An Innovative Approach for Crop Disease Detection using Image Processing Technique and Pesticide Suggestion for Effective Crop Cultivation

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Abstract:

The yield of the crop is important as the farmers are the back bone of our country India. The bacterial attack is going to ruin the early detection of these diseases on leaf and the pomegranate fruit. The proposed framework automatically grades the disease on leaves of crops. The system effectively inculcates Information and Communication Technology (ICT) in agriculture and hence contributes to Precision Agriculture. Presently, plant pathologists mainly rely on naked eye prediction and a disease scoring scale to grade the disease. This manual grading is not only time consuming but also not feasible. Hence we are proposing an image processing based approach to automatically grade the disease spread on plant leaves by employing SVM(Support Vector Machine) classifier to make the decisions. The results are simulated in the Mat lab and it has shown that it has successfully detected the leaf or crop disease and names it. The proposed system can be reliably implemented on the real time scenario.

Introduction:

The sole area that serves the food needs of the entire human race is the Agriculture sector. It has played a key role in the development of human civilization. Crop disease is one of

the crucial causes that reduces quantity and degrades quality of the agricultural products. Crop Pathology is the scientific study of crop diseases caused by pathogens (infectious diseases) and environmental conditions (physiological factors). It involves the study of pathogen identification, disease etiology, disease cycles, economic impact, Crop disease epidemiology, crop disease resistance,patho-systemgenetics and management of crop diseases. Disease is impairment to the normal state of the crop that modifies or interrupts its vital functions such as photosynthesis, transpiration, pollination, fertilization, germination etc. Crop diseases have turned into a nightmare as it can cause significant reduction in both quality and quantity of agricultural products.

In the area of disease management, grade of the disease is determined to provide an accurate and precision treatment advisory.

Methodology:

The methodology in order to achieve this process of giving the information to farmer after receiving image from him has the following steps:

The proposed methodology aims to model a promising disease grading system for plant leaves. For the experimentation purpose, pomegranate leaves are considered. The flow chart of the methodology is presented in the below figure. The system is divided into the following steps: (1) Image acquisition (2) Image Pre-processing (3) Color image segmentation. (4) Segmentation (5) Classifier.

Image acquisition

The digitization and storage of an image is referred as the image acquisition. In any image processing applications, the work always starts with image acquisition. In the current work, the images of diseased samples of pomegranate leaves are captured from the device. Those captured images are in the JPG format and resized their size into 120*240 for experimental purpose as it consumes more time if the resolution of the image is more.



Image Pre-Processing

Image processing is a form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Digital image processing is the use of computer algorithms to perform image processing on digital images [5]. Preprocessing uses the techniques such as image resize, filtering, segmentation, cropping, contrast enhancement, angle correction, morphological operations etc. In the contemporary exertion, image resize and filtering are performed as a part of pre-processing.

The pre-processing method incorporated is the contract enhancement which increases the pixel distribution to whole range i.e. 0 to 255.

Color Segmentation

Image segmentation refers to the process of partitioning the digital image into its constituent regions or objects so as to change the representation of the image into something that is more meaningful and easier to analyze. The level to which the partitioning is carried depends on the problem being solved i.e. segmentation should stop when the objects of interest in an application have been isolated [5]. In the current work, the very purpose of segmentation is to identify regions in the image that are likely to qualify as diseased regions. There are various techniques for image segmentation such as clustering methods, compression-based methods, histogram-based methods, region growing methods etc. K-means clustering method has been used in the

present work to carry out segmentation. K-Means Clustering is a method of cluster analysis which aims to partition n observations into k mutually exclusive clusters in which each observation belongs to the cluster with the nearest mean.

Classifier

The SVM is the classifier incorporated in the experimental phase which stores the features and start learning the process of grading the disease. The SVM will provide the accurate decisions compared to other existing classifier. The thirteen features are extracted from each training set images and store it in the database. These datasets are used to provide the decision for the query image using the support vectors.

Sample Inputs:

1. Leaf Disease

Original Image



2.Crop disease for multiple leafs



1. Crop disease for fruits



Results and Discussion

We have built an interactive application using the image processing technique which helps in communication between the farmer and the server. The application will help the farmer to get the necessary information regarding the pesticide that has to be used for the infected crop.

Conclusion And Future Work

An application detecting plant diseases and providing necessary suggestions has been implemented. The results indicate the proposed approach works with less computational effort. As a part of future Enhancement the complete process can be automated so that the result can be delivered in a very short time and the training samples can be increased to improve efficiency of disease identification.

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