International Journal of Advanced Research Methodology in Engineering & Technology, ISSN 2456 6446
Volume 1, Issue 3, May 2017

Effective Disease Detection for Plants

U. Gayathri, S.suba, J. Princy,

Department Of Computer Science And Engineering, Velammal College of Engineering and Technology, Madurai

gayathrianu22@gmail.com, princynoopraj@gmail.com, subaselvaraj05@gmail.com

ABSTRACT:

The main objectives of this research is to develop a prototype system for detecting the banana disease .This paper concentrate on the image processing techniques used to enhance the quality of the image and neural network technique to classify the banana disease. The methodology involves image acquisition, pre-processing and segmentation, analysis and classification of the disease. All the banana sample will be passing through the RGB calculation before it proceed to the binary conversion. If the sample is in the range of normal Banana RGB, then it is automatically classify as type 4 which is Normal. Then, all the segmented Banana disease sample will be convert into the binary data for classification training and testing. Consequently, by employing the neural network technique, the Banana diseases are recognized about 92.5 percent accuracy rates. This prototype has a very great potential to be further improved in the future to detect the plant related issues in the field of agricultural analysis

Motivation:

A product quality control is fundamentally required in order to gain more value added products. Many studies show that quality of agricultural products can be reduced from many causes. One of the most important factors of such quality is plant diseases. Consequently, minimizing plant diseases allows substantially improving quality of the products.

Banana is one of the most utilized food plants and widely grown originated in ASIA.banana is an important crop worldwide and over half of the world population relies on it for food. Many people in the world use sugar as a secondary food . However, there are many factors that make banana production become slow and less productive. One of the main factors is banana disease

An abnormal condition that injures the plant or leads it to function improperly is called as a disease. Diseases are readily recognized by their symptoms. There are a lot of Banana disease types which are Bakanae, red disease virus, brown spot disease and many more. Image processing and computer vision technology are very beneficial to the agricultural industry. They are more potential and more important to many areas inagricultural technology. Banana Disease Detection System is one of the very beneficial systems. It can help the farmer detect the disease faster. This study aims to develop a prototype system to automatically detect and classify the Banana

diseases by using image processing technique as an alternative or supplemental to the traditional manual method.

Problem Statement

Banana will be harvest twice in a year. Most of Banana farmer faces many problems to harvest their Banana because they had been attack by snail, worm and fungi. Furthermore, when the Banana had been infected or attacked, the others areas had been exposed to be infected. Thus, it will decrease Banana farmer‟s income and lead to significance losses to farmer. Currently, the Banana farmer determines the type of disease manually. The errors might occur in order to determine the type of diseases. Banana farmer also have to spend a lot of time to detect the type of disease. It also takes a time as the Banana farmers manually check the disease since the Banana field is in wide area.

Objective

There are three objectives to achieve in this project:

i. to develop the prototype of Banana disease detection system

ii. to detect the Banana disease by using image processing

iii. to apply image processing technique to analyze the pattern of Banana disease

Scope

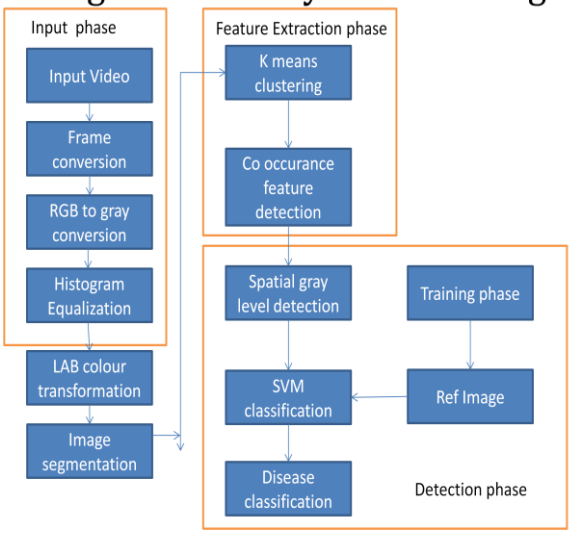
- The users of this system are banana farmers.
- The prototype will be develop by using LabVIEW
- 10 samples of the normal, yellow spot disease, smut brown spot disease and wilt disease will be used in this project.

METHOD OF RESEARCH

A. Disease Identification :

The model for identification of banana leaf disease is introduced in this study as shown in Figure 1. It is used for disease identification, and simultaneously provide calculation of severity. Therefore, this model is divided into two stages: the calculation of the severity and classification of disease. The first stage is the severity calculation which is performed only on testing data in a certain standard size of the leaves. Whereas the second stage uses the data from the testing and training spot disease (spot disease use Otsu segmentation method from a* channel of L*a*b* color space), from intervenum area. Then, for each area the region of dominant disease areas is determined as region of interest. It represents the type of disease and it has a smaller size which accelerate the process of detection of the disease

Image based analysis block diagram



Sample input image

Image preprocessing techniques are basically used to bring out details that are obscured or simply to highlight certain features of interest in an image. These are mainly subjective processes and are designed to manipulate an image in order to take advantage of the psycho visual aspects of the human visual system. Histogram equalization and median filtering techniques were used.

Histogram Equalization:

It is one of the image enhancement techniques. This method distributes the intensities of the images. Through this distribution, increases contrast of the areas from local contrast t o higher contrast. Histogram equalization is used to improve the interpretability, visibility and quality of the image.

B. LAB Color Transformation This method matches the luminance of the grayscale image to the luminance of the color image. First get the values of three primary colors (Red, Green and Blue) and encodes this linear intensity values using gamma expansion. The LAB space consists of a luminosity layer 'L*', chromaticity-layer 'a*' indicating where color falls along the red-green axis, and chromaticity-layer 'b*' indicating where the color falls along the blue-yellow axis. We choose ‘b’ as input for segmentation process. D. Image Segmentation Image segmentation is the important step to separate the different regions with special significance in the image, these regions do not intersect each other and each region should meet consistency conditions in specific regions. The division of an image into its constituent objects or regions is called Segmentation. The level to which the subdivision is carried out depends on the problem being solved. That is, segmentation

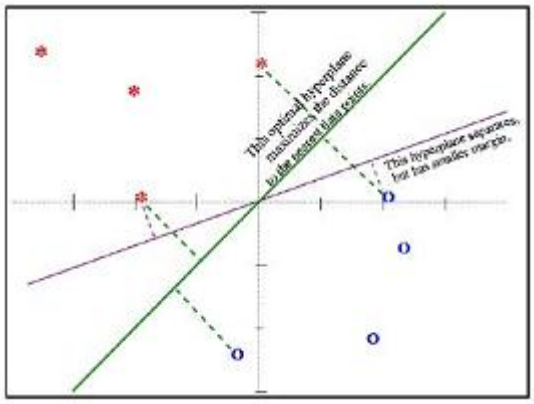
should stop when the objects of interest or the regions of interest in an application have been isolated. Several techniques have to be applied to achieve a desirable level of segmentation sufficient to carry out recognition

K Means Segmentation:

K-means is one of the simplest unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each cluster. These centroids should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other.

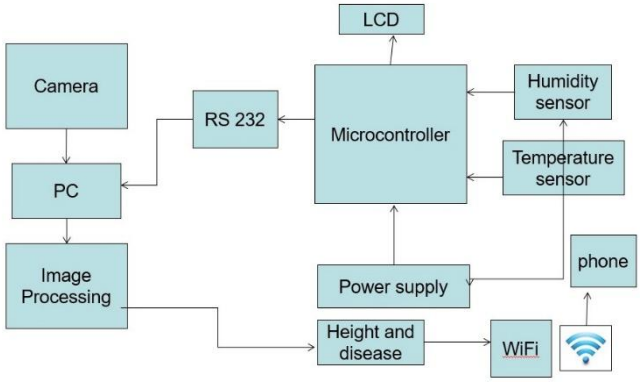
2). Canny Edge Detection: After segmentation process edges are clearly found by the use of canny edge detector. Canny algorithm finds the edges by looking for the local minima of the gradient input image.

3). Feature Extraction: Image texture is a set of matrices calculated in image processing designed to quantify the perceived texture of an image. Grey-Level Co-occurrence Matrix texture measurements have been the workhorse of image texture since they are a button you push in the software that yields a band whose use improves classification



Segmentation diagram

Block diagram

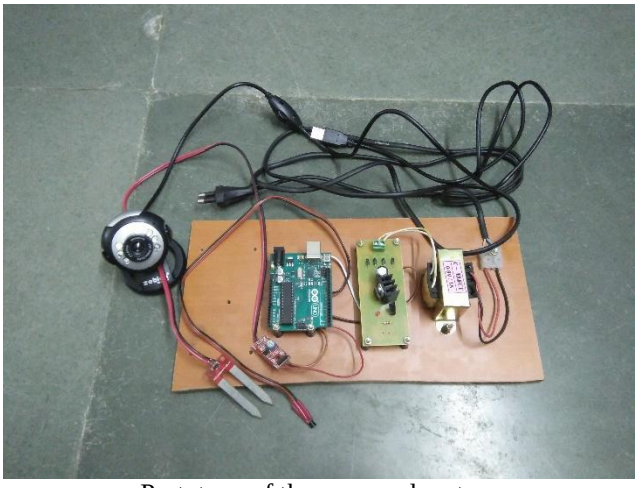


Block diagram for the working procedure

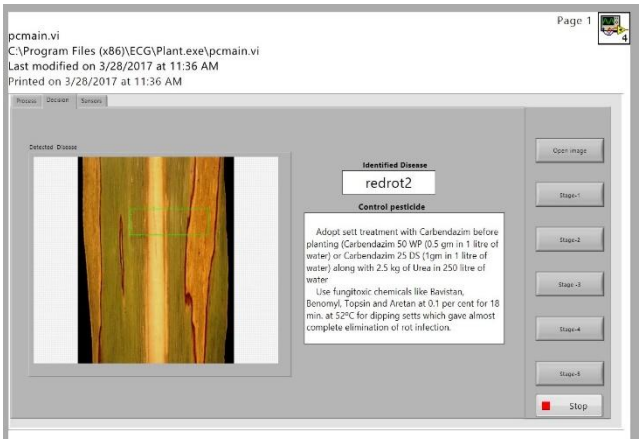
Results and Discussions

An arduino based data collection system along with a sugar cane analysis is presented the scheme has a robust detector for a sugar cane disease detection , the required image processing sequences such as preprocessing and the feature detection has been carried out , the variation of the diseases are been trained dot the SVM classified that classifies the segmented content of the images further the detection system is been verified with the other sugar can samples that provides asatisfactory detection results , furtherenvironmental control to the

detectionprovides a better automation that reduces the humidity and the temperature related issues . the automation system can be used in any filed which has the pre definedsettings to control the humidity the temperature , the proposed system can be applied to any kind of filed study and control systems that can improve the agricultural production .



Prototype of the proposed system



Disease detected in the plant using the proposed system

Conclusion

The above method was experimentally verified and it will gradually decrease the effects of disease in plants and the plants can be easily monitored via camera at less expenditure. Hence more plants were saved by the advent of the project.

Future scope

The project based on the banana detection system is designed and the various disease conditions are analyzed the results provides a better detection rate towards the variations are studied , further this project can be extended to cash crops like tea and the cardamom and banana , developing a combined systems with a user structural would be required for various requirements.

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