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An Improved Vegetable Disease Detection System Using Machine Inspection Technique

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ABSTRACT
Vegetables are most necessary ingredient for any nutritious diet. Before using them, certain care should be taken, to make sure it is free from any form of diseases and infections. Generally, the disease features of any vegetables are extracted manually. Automatic detection of disease by machine inspection can be of great benefits. This paper discuss on different methods of identification of diseases in vegetables by using various feature extraction techniques and also various classification methods. Vegetable disease identification is a system which takes a RGB image of vegetable as an input , segmentation is applied, then feature are extracted from it. Finally classification of image takes place which gives a result whether the vegetables are defected or not defected.

Keywords:- Vegetable disease, Machine Inspection

I. INTRODUCTION

Image processing is any form of signal processing for which the input is an image. Images which get stored in digital form are called as digital images. For the processing of image, it has a set of Image Processing Tool Box. Image Processing Toolbox provides a large set of standard algorithms, applications for image processing, analysis, visualization and algorithm development. It can also perform image analysis, segmentation of image, enhancement of image, noise reduction in image, and geometric transformations. Toolbox supports functions for multicore processor, GPUs and generation of C code

Fig1:Image processing pipeline

Acquisition: Creation of digital image.
2. Processing: Enhancement or other processing.
3. Archival: Storing the image.
4. Transmission: Exchange of digital image data.
5. Display: Visualization of digital image.

The Main objective of Automatic detection of disease in vegetables is to help the farmer in identifying the diseases in the vegetables at early stage. It provides different methods that are used to study vegetable disease detection using image processing methods.

The optimized approach for detection of vegetable diseases based on machine learning that provide a portion of information to identify and treat the diseases. Automatic detection of vegetable disease is to identify the reactions of diseases as right on time, as soon as they are visible in developing natural products. The purpose of this topic is to discuss various techniques in image processing for feature extraction and classification. The system is provided with various vegetable images. The symptoms of diseases found on vegetables differ in color, shape, and size according to the type of virus affecting the vegetables. To solve the problems of feature extraction Machine vision techniques are used. It analysis the features such as colors, size, shape, and surface texture.

II. PROPOSED WORK

Existing one is an approach for identification of infection in vegetable is based on human visual observation by expert is very difficult. Consulting experts is too expensive and time consuming.

Automatic identification and classification of vegetable disease based on particular symptoms by machine inspection is very useful for farmers, gardeners, research scientists. The system can detect the diseases in early stages. It has the advantage in monitoring large quantity of vegetables. The different phases of vegetable disease identification process are depicted in the following figure:

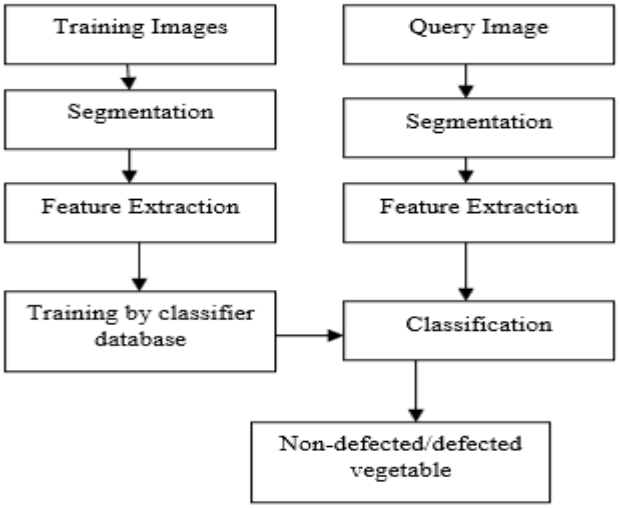

Fig2:Workflow diagram

whether the vegetable is defected/Non-defected is identified by proposed method. The infections detection and classification is mainly consists of three steps. The left block operation shows the flow of operation in database that contains various categories of images. The right block operation shows the fundamental operations of the vegetable infection identification in image processing. The first step is to prepare the test query image of vegetables. The tested image is segmented by using segmentation techniques. Third step is feature extraction that is to extract the features of the image, there are different features in the image depend on the requirement. Finally, classification is classifies the vegetable (query) image is infected or not by using various classifier

.III. FEATURE EXTRACTION TECHNIQUES

The process of extracting appropriate information from the input image in order to describe a set of data is called feature extraction. Feature Extraction is used to validate the accuracy and efficiency of image. There are various techniques to extract feature from image. Some are:

Global Color Histogram (CGH): Most straight forward approach to deal with encoding of the information present in the image. It is an arrangement of ordered values, for each particular color, representing probability of a pixel being of that color. CGH is used for feature extraction.to extract the color histogram value from given image. The color histogram for an image is establishing by quantizing the colors within the image and counting the number

of pixels for each color. Then we take a summation of that and also find the mean and standard deviation from the color histogram. And finally result is stored in 1D array.

Color Coherence Vector (CCV): They define color coherence as the degree to which image pixels of that color are members of a large region with image pixels of that color are members of a large region with homogeneous color. These regions are referred as coherent regions. Coherent pixels are belongs to some sizable contiguous region, whereas incoherent pixels are not. It is efficient and insensitive to small changes in camera viewpoint. But color histograms lack of spatial information, so image with very different appearance can have a similar histogram.

Local Binary Pattern (LBP): LBP is one of the popular texture classification features. LBP is used encode the pixel difference between the central pixel and the neighboring pixel on a circle of radius. As it considers the pixel difference, LBP is robust to illumination and contrast variation. But it is sensitive to small changes in camera viewpoint. Local Binary Pattern has also been adapted by other applications such as face recognition, shape localization and dynamic texture recognition.

Gray Level Co-occurrence Matrix (GLCM): The most commonly used methods for texture feature classification is Gray level Co-occurrence Matrix (GLCM). The spatial distribution of the gray level in the texture image is extracting certain properties. Gray Level Co-occurrence Matrix (GLCM) is one of the simplest approaches in two-point statistical features extraction techniques. GLCM is calculated as a second-order histogram. Contains information about the frequency of occurrence of two neighboring pixel combination in a gray image. GLCM have mainly 3 important features Contrast, Correlation, and Homogeneity. It is applicable to different color space for color occurrence matrix. But it requires lot of computation and is not invariant to rotation and scaling.

CLASSIFICATION TECHNIQUES An important part of image analysis is identifying groups of pixels having similar spectral characteristics and to determine the various features. This form of analysis is known as classification. Classification employs two phases of processing: Training – Create unique description based on characteristic properties of image (face). Testing – Match the description and classifies the image (face). Various classification techniques are:

Artificial Neural Network (ANN): ANNs are popular machine learning algorithms that are in a extensively used in recent years. Multi-Layer Perception (MLP) is the common form of ANN that updates the weights through back propagation during the training. There are other variations in neural networks, which became popular in texture classification Back propagation neural network. A typical back propagation network consists of three parts: input layer, hidden layer and output layer. Three parts in turn connect through the collection weight value between nodes. Robust and user friendly and can handle noisy data. Well suited to analyse complex numbers. The main drawback is that it require large number of training samples hence it is time consuming.

Back Propagation Neural Network (BPNN): BPNN algorithm is used recurrent networks. Once trained a network, the neural network weights are fixed. It can be used to

compute output values for new query images which are not present in the learning database and is more accurate. This method is used for weight adjustment of training image database. The images are categorized and mapped to their respective diseases categories. The demerit of the BPNN is merging of training, learning and transfer function in datasets. This type of merging does not work for sizable datasets.

Support Vector Machine (SVM): One of the best observed learning algorithms is Support Vector Machine (SVM). SVM is high-dimensional spaces seeking an optimal hyper-plane to separate the each categories. SVM is used for decision making matrix. Here the vegetable image is infected or not decision is taken of the SVM classifier. It is suitable to work with high dimensional data, but it can work only with two classes.

Features	Classification	Average Accuracy (%)
Color+Texture	ANN	84
GCH+CCV	Multiclass SVM	97
Texture	BPNN	76.60
Color+GLCM	BPNN	88.58
LBP	-	60
Color, Texture and shape	Classifier Fusion	98.80

Table: Comparative analysis of various techniques

IV. CONCLUSIONS

Several feature extraction and classification in the field of detection of vegetable disease using digital image processing techniques has been outlined. Each and every technique has some advantages as well as disadvantages. Based on the requirement various features are extracted by using various feature extraction techniques. And also discussed the various classification techniques which is suitable for vegetable disease identification and classification.

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