect the diseases in plant's leaf. In present system does detect and identify diseases in particular leaf. Identify Rice Leaf diseases are already developed. This developed system is able to identify and detect any plant's leaf diseases with maximum accuracy. The Detection and identification of plant leaf diseases using SVM very useful in future due to the system shows diseases name as well as affected region with features fields

8. CONCLUSIONS

The main purpose of this approach is to detect and identify the diseases in Leaves using SVM. Detection & Identification of Leaves Diseases using Multiclass SVM plays very important role in agriculture solutions to their problems. This methodology is automatically detecting leaf diseases with the name of disease and features. From the execution point of view, this methodology used with various kinds of Plant's leaves like bacterial blight, brown spot, leaf scald and leaf blast successfully. Therefore, by using SVM with Image processing technique to optimize the feature as diseases of the leaves, SVM is proved to be the promising technique for the differentiation and categorization of the rice leaf diseases with normal precision with affected region of the leaf having more accuracy in result shows in percentages.

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