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Research Article

COMPARATIVE ANALYSIS AND DETECTION OF LEAF DISEASE FOR AGRICULTURAL PURPOSE USING VARIOUS IMAGE CLASSIFICATION ALGORITHMS

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A R T I C L E I N F O

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A B S T R A C T

Agriculture plays a vital role in the development of economy India. Farmers have difficulty to select suitable fruit and vegetable crop. Disease management by manually is a challenging task. Most of the diseases are seen on the leaves or stems of the plant. Hence, agriculturist needs to find out the efficient techniques. In this paper we have combined two techniques to predict the disease. The goal of proposed work to diagnose the disease using image processing and clustering techniques is classification on image of plant leaves disease.

INTRODUCTION

Plant disease diagnosis is an art as well as science. The diagnostic process (*i.e.*, recognition of symptoms also symbols), be in nature image with require perceptive judgment as well as the use of scientific method [1]. Plant diseases reduce both quantity and quality of plant products. Diseases are impairment to the normal state of the plant that modifies or interrupts. [2] Farmers require continuous monitoring of experts which might be prohibitively expensive and time- consuming. Leaf presents several advantages over flowers and fruits at all seasons worldwide. Farmers are very much concerned about the huge costs involved in disease control activities and it causes severe loss. The cost intensity, automatic correct identification and classification of diseases based on their particular symptoms which become essential and very useful to farmers and also agriculture scientists [3]. Early detection of diseases is a major challenge in horticulture/agriculture science. Many disease produce symptoms which are the main tools for field diagnosis of diseases showing external symptoms out of a series of reactions that take place between host and pathogen. As such, several important decisions regarding safe practices, the production and processing of plant have been made in the recent past [4].

Related Work

Comparative study of selected data mining algorithms used for intrusion detection [5], in the relatively new field of data mining and intrusion detection a lot of techniques have been proposed by various research groups. Researchers continue to find ways of optimizing and enhancing the efficiency of data mining techniques for intrusion attack classification. They evaluate the performance of well-known classification algorithms for attack classification. [6] Classification of leaf diseases using cross information gain minimal resource allocation network classifier with particle swarm optimization: They developed based on machine vision system and data mining techniques to identify the cotton leaf spot diseases. [7] Detection and classification of plant leaf diseases: medicinal plants used very much in verbal ism to study the medicinal properties of the plants. The applications of Near-Infrared Spectroscopy (NIRS) have expanded widely in the field of farming; vegetation with different extra field, except the usage for identification of plant variety is still rare. [8] Leaves classification using SVM and neural network for disease detection: the process to classify cotton, orange and Lemon leaf diseases the infected leaf samples were collected, and they were captured using a digital camera with specific calibration procedure under proscribed situation. The categorization going on the plants disease is based on color feature extraction from RGB color model where the RGB pixel color indices have been extracted from the identified Regions of Interest (ROI). [10] Prediction of leaf disease using segmentation with hierarchical clustering the major techniques used in predict leaf disease are hierarchical clustering, GLCM and SVM. Some challenges in these techniques are optimization technique for a exact place, result of the backdrop sound inside the acquire image and automation technique for a continuous automated monitoring

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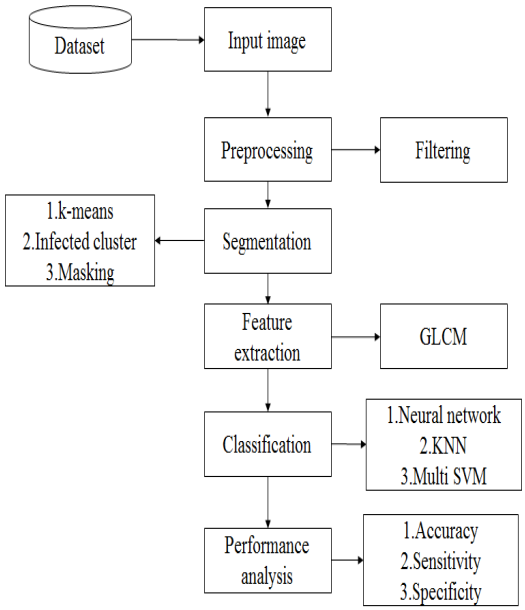
of plant leaf diseases under real world field conditions. The proposed approach is a expensive advance, which canister considerably hold an correct detection of leaf diseases in a little computational effort. [11] Agricultural plant Leaf Disease Detection Using Image Processing: the plant leaf disease has been explained firstly by color transformation structure RGB is converted into HSV space because HSV is a good shade descriptor. Mask with remove of olive pixels among recomputed entrance stage. Next inside the then pace segmentation be perform using32X32 patch size and obtained useful segments.

Proposedwork



Preprocessing

Though RGB model matches to the human eye in such a way as strongly perceptive to the primary colors, this model is not well suited for describing colors in terms that are practical for human interpretation. To avoid these limitations, the acquired RGB images were converted into HSV format.

Median filter

The median filter is a nonlinear digital filter method, frequently use near eliminate sound. Such sound decrease is a typical reprocessing step to improve the results of later processing (used for model, border recognition lying on a picture). Median filter is very widely used in digital image dealing out since, below positive situation, it conserves ends while removing noise. Neighborhood averaging cans suppers isolated out-of-range noise, but side effect is that it also blurs sudden changes such as line features, sharp edges, and other image details all corresponding to high spatial frequencies. The median filter is an effective process to container near various sizes; differentiate out-of-range isolated noise from legitimate image features such as edges and lines.

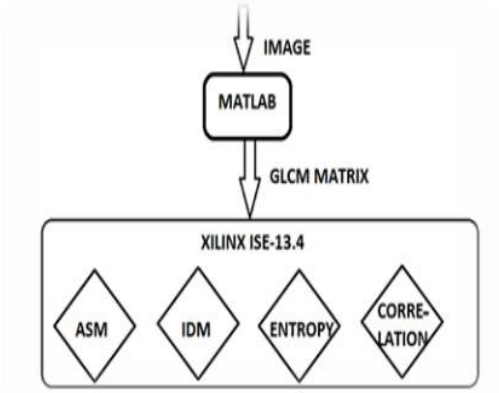
$$y[m,n] = median\{x[i,j],(i,j) \in w\}$$

Segmentation

Then color based segmentation using k-means clustering is applied to get the infected region of interest. We can see that the healthy part and disease affected portion of leaf. This is the region of interest for further processing. Next infected cluster is selected. Green pixels are masked based on verge rate locate. As well, Pixels taking place the limitations are as well removed as they both do not contribute to disease identification process.

Feature extraction

In statistical consistency study, surface skin be compute starting the statistical distribution of observed combinations of intensities at specified positions relative to each other into the picture. According near the numeral of concentration point (pixels) in every grouping, figures be secret keen on first-order, second-order and higher- arrange information. The Gray Level Concurrence Matrix (GLCM) method is a way of extracting second order statistical consistency skin. The move toward have been use into a number of applications, Third with advanced arrange texture think the relationships among three before extra pixels. These are supposedly likely accepted not commonly implemented due to calculation time and interpretation difficulty. A GLCM is a matrix where the number of rows and columns is equal to the number of aged level, G, into the picture.



Neural Network

Neural networks, with their remarkable ability to derive meaning from complicated or inexact figures, container exist use near remove pattern with spot trends that are too complex to be noticed by either humans or other processor technique. A taught neural system container exist consideration of as an "expert" in the category of information it has been given to analyses.

KNN:k nearest neighbor

In pattern recognition, the k-nearest neighbor's algorithm (k-NN) is a non-parametric method used for classification with failure. Into equally luggage, the effort consists of the k the closest training examples in the mark room. The production taking place whether k-NN is use designed for classification or regression: In k-NN categorization, the production is a group association. A purpose is classified by a popular choose of its neighbors, among the objective organism assign toward the group most common among its k the nearest neighbors (k is a helpful numeral, classically minute). Condition k = 1, next the objective is simply assigned to the class of that single the near national. Into k-NN failure, the production is the possessions value used for the objective. This price is the standard of the value of its k the near neighbors. K-NN is a form of instance-based knowledge, before indolent culture, anywhere the meaning be only approximated locally and all computation is deferred until categorization. The k-NN

algorithm is amongst the simplest of all machine learning algorithms.

Multi SVM

Multi class SVM is inherently two-class classifiers. The traditional way to do multi class classification with SVM is to use one of the methods. Into exacting, the majority general method in practice has been to build one-versus-rest classifiers (commonly referred to as ``one-versus-all" or OVA categorization), with near select the group which classify the test datum with the most border. "Support Vector Machine" (SVM) is machine learning algorithm which can be used for both classification and degeneration challenge. Still, it is generally used in categorization problems. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of an exacting organize. Then, we perform classification by sentence the hyper-plane that differentiate the two classes very well (look at the below snapshot).

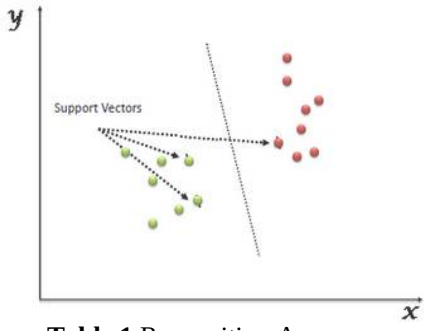
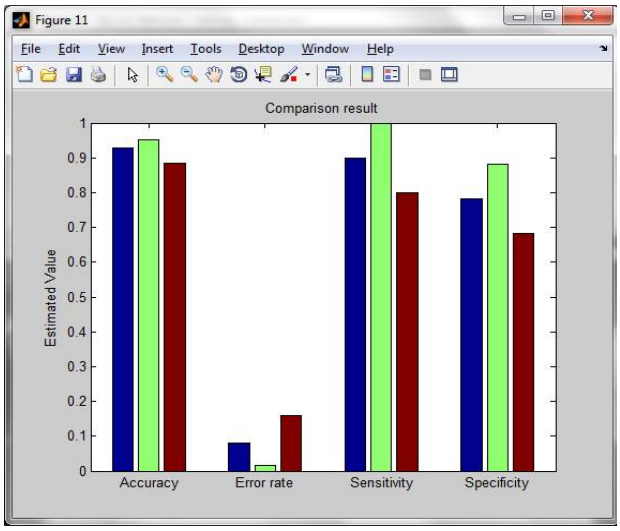


Table 1 Recognition Accuracy

Dataset	Method	Accuracy	Sensitiviy	Specificity	Error Rate
50	NN	88.4615%	0.08	1	0.88235
50	KNN	95.1396%	0.08	1	0.88235
50	Multi SVM	92.7419%	0.08	1	0.88235

Accuracy for detecting disease on leaves using KNN has the highest accuracy of 95.1396%.



CONCLUSION

The image processing techniques for several plant species that have been used for recognizing plant diseases. The major techniques used are hierarchical clustering, GLCM and SVM. Some challenges in these techniques are optimization for an exact place, result of the backdrop sound in the acquired image and automation technique for a continuous automated monitoring of plant leaf diseases under real world field conditions. The proposed approach is an expensive advance, which can significantly support an accurate detection of leaf diseases in a little computational effort.

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