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Detection Of Plant Leaf Diseases Using Image Segmentation

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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 project 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.

Keywords: Detection, Disease, 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. For instance a disease named little leaf disease is a hazardous disease found in pine trees in United States. The affected tree has a stunted growth and dies within 6 years. Its impact is found in Alabama, Georgia parts of Southern US. In such scenarios early detection could have been fruitful. The 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. 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 measurinImage 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

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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. This might be color information, boundaries or segment of an image. We use Genetic algorithm for color image segmentation. affected area of disease and to determine the difference in the color of the affected area.

2. RELATED WORK

In leaves recognition research, a lot has been done about general features extraction or recognition between different classes of objects. In case of specific domain recognition, taking into account the unique characteristics that belong to this category, improves the performance of the system. Despite the high technical aspect of this project, dealing with leaves gives a biological connotation.

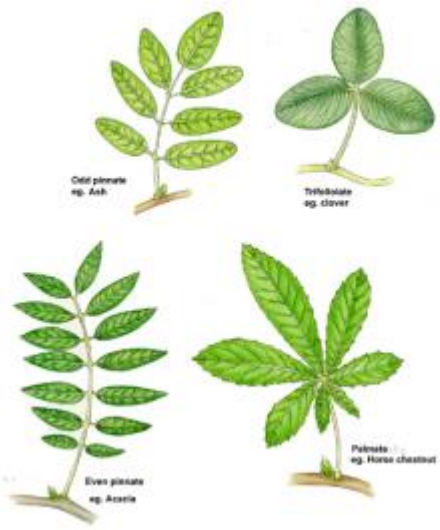

Fig.1.Compound Leaves

A very basic knowledge on leaves has to be learned and knowing the perspective of how biologists themselves recognizing a leaf is and add on. Biologists also emphasize the importance of leaves; indeed their size, their shape, their disposition can vary very much and be a good mean for differentiating similar blooms. The disposition of the leaves on the stem can be alternate opposed or whorled as illustrated in Figure.1The enervations of the leaf can be of different types; there are leaves with dichotomist, parallel, palmate, pinnate nerves.

3. GENETIC ALGORITHM

Genetic algorithms belong to the evolutionary algorithms which generate solutions for optimization problems. Algorithm begins with a set of solutions called population. Solutions from one population are chosen and then used to form a new population. This is done with the anticipation, that the new population will be enhanced than the old one. Solutions which are selected to form new solutions (offspring) are chosen according to their fitness – the more appropriate they are, the more probability they have to reproduce Genetic algorithm optimizes both variables efficiently, continuous or discrete. Gives a number of optimum solutions, not a single solution. So different image segmentation results can be obtained at the same time

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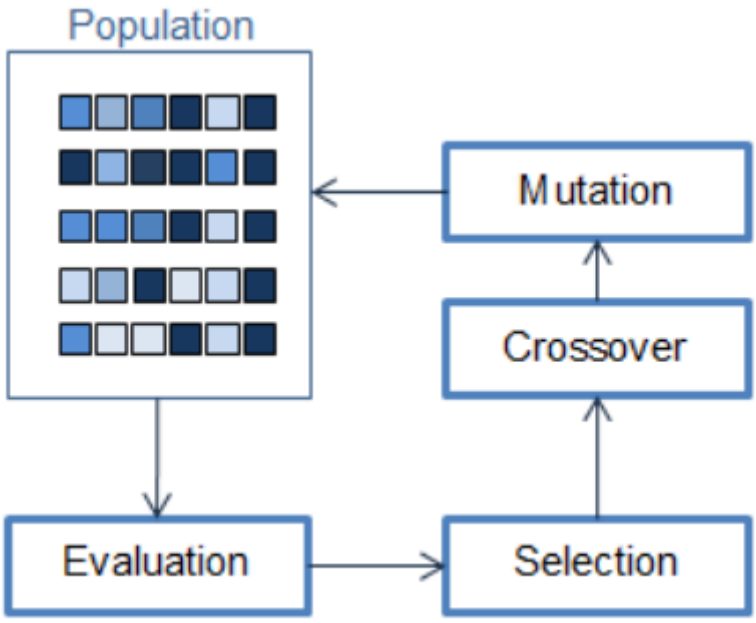

Fig.2.Genetic Algorithm

The manifestation of pathogens in plantations is the one of the most important cause of losses in many crops. Bernardes et al. give the method of the automatic classification of cotton diseases based on the feature extraction of foliar symptoms from digital images. For the feature extraction this method uses the energy of the wavelet transform and a SVM for the actual classification. Review on the current segmentation algorithms used for medical images. Algorithms mainly categories in three categories according to their main concepts: the first based on threshold, the second based on pattern recognition techniques and third one based on deformable models. In recent years the third category of algorithms are focused on deformable models as a result of intensive investigation. Some of the main applications of these algorithms are segmenting organs and tissues in pelvic cavity area. These are discussed through several preliminary experiments.

4. ANALYSIS

The 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. This also supports machine vision to provide image based automatic process control, inspection, and robot guidance. Digital camera or similar devices are use to take images of leafs of different types, and then those are used to identify the affected area in leafs. Then different types of image-processing techniques are applied on them, to process those images, to get different and useful features needed for the purpose of analyzing later. Mostly green colored pixels, in this step, are masked. In this, we computed a threshold value that is used for these pixels. Then in the following way mostly

green pixels are masked: if pixel intensity of the green component is less than the pre-computed threshold value, then zero value is assigned to the red, green and blue components of the this pixel. For feature extraction the method used is color co-occurrence method. It is the methodology in which both the texture and color of an image are considered, to come to the unique features, which shows that image. Over the traditional gray-scale representation, in the visible light spectrum, the use of color image features provides an additional feature for image characteristic. There are three major mathematical processes in the color co- occurrence method. First, conversion of the RGB images of leaves is done into HIS color space representation. After completion of this process, to generate a color co- occurrence matrix, each pixel map is used, which results into three color co- occurrence matrices, one for each of H, S, I. In this method, diseased images of plants are captured through the high-resolution camera to create the required database. This database has different types of plant diseases and images are stored in jpeg format. These images are then read in mat lab using read command. R, like S, is designed around a true computer language, and it allows users to add additional functionality by defining new functions. Much of the system is itself written in the R dialect of S, which makes it easy for users to follow the algorithmic choices made. For computationally-intensive tasks, C, C++ and Fortran code can be linked and called at run time. Advanced users can write C code to manipulate R objects directly.

CONCLUSION

Classification technique is used for training and testing to detect the type of leaf disease. Classification deals with associating a given input with one of the distinct class. In the given system support vector machine [SVM] is used for classification of leaf disease. The classification process is useful for early detection of disease, identifying the nutrient deficiency. In feature extraction method, various attributes of the segmented image are extracted. Features like color, shape,and texture are extracted using Colour correlogram, spatial gray dependency matrix [SGDM]. Color correlogram is used to extract color feature. Correlogram is an image of correlation statistics. SGDM is used to extract texture feature like contrast, energy, local homogeneity, and correlation are computed for the hue content of the image.

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