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Identification and Detection of Plant Leaf Diseases Using Python

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Abstract

India is an agricultural country where in most of the population depends on agriculture. Research in agriculture is aimed towards increase of productivity and food quality at reduced expenditure, with increased profit. Agricultural production system is an outcome of a posh interaction of soil, seed, and agro chemicals. so as to get more valuable products, a product internal control is essentially mandatory. Many studies show that quality of agricultural products could also be reduced thanks to plant diseases. Diseases are impairment to the traditional state of the plant that modifies or interrupts its vital functions like photosynthesis, transpiration, pollination, fertilization, germination etc. These diseases are caused by pathogens viz., fungi, bacteria and viruses, and thanks to adverse environmental conditions. Farmers encounter great difficulties in detecting and controlling plant diseases. Thus, it's of great importance to diagnose the plant diseases at early stages so appropriate and timely action may be taken by the farmers to avoid further losses. The paper focuses on the approach supported image processing for detection of diseases of plants. web application is employed that helps farmers for identifying disease by uploading a leaf image to the system. The system encompasses a set of algorithms which might identify the kind of disease. Input image given by the user undergoes several processing steps to detect the disease and results are returned back to the user via web application.

***Key Words**: Image processing, Detection, Identification ,diseases, Convolutional neural network, segmentation, feature extraction, classification.*

1. Introduction

The most widely used method for disease detection is just optic observation by experts through which identification and detection of plant diseases are done. For doing so, an outsized team of experts still as continuous monitoring of experts is required, which costs very high when farms are large. At the identical time, in some countries, farmers haven't got proper facilities or maybe concept they'll contact to experts. thanks to which consulting experts even cost high still as time consuming too. In such a condition, the suggested technique proves to be beneficial in monitoring large fields of crops. And automatic detection of the diseases by just seeing the symptoms on the plant leaves makes it easier still as cheaper.

Plant disease identification by the visual way may be a more laborious task and at the identical time less accurate and might be done only in limited areas. Whereas if automatic detection technique is employed it'll take fewer efforts, less time and more accurately. In plants, some general diseases are bacterial, black spotted, et al. are Rust, viral and Red cotton Leaf. Image processing is that the technique which is employed for measuring the affected area of disease, and to see the difference within the color of the affected area. Image segmentation is that the process of separating or grouping a picture into different parts. There are currently many various ways of performing image segmentation, starting from the easy thresholding method to advanced color image segmentation methods. The segmentation process relies on various features found within the image. This may well be color information, boundaries or segment of a picture.

2. Literature Survey

Paper [1] Extensive research has been conducted to explore various methods for automated identification of plant diseases. The disease can manifest in various parts of the plant like roots, stem, fruit or leaves. As stated before, this work concentrates, particularly on leaves.

Paper [2] discussed a technique for recognition of plant diseases present on leaves and stem. The proposed work

consists of K-Means segmentation technique and also the segmented images are classified employing a neural network. They developed a way for detecting the visual signs of plant diseases by using the image processing algorithm. The accuracy of the algorithm was tested by comparing the pictures, which were segmented manually with those automatically segmented.

Paper [3] discussed various techniques to segment the diseased a part of the plant. This paper also discussed some Feature extraction and classification techniques to extract the features of infected leaf and therefore the classification of plant diseases. the utilization of ANN methods for classification of disease in plants like self-organizing feature map, back propagation algorithm, SVMs, etc. is efficiently used. From these methods, we are able to accurately identify and classify various plant diseases using image processing techniques.

In paper [4] an approach supported image processing is employed for automated plant diseases classification supported leaf image processing the research work is worried with the discrimination between diseased and healthy soybean leaves using SVM classifier. they need tested our algorithm over the database of 120 images taken directly from different farms using different mobile cameras. The SIFT algorithm enables to properly recognize the plant species supported the leaf form. The SVM classifier can help in recognizing normal and diseased soybean leaves with a mean accuracy as high as 93.79%. the most aim of the proposed work is to produce inputs to an autonomous DSS which is able to provide necessary help to the farmers as and when required over the mobile. this technique will provide help to the farmer with minimal efforts. The farmer only must capture the image of the plant leaf employing a mobile camera and send it to the DSS, with none additional inputs.

paper [5] the work represents groundnut plant disease extraction and classification using color imagery. the colour imaginary transform, color co-occurrence matrix, feature extraction are done and acquire an efficiency output with a neural network, Back propagation gives efficient groundnut leaf detection with a fancy background, during this work we classified only four different diseases with 97 El Alamein of efficiency. But within the future, the work dispensed more diseases by using this method.

Paper [6] contain the study of detection of plant diseases and therefore the detection of the infected a part of plants. Initially, input images are taken then image processing is started. Background and Black pixels are both segmented within the beginning. Then Hue and Saturation a part of the image is additionally separated. and eventually infected part and infected distinctiveness and a reputation of the disease is acquired which is main work using our proposed methodology.
Following are some common symptoms of fungal, bacterial and viral plant leaf diseases..

3.Block Diagram

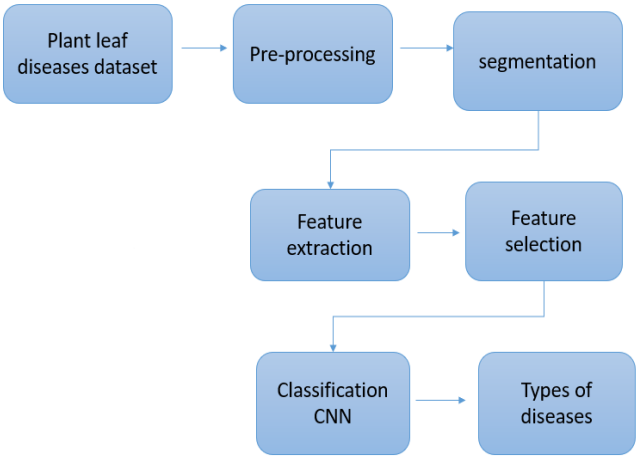

fig.1 System Architecture

4. Methodology

There are five main steps used for the detection of plant leaf diseases as shown in fig. The processing scheme consists of image acquisition through photographic camera or web, image pre-processing includes image enhancement and image segmentation where the affected and useful area are segmented, feature extraction and classification using C.N.N.-convolutional neural network. Finally the presence of diseases on the plant leaf are identified.
In the initial step, images of leaf samples were picked up. The step-by-step procedure as shown below:

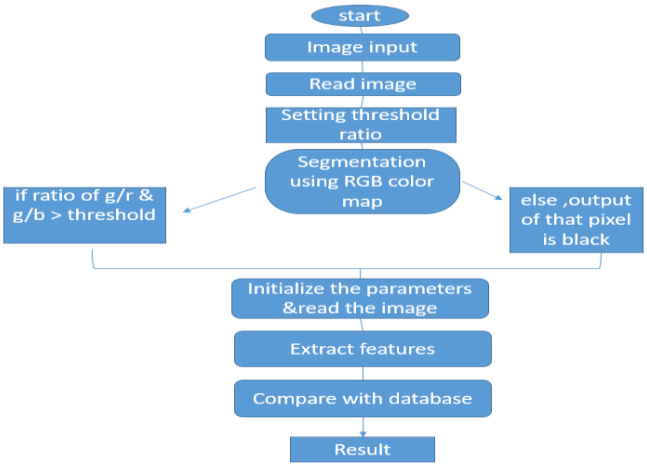

Fig .2 Flow Chart

The steps of the proposed system:

I. Image Acquisition

Firstly, the photographs of assorted leaves acquired employing a photographic camera with required resolution for better quality. the development of a picture database is clearly addicted to the appliance. The image database itself is responsible on the application. The image database itself is responsible for the better efficiency of the classifier which decides the robustness of the algorithm

Following are some common symptoms of fungal, bacterial and viral plant leaf diseases.

Bacterial disease symptoms:

The disease is characterized by tiny pale green spots which soon acquire regard water- soaked. The lesions enlarge and so appear as dry dead spot, e.g. bacterial leaf spot have brown or black water-soaked spots on the foliage, sometimes with a yellow halo, generally identical in size. Under dry conditions the spots have a speckled appearance.

fig.3 Bacterial disease on leaf

Viral disease symptoms:

Among all plant leaf diseases, those caused by viruses are the foremost difficult to diagnose. Viruses produce no telltale signs which will be readily observed and sometimes easily confused with nutrient deficiencies and herbicide injury. Aphids, leafhoppers, whiteflies and cucumber beetles insects are common carriers of this disease, e.g. Mosaic Virus, search for yellow or green stripes or spots on foliage.

fig.4 Viral disease on leaf

Fungal disease symptoms:

Among all plant leaf diseases, those caused by fungus a number of them are discussed below, e.g. blight caused by the fungus Phytophthora infesters shown. It first appears on lower, older leaves like water-soaked, gray-green spots. When fungal disease matures, these spots darken so white fungal growth forms on the undersides. Early blight is caused by the fungus Alternaria solani. It first appears on the lower, older leaves like small brown spots with concentric rings that form a bull's eye pattern. When disease matures, it spreads outward on the leaf surface causing it to show yellow. In mildew yellow to white patches on the upper surfaces of older leaves occurs. These areas are covered with white to greyish on the undersides..

fig.5 Fungal disease on leaf

II. Image segmentation

Image segmentation could be a branch of digital image processing which focuses on partitioning a picture into different parts per their features and properties. the first goal of image segmentation is to simplify the image for easier analysis. In image segmentation, you divide a picture into various parts that have similar attributes. The parts within which you divide the image are called Image Objects.It is the primary step for image analysis. Without performing image segmentation, performing computer vision implementations would be nearly impossible for you.By using image segmentation techniques, you'll divide and group-specific pixels from a picture, assign them labels and classify further pixels in step with these labels. you'll be able to draw lines, specify borders, and separate particular objects (important components) in a picture from the remainder of the objects (unimportant components).

There are currently many various ways of performing image segmentation, starting from the easy thresholding method to advanced color image segmentation methods. The segmentation process relies on various features found within the image. This may well be color information, boundaries or segment of a picture. Threshold based method

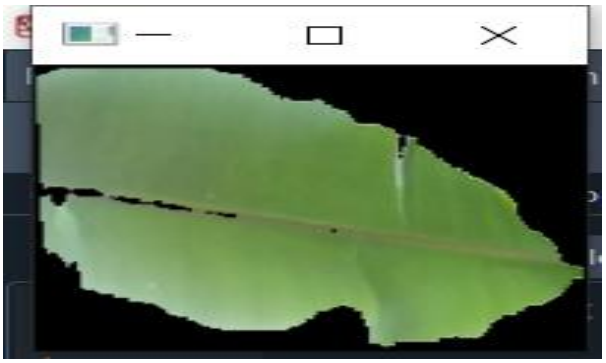

Fig.6 Segmented output image.

Threshold based method

it's the best way of segmentation. Here segmentation is completed through the edge values obtained from the histogram of these edges of the first image. So, if the sting detections are accurate then the edge too. Segmentation through thresholding has fewer computations compared to other techniques. The disadvantage of this segmentation technique isn't suitable for complex images.

III. Feature Extraction

Feature extraction is finished after the preprocessing innovate character recognition system. the first task of pattern recognition is to require an input pattern and properly assign it collectively of the possible output classes. This process are often divided into two general stages: Feature selection and Classification. Feature selection is critical to the entire process since the classifier won't be able to recognize from poorly selected features. Criteria to decide on features given by Lippman are: “Features should contain information required to tell apart between classes, be insensitive to irrelevant variability within the input, and even be limited in number, to permit, efficient computation of discriminant functions and to limit the number of coaching data required” Feature extraction is a vital step within the construction of any pattern classification and aims at the extraction of the relevant information that characterizes each class. during this process relevant features are extracted from objects/ alphabets to create feature vectors. These feature vectors are then utilized by classifiers to acknowledge the input unit with target output unit. It becomes easier for the classifier to classify between different classes by observing these features because it allows fairly easy to differentiate. Feature extraction is that the process to retrieve the foremost important data from the data. Feature extraction is finding the set of parameter that outline the form of a personality precisely and uniquely. In feature extraction phase, each character is represented by a feature vector, which becomes its identity. the key goal of feature extraction is to extract a collection of features, which maximizes the popularity rate with the smallest amount amount of elements and to come up with similar feature set for type of instance of the identical symbol. The widely used feature extraction methods are Template matching, Deformable templates, Unitary Image transforms, Graph description, Projection Histograms, Contour profiles, Zoning, Geometric moment invariants, Zernike Moments, Spline curve approximation, Fourier descriptors, Gradient feature and Gabor features.

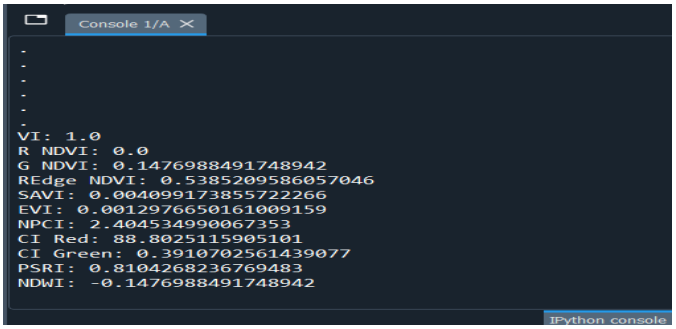

Fig.7 Features of Leaf Image.

IV. Classification

C.N.N.-convolutional neural network (CNN, or Conv Net) may be a class of deep, feed-forward artificial neural networks, most ordinarily applied to analyzing visual imagery.

Convolutional Neural Networks–After removing noise from the image it required to extracts the feature. We propose to use a CNN for document image classification. the most idea is to be told a hierarchy of feature detectors and train a nonlinear classifier to spot complex document layouts. Given a document image, we first perform down sampling and pixel value normalization, then feed the normalized image to the CNN to predict the category label.In classifier training features and their corresponding disease given to classifier. Classifier find the load consistent with features Algorithm will divide weights we use CNN(Convolution neural network) it'll gives output. in CNN within the initial step, images of leaf samples were picked up. using Architecture VGG Net 19 restructure .

V. Diagnosis of Diseases

Input output

Whatever new image comes segment that image afterward find feature which features will give to classifier which is trained, this may identify and detect disease style of given image..

5. Conclusion

The use of automated monitoring and management systems are gaining increasing demand with technological advancement. In agricultural field loss of yield mainly occurs because of widespread disease. Mostly the detection and identification of the disease are noticed when the disease advances to the severe stage. Therefore, causing the loss in terms of yield, time and money. The proposed system is capable of detecting the disease at the sooner stage as soon because it occurs on the leaf. Hence saving the loss and reducing the dependency on the expert to a specific extent is feasible. It can provide help for an individual having less knowledge about the disease. reckoning on these goals, we've got extract the features similar to the disease.

6. References

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