Farm disease detection procedure by image processing on Smart Farming

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Abstracts

The environmental change is affecting the farm products like tomato, and pepper, etc. This affects to lead smart farming yield. What is more, this inconstant conditions cause the farms to be infected by variety diseases. Therefore ICT technology is needed to detect and prevent the crops from being effected by diseases. This article suggests the procedure to help producer for identifying farms disease based on the detected image. This detects the kind of diseases with comparing the trained image data before and after disease emergence. First step monitors an image of farms and resize it. Its features are extracted on parameters such as color, and morphology, etc. The next steps are used for classification to classify the image as infected or non-infected. on the bassis of detection algorithm.

Keyword

ICT, Clustering, Coherence Vector, Morphology,

Ⅰ. Introduction

The farm producers observe visual symptoms of disease on products. Expert may easily diagnose the disease rely on experienced knowhow. Most of the farm product disease are detected by eye observation. The consultation of professional experts will be charged but it is not possible to get it on time at remote location. Therefore there will need an automatic farm product disease detection system in the initial stage of the disease.

Here it suggests the general procedure of disease detection about fruit farm products. The fruit products is mainly affected now days by the attack of bacterial defect cause the major loss for the farm producers. Leaf of fruit products is mainly affected The production of fruit is taken in the low rain region and which gives more profit to the farm producers. The severity of disease is mainly in rainy season. This disease affects stem, leaf and fruits, but major distractive part is on fruits. The leaf disease shows the different color comparing with normal the leaf of fruit product. The injured leaf spot turns to a different color in the disease fruit. There is required to identify the disease at the primary stage[1]. But it is not able to identify the disease due to lack of domain knowledge, The procedure to detect the affected disease at primary stage is an important.

Ⅱ. The detection architecture based on ICT

The architecture web based system as shown figure 1 can be suggested[2] . The experts or farmers are available to observe the disease status of fruit product at remote site. Observer can detect by using the disease detection algorithm system. Before running detection system, Observer prepares the optimized images with adding and deleting and updating the colors of the defected and normal fruit products. The detection algorithm detects the affected fruit products based on the optimized image.

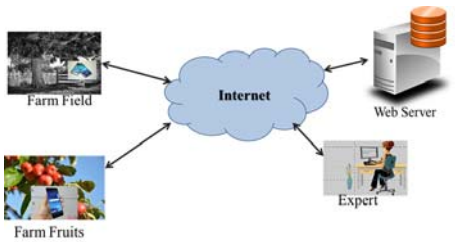

Figure 1. Conceptual model of detection system

Ⅲ. Proposed detection procedure

Here suggests the detection procedure in figure 3. The disease detection system prepare two images databases which are one for detection of fruit product disease and the other one for testing[3]. The image is captured and preprocessing is done for optimizing the image with resizing and adding and deleting in the initial training stage. The feature extraction of the optimized image is done at second stage. Next stage, it clusters the features extracted by applying clustering algorithm and performs finally classification. In the testing stage, image will be captured as initial processing, and performs feature extraction and classification as infected or non-infected image.

3.1 Initial processing

The initial processing is carried out on the basis of captured image. This stage performs the resizing, adding, deleting, and updating of it to make the optimized image for extracting features.

3.2 Color feature extraction

For color feature extraction, it uses color, morphology and feature vectors. The extracted feature have been used in classification process.[4]

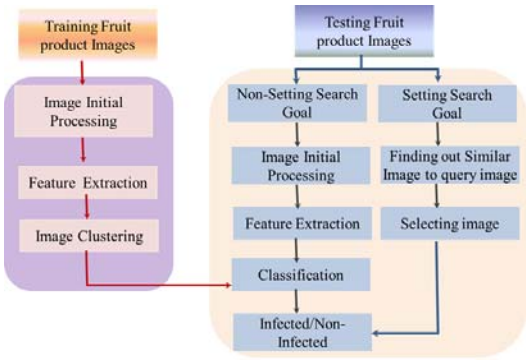

Figure 2. Proposed detection procedure

1) Color: Color is widely used visual feature and used to compare imaged. A color distribution histogram represents the distribution of color in image. While computing the pixels of different colors in an image, if the color space is large, then the color space is divided into certain number of small intervals. Each small interval is called casket. Then by counting number of pixels in each of the caskets it can get distribution color histogram of image and computes color histogram for all images in dataset and save in database which will be used for comparison of query image with dataset images. Usually, color histogram of two images is compared using sum of squared of differences. It builds three casket histogram for RGB color space[5].

2) Morphology: Morphology is used for extracting image components. The extracted images components are useful in description and representation of region shape such as boundary extraction. This corrosion concept is used which is fundamental operation of morphology for obtaining the boundaries of image. It get image boundary by subtracting eroded images from original image after applying this corrosion operation. It will be able to extract disease shape vector from normal fruit products.

3) Color Coherence Vector: This is a distribution histogram-based for comparing images that incorporates spatial information. Each pixel in a given color bucket is classified as either coherent pixel or incoherent pixel. Classification of each pixel is based on whether or not it is part of a large similarly-colored region. Coherent pixels are part of some sizable contiguous region, whereas incoherent pixels are not belongs to some sizable region. In order to compute Color Coherent Vector, first image is blurred. Then color space is ensured that there are only distinct colors in the image[6].

3.3 Clustering

Clustering technique is used for partitioning the training dataset according to their features. Clustering algorithm gives greater efficiency if the larger dataset is used. Clustering algorithm uses input as data set(fruit image) and output as cluster sets. The clustering procedure is as following steps.

- Initialize the cluster number, and pick initial centroid randomly.
- The squared Euclidean distance will be calculated from each image to each cluster is computed, and each object is assigned the closet cluster
- For each cluster, the new centroid is computed and each seed value is now replaced by the respective cluster centroid.
- Euclidean distance from an object to each cluster is calculated, and the image is allotted to the cluster with the smallest Euclidean distance

This process will be continue until image is in same cluster at every iteration.

3.4 Classification

Vector algorithm is used for training and classification. Support vector find out the linear separating hyper plane which maximize margin and can be used for classification. Vector algorithm uses a nonlinear data into higher dimensions. Dimension boundary separate tuple from one class to another.

The training time of vector is slow but they are highly accurate. After applying Vector algorithm clusters will classify into two classes with labels disease infected images and non-infected images. Infected image class consist fruit images affected by bacterial defect and non-infected image class includes normal fruit images[7].

Ⅳ. Conclusion

A web based image processing dependent approach for the bacterial defect disease for farm fruit is proposed. The input image is first initially processed, then its features are extracted on three parameters that is color, morphology, and color vector then, training and classification of the same are done. The proposed procedure provides two methods for the user to check the disease infection for the input fruit image with setting goal search and non-setting goal search. Experimental results display different accuracy levels of disease detection based on the input image quality and the stages of the disease.

The overall system accuracy is an important to be measured Thus, this procedure takes one step towards promoting the producers to do the smart farming and allowing them to take decisions for a better yield by making them capable to take the necessary preventive, corrective action on their farm product. This procedure can be improved with the new features incorporated to detect diseases for other fruits, increase dataset size to improve the overall system performance to detect diseases more accurately.

Acknowledgements

This research was supported by the ReSEAT program funded by the Ministry of Science, ICT and Future Planning through the National Research Foundation of Korea and the Korea Lottery Commission grants.

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