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DETECTION OF PLANT LEAF DISEASE USING IMAGE PROCESSING APPROACH

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ABSTRACT

Agricultural productivity is something on which economy highly depends. This is the one of the reasons that disease detection in plants plays an important role in agriculture field, as having disease in plants are quite natural. If proper care is not taken in this area then it causes serious effects on plants and due to which respective product quality, quantity or productivity is affected. For instance, a disease named little leaf disease is a hazardous disease found in pine trees in United States. Detection of plant disease through some automatic technique is beneficial as it reduces a large work of monitoring in big farms of crops, and at very early stage itself it detects the symptoms of diseases i.e. when they appear on plant leaves. This paper presents an algorithm for image segmentation technique which is used for automatic detection and classification of plant leaf diseases. It also covers survey on different diseases classification techniques that can be used for plant leaf disease detection. Image segmentation, which is an important aspect for disease detection in plant leaf disease, is done by using genetic algorithm.

1.INTRODUCTION

The agricultural land mass is more than just being a feeding sourcing in today's world. Indian economy is highly dependent of agricultural productivity. Therefore in field of agriculture, detection of disease in plants plays an important role. To detect a plant disease in very initial stage, use of automatic disease detection technique is beneficial. he existing method for plant disease detection is simply naked eye observation by experts through which identification and detection of plant diseases is done. For doing so, a large team of experts as well as continuous monitoring of plant is required, which costs

very high when we do with large farms. At the same time, in some countries, farmers do not have proper facilities or even idea that they can contact to experts. Due to which consulting experts even cost high as well as time consuming too. In such conditions, the suggested technique proves to be beneficial in monitoring large fields of crops. Automatic detection of the diseases by just seeing the symptoms on the plant leaves makes it easier as well as cheaper.

Plant disease identification by visual way is more laborious task and at the same time, less accurate and can be done only in limited areas. Whereas if automatic detection technique is used it will take less efforts, less time and become more accurate. In plants, some general diseases seen are brown and yellow spots, early and late scorch, and others are fungal, viral and bacterial diseases. Image processing is used for measuring affected area of disease and to determine the difference in the color of the affected area [Image segmentation is the process of separating or grouping an image into different parts. There are currently many different ways of performing image segmentation, ranging from the simple thresholding method to advanced color image segmentation methods. These parts normally correspond to something that humans can easily separate and view as individual objects. Computers have no means of intelligently recognizing objects, and so many different methods have been developed in order to segment images. The segmentation process is based on various features found in the image. We use Genetic algorithm for color image segmentation.

2. LITERATURE SURVEY

Mrunalini presents the technique to classify and identify the different disease through which plants are affected. In Indian Economy a Machine learning based recognition system will prove to be very useful as it saves efforts, money and time too. The approach given in this for feature set extraction is the color co-occurrence method. For automatic detection of diseases in leaves, neural networks are used. The approach proposed can significantly support an accurate detection of leaf, and seems to be important approach, in case of steam, and root diseases, putting fewer efforts in computation.

Authors present disease detection in Malus domestica through an effective method like K-mean clustering, texture and color analysis . To classify and recognize different agriculture, it uses the texture and color features those generally appear in normal and affected areas. In coming days, for the purpose of classification K-means clustering, Bayes classifier and principal component classifier can also be used.

According to histogram matching is used to identify plant disease. In plants, disease appears on leaf therefore the histogram matching is done on the basis of edge detection technique and color feature. Layers separation technique is used for the training process which includes the training of these samples which separate the layers of RGB image into red, green, and blue layers and edge detection technique which detecting edges of the layered images. Spatial Gray-level Dependence Matrices are used for developing the color co-occurrence texture analysis method.

Authors describe an algorithm for disease spot segmentation in plant leaf using image processing techniques. In this paper, process

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of disease spot detection is done by comparing the effect of HSI, CIELAB, and color space. For Image soothing Median filter is used. In final step, by applying Otsu method on color component, calculation of threshold can be done to find the disease spot. There is some noise because of background which is shown in the experimental result, camera flash and vein. CIELAB color model is used to remove that noise.

The state of art review of different methods for leaf disease detection using image processing techniques is presented in paper. The existing methods studies are for increasing throughput and reduction subjectiveness which comes due to naked eye observation through which identification and detection of plant diseases is done.

According to soft computing methods such as artificial neural networks (ANN), genetic programming, and fuzzy logic can be used as an alternative method for modeling complex behavior of materials such as graphene. These algorithms require input training data for solving problems. These computing methods generate meaningful solutions for complicated optimization problems based on the input. In many models feed-forward network of three layers can be used. Root-mean-square error method can be used to determine the number of neurons in hidden layer.

3. PROPSOED WORK

PROPOSED METHODOLOGY:

1. Image Preprocessing:

1.Image Smoothing:

Smoothing is often used to reduce noise within an image or to produce a less pixelated image. Most smoothing methods are based on low pass filters. Image filtering can be grouped in two depending on the effects:

2.Low pass filters (Smoothing)

Low pass filtering (aka smoothing), is employed to remove high spatial frequency noise from a digital image. The low-pass filters usually employ moving window operator which affects one pixel of the image at a time, changing its value by some function of a local region (window) of pixels. The operator moves over the image to affect all the pixels in the image.

3.High pass filters (Edge Detection, Sharpening)

A high-pass filter can be used to make an image appear sharper. These filters emphasize fine details in the image - the opposite of the low-pass filter. High-pass filtering works in the same way as low-pass filtering; it just uses a different convolution kernel.

When filtering an image, each pixel is affected by its neighbors, and the net effect of filtering is moving information around the image.

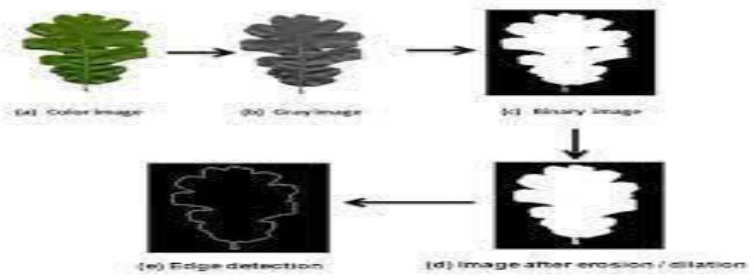

Fig: Image pre-processing

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2 Image Enhancement:

Image enhancement techniques have been widely used in many applications of image processing where the subjective quality of images is important for human interpretation. Contrast is an important factor in any subjective evaluation of image quality. Contrast is created by the difference in luminance reflected from two adjacent surfaces. In other words, contrast is the difference in visual properties that makes an object distinguish from other objects and the background. In visual perception, contrast is determined by the difference in the color and brightness of the object with other objects. Our visual system is more sensitive to contrast than absolute luminance; therefore, we can perceive the world similarly regardless of the considerable changes in illumination conditions.

The aim of image enhancement is to improve the interpretability or perception of information in images for human viewers, or to provide `better' input for other automated image processing techniques.

Image enhancement techniques can be divided into two broad categories:

1.Spatial domain methods, which operate directly on pixels, and

2.frequency domain methods, which operate on the Fourier transform of an image

3 Image Segmentation:

The Otsu method is put forward by Otsu in 1978, and has been widely used for its simple thought and stability calculation. From the perspective of pattern recognition, the optimal threshold value should be the goal to produce the best separation performance of object class and background class, this performance is characterized by type of variance, for the introduction of the variance within the class, between-class variance and total variance. The variance is the Statistics, and characterized of the unbalanced distribution of data. The greater the variance, the differences bigger between the two parts of an image. If some targets are wrong to part of the background, the differences between the two parts will smaller, so make the largest variance means that minimum the probability of mistake segmentation, optimum threshold will make the variance largest between target and background. In consideration of computation, usually get the threshold by optimizing the third criterion. This method has its flaws, as kittler and Illingworth experiments revealed: when the ratio of the image of target and background is very small ,method is failure

4. Genetic Algorithm:

A genetic algorithm is a search heuristic that is inspired by Charles Darwin's theory of natural evolution. This algorithm reflects the process of natural selection where the fittest individuals are selected for reproduction in order to produce offspring of the next generation

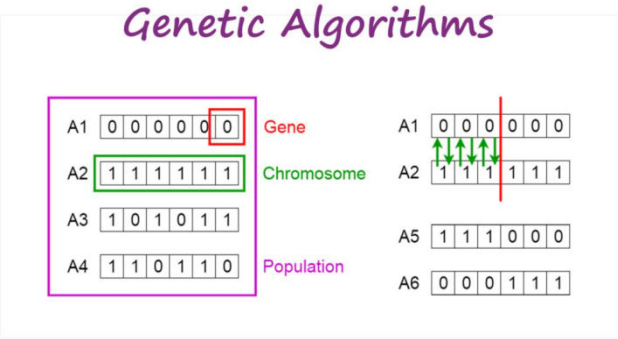

Fig: Genetic Algorithm

5 Feature Extraction:

A feature is defined as an "interesting" part of an image, and is used as a starting point in main primitives for subsequent algorithms. The overall algorithm will often only be as good as

its feature detector. Consequently, the desirable property for a feature detector is its repeatability: whether or not the same feature will be detected in two or more different images of the same scene. The most important types of features which can be considered when trying to identify the signs are spatial, temporal and textural. The feature extraction stage is built and designed to process real images (Ryszard S. Choras, 2007). The end result of feature extraction is a set of features, commonly called a feature vector, which constitutes a representation of an image.

The feature is defined as a function of one or more measurements, each of which specifies some quantifiable property of an object, and is computed such that it quantifies some significant characteristics of the object. The various features classified and currently employed are

• General features: Independent features such as color, texture, and shape According to the abstraction level, they can be further divided into:

- Pixel-level features: Features calculated at each pixel, e.g. color, location.

- Local features: Features calculated over the results of subdivision of the image band of an image segmentation or edge detection.

- Global features: Features calculated over the entire image or just regular sub-area of an image.

• Domain-specific features: Application of dependent features such as human faces, fingerprints and conceptual ones. All features can be coarsely classified into low-level features and high-level features. Low-level features can be extracted directly from the original images, whereas high-level feature extraction depends on low level features. The issue of choosing the features from the extracted vector should be guided by the following concerns:

• the features should carry enough information about the image and should not require any domain-specific knowledge for their extraction.

• they should be easy to compute in order to approach the feasibility of a large image collection and rapid retrieval.

• they should relate well to the human perceptual characteristics since users finally determine the suitability of the images retrieved.

4. RESULT

Fig : Input & Output Image of banana leaf Output disesase is early scorch

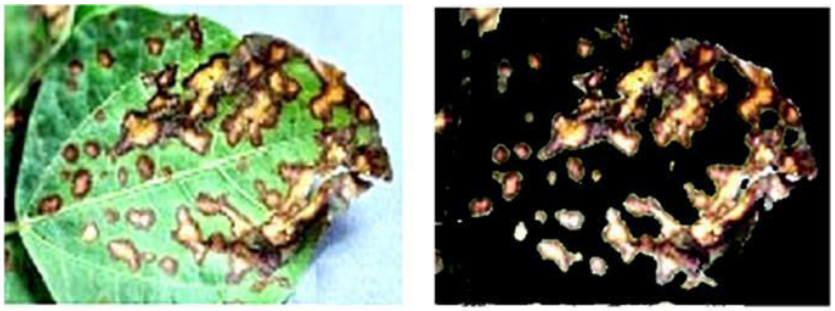

Fig : Input & Output Image of beans leaf Output disesase is bacterial leaf spot

Fig: Input & Output Image of beans leaf Output disesase is bacterial leaf spot

Fig : Input & Output Image of lemon leaf Output disesase is sun burn disease

Fig : Input & Output Image of beans leaf Output disesase is fungal disease

5. CONCLUSION

This paper presents the survey on different diseases classification techniques used for plant leaf disease detection and an algorithm for image segmentation technique that can be used for automatic detection as well as classification of plant leaf diseases later. Banana, beans, jackfruit, lemon, mango, potato, tomato, and sapota are some of those ten species on which proposed algorithm is tested. Therefore, related diseases for these plants were taken for identification. With very less computational efforts the optimum results were obtained, which also shows the efficiency of proposed algorithm in recognition and classification of the leaf diseases. Another advantage of using this method is that the plant diseases can be identified at early stage or the initial stage. To improve recognition rate in classification process Artificial Neural Network, Bayes classifier, Fuzzy Logic and hybrid algorithms can also be used.

By using this automated detection technique through our proposed method we can prevent the plant leaves by suggesting the appropriate solutions.

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