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Fruit Quality Analysis Using GLCM Algorithm in Image Processing

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ABSTRACT: Nowadays, an identification system is needed in the food processing industries to boost the efficiency of production so as to meet up with demand in the society. Manual approach is often used in product grading and quality control, and this unfortunately could lead to uneven products, higher time expense, and fatigue by the human operators. Therefore, we propose in this project, an automatic system for classification of fruit whether it is healthy for production or not. Such a system is faster, accurate and also relieves the stress that an operator may have. Our system uses GLCM texture feature analysis to extract the features required for training and testing models namely support vector machine (SVM). A classification performance comparison is drawn between the different classification models, and the obtained experimental results indicate that such intelligent grading systems may be efficiently used in real life applications for similar tasks in food processing industries.

KEYWORDS: GLCM algorithm, SVM algorithm, Disease identification, Ripeness status , Gradinsystem.

I. INTRODUCTION

In order to improving fruits quality and production efficiency, reduce labor intensity, it is necessary to research non-destructive automatic detection technology. Fruit non-destructive detection is the process of detection fruits' inside and outside quality without any damage, using some detection technology to make evalution according some standard rules fig(2). Nowdays, the quality of fruit shape, default, color and size andso on cannot evaluate on line by the traditional methods. With the development of image processing technology and computer software, it becomes more attractive to detect fruits'quality by using vision detecting technology.

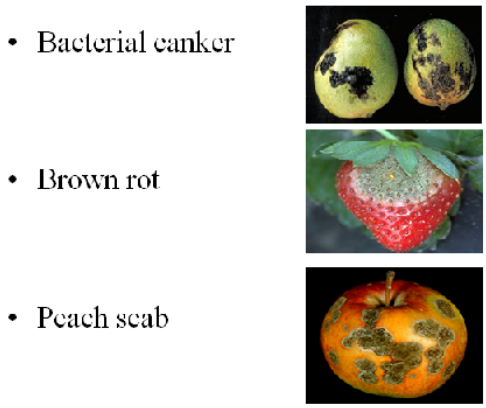

Figure (1): Disease caused in fruit.

At present, most exsting fruit quality detecting and grading system have the disadvantage of low efficiency, low speed of grading, high cost and complexity.So it is significant to develop high speed and low cost fruit size detection and grading system. In order to validate the proposed approach, we have considered the three types of the diseases in fruits; bacterial canker, peach scab and brown rot fig (1).

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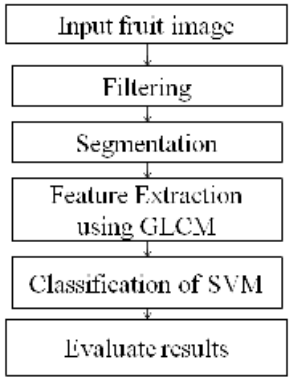

Figure(2);Block diagram.

1. IMAGE ACQUISITION

The RGB colour model is an additive colour model in which red, green and blue light are added together in various ways to reproduce a broad array of colours.The name of the model comes from the initials of the three additive primary colours, red, green and blue.In photography and computing, a grayscale or greyscale digital image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray , varying from black at the weakest intensity to white at the strongest.

Figure (3): Image acquisition.

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2. GRAY IMAGE:

Grayscale images are distinct from one-bit bi-tional black-and-white images, which in the context of computer imaging are images with only two colours, black and white (also called bilevel or binary images). Grayscale images have many shades of gray in between fig (4).

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Figure (4): Gray image.

Grayscale images are often the results of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g.infrared, visible light, ultraviolet, etc.),and in such cases they are monochromatic proper when only a given frequency is captured.But also they can be synthesized from a full colour image;see the section about converting grayscale.

3. FILTERING:

In image processing filters are mainly used to suppress either the high frequencies in the image,or the low frequency,i.e.enhancing or detecting edges in the image.

Figure (5): Filter.

The median filter is normally used to reduce noise in an image, somewhat like the median filter.However,i t often does a better job than the mean filter of preserving useful detail in the image.

4. SEGMENTATION:

This work present a segmentation of fruit based on color feature with k-means clustering unsupervised algorithm.we used colour images of fruit for defect segmentation.defect segmentation is carried out into two stages.

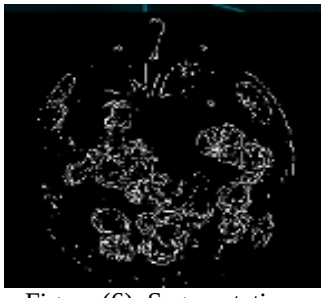

Figure (6): Segmentation.

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At first, the pixels are clustered based on their color and spatial features, where the clustering process is accomplished. Then the cluster blocks are merged to a specific number of regions.Using this two step procedure, it is processible to increase the computational efficiency avoiding feature extraction for every pixel in the image of fruits fig (6).Although the color is not commonly used for defect segmentation,it produces a high discriminative power for different regions of image.The experimental results clarify the effectiveness of proposed opproach to improve the defect segmentation quality.

5. FEATURE EXTRACTION

In GLCM matrix the relation between two adjacent pixels at a time is considered out of which one pixel is called as reference pixel and the other is called as its neighbour pixel. Now to calculate the texture information it requris a symmetricle matrix. A symmetrical matrix is made up of exactly similar parts or values on opposite sides of the diagonal.In the next step the GLCM is converted in to this form for futher processing.The GLCM is created by calculating how many times the pixel with intensity vale i ocuurs horizontally adjacent to a pixel with value j .Here we can specify the distance between the pixel value of interest and its neighbour which can be called as offset.Different offses and angles or directions around the pixels of interest can be calculated the GLCM.

ENERGY: Provides the sum of squared elements in the GLCM.Aslo known as uniformly or the angular second moment.

Energy: $\sum_{i,j} P(i,j)^2$

HOMOGENEITY: Measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal.

Homogeneity : $\sum_{i,j} \frac{1}{1+(i-j)^2} P(i,j)$

CONTRAST: Measures the local variations in the gray level co-occurrence matrix.

Contrast : $-\sum_{i,j} P(i,j) \log P(i,j)$

CORRELATION: Measure the joint probability occurrence of the specified pixel pairs.

Correlation: $-\sum_{i,j} \frac{(i-\mu)(j-\mu)}{\sigma^2} P(i,j)$

6.CLASSCIFICATION OF SVM

Another statistical classifier is SVM, which first non-linearly maps data to a high-dimensional space by kernels and then tries to find the hyper plane that separates data with maximum margin in that new space . Originallyproposedfor2-classproblems, SVM can be easily extended to multiclass problems by one-against-one or one-against all strategies, where the latter is used in this work. Several features are extracted using GLCM methodology. In this scenario only 6 features are taken to classify the AO. One is area and remaining textural features. The SVM classifier is employed to infect fruits in the images.

The selected features feed as input to SVM classification parameters and it classifies the normal and abnormal categories. Also the classification stage is applied to define the grade of fruits based on the defects occur on the surface. This procedure is carried out to differentiate the fruit diseases.

II. RESULT AND CONCLUSION

An image processing based solution is proposed and evaluated in this paper for the detection and classification of fruit diseases. The proposed approach is composed of mainly three steps. In the first step image segmentation is performed using k-means clustering technique. In the second step feature are extracted by using GLCM algorithm to identified the affected region of fruit and ripeness status of fruits.

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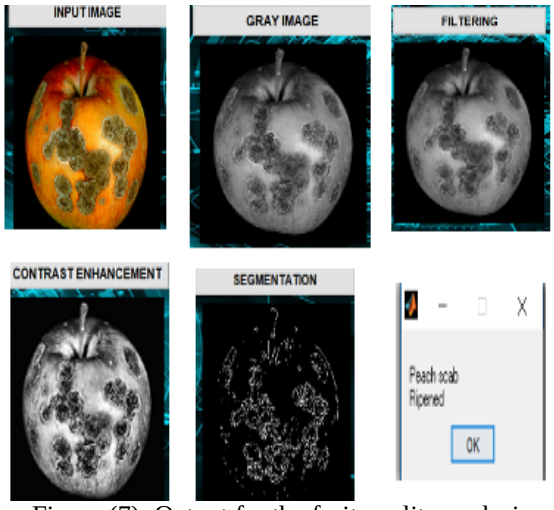

Figure (7); Output for the fruit quality analysis

In the third step training and classification are performed on a SVM algorithm. We have used three types of diseases namely: bacterial canker , peach scab and brown rot. Our experimental results indicate that the proposed system can significantly support detection and classification of fruit diseases. The fruit disease detection system is developed by using the Matlab application.

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