

A REVIEW ON FRUIT DETECTION AND GRADATION

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I. ABSTRACT

Grading and classification of fruits is based on observations and through experiences. The system exerts image-processing techniques for classification and grading the quality of fruits. Two-dimensional fruit images are classified on shape and color-based analysis methods. However, different fruit images have different or same color and shape values. Hence, using color or shape analysis methods are still not that much effective enough to identify and distinguish fruits images. Therefore, computer vision and image processing techniques have been found increasingly useful in the food industry, especially for applications in quality detection. Research in this area indicates the feasibility of using computer vision systems to improve product quality, the use of computer vision for the inspection of food has increased during recent years. This proposed work presents food quality detection system. The system design considers some feature that includes fruit colors and size, which increases accuracy for detection of roots pixels. Histogram of oriented gradients is used for background removal, for color classification support vector machine is used.

II. INTRODUCTION

Agriculture and Horticulture is one of the largest economic sectors in the world which plays the major role in economic development of India. But still in India, the traditional is used for inspection of fruits by human experts. Which results a wastage of time in the fields for checking the quality of the crops. In this Paper, an economic and safe way is used to analyze the fruit or vegetable quality which is based on color, shape and size. The most important physical property is fruit size while color corresponds to visual property. Hence, classification of fruit is very important and necessary in evaluating agricultural produce for meeting quality standards and increasing the market value. Which helps in planning, packaging, transportation and marketing operations. If the classification and grading is done through traditional techniques, the process will be very slow and may cause error prone. The labors classify fruits and vegetables based on color, size, etc. if these quality measures are mapped into automated system by using suitable programming language then the work will be faster and error free. In recent years, computer machine vision and image processing techniques have been found increasingly useful in the fruit industry, especially for applications in quality inspection and shape sorting [1].

Color and shape characteristics of fruits are decisive for visual inspection. An efficient autonomous system for fruit sorting must be able to adequately identify both parameters. Shape of fruits can easily be obtained from a digital image using classical techniques for image processing. However, color identification involves many physical and psychological concepts, asking it difficult to properly model and process color in an image. There are wide varieties of color systems present for the grading of fruits based on colors. There are some techniques like Fuzzy logic, Neural Network; Based on Color Histogram, Genetic algorithm etc. Software development is highly important in this color classification system. The entire system is designed over MATLAB software to inspect the color and size of the fruit. Color of the fruit is very important in classification but since due to the similarity of colors between some fruits, the size also helps in solving this kind of problems. The color and size-based classification involves extracting the useful information from the fruit surface and classify it to the respective type. Nondestructive quality evaluation of fruits is important and very vital for the Food and agriculture industry. This project presents food quality detection system.

The system design considers some feature that includes fruit colors and size, which increases accuracy for detection of roots pixels. Histogram of oriented gradients is used for background removal, for color classification support vector machine is used. The main idea behind the histogram of oriented gradient is that the local appearance and shape of object in an image can be described by the intensity distribution of gradients or direction of the contours. At present, most existing route quality detection and grading system have the disadvantage of low efficiency, low speed of grading, high Cost and complexity. Image processing of course solution for the automated size trading to provide accurate, reliable, consistent and quantitative information apart from handling large volumes, which may not be achieved by human grades. The hardware prototypes also created by using open CV ultra-low power micro controller [2].

III. LITERATURE SURVEY

John et. al. [3] In this work an automated grading system has been developed using image processing, which mainly focus on internal and external defects of a fruit. The system is having total no. of six CCD cameras. From that two of the cameras are mounted on the top, two on the right and another two cameras mounted on the left of the fruit. X-ray imaging is used for inspecting the biological defect. Image processing is used to analyze the fruits features: size, shape, color and the grade is determined based on the features. The developed system is built from a combination of advanced designs, expert fabrications and Automatic mechanical control.

Frances et.al. [4] Accurate weighting of pieces in different sorts of conveyor belt or articulated Chains at fast speed is a key feature in many industrial processes. This paper presents a procedure to improve the performance, whether increasing speed or accuracy. The proposed solution includes a signal pre-processing based on a previous ARMA modelling and of the weighting Subsystem response plus a power line noise removal and a simple sample averaging in the plateau. The procedure has been tested of line using aerial signals acquired from a prototype machine.

Wong et. al. [5] As a smart consumer, there is always a need for use to identify the quality of the goods we want to buy, such as trying to choose the best mango amongst the others. With the popularity of the mobile phone and the maturity in wireless messaging technology, it is no more a dream for us to get the information what we want anywhere, anytime. This paper proposes a new mobile data service that Includes signal processing service via MMS i.e. multimedia messaging service and SMS i.e. short messaging service. This paper contains the study, design, construction and analysis of a fully automated consumer-based wireless prototype system with interconnect the signal processing tools with consumer using MMS and SMS technology. The system with signal processing application processes the information sent by the consumer using MMS. Then it sends by the grading result to the consumer using SMS.

Tajul Rosli et al. [6] proposed and implemented methodologies and algorithms that utilize digital fuzzy image processing, content predicated analysis, and statistical analysis to determine the grade of local mango production in Perlis. The main contribution for this study is on a design and development of an efficient algorithm for detecting and sorting the mango at more than 80% accuracy in grading compared to human expert sorting. This work proposes a mango grading technique for mangoes quality classification by fuzzy image processing. The method has been implemented using MATLAB language and is suitable for various fuzzy environments. Main advantage of method is the use of fuzzy inference engine without depending on the human expert.

Z. May et al. [7] works on detection of ripeness of oil palm fruit. In this paper, a new system of automatic grading system for oil palm fruit is developed using the RGB color model and artificial fuzzy logic. This

automated system uses a computer and a CCD camera to analyze and recognize images. The software code is developed for the image processing part like the segmentation of colors, the calculation of the mean color intensity based on RGB color model and the decision-making process using fuzzy logic technique to train the data and make the classification for the oil palm fruit. The software code generated has been able to classify the three different classes of oil palm fruit automatically with 86.67% of overall accuracy.

Suzanawati Abu et al. [8] proposed and implemented Automated Mango Fruit Assessment Using Fuzzy Logic Approach. This work developed a new method of automated mango Size and grade assessment using RGB fiber optic sensor and fuzzy logic approach. They reported that this technique is able to classify the mango into small, medium and large categories. The calculation of maximum, minimum and mean values based on RGB fiber optic sensor and the decision making development using minimum entropy formulation to analyses the data and make the classification for the mango fruit. The automated mango grading system using fuzzy logic achieved 77.78% accuracy in overall categories.

Monika Jhuria et al. [9] proposed image processing for smart Farming: detection of disease and fruit grading. artificial neural network is used developed algorithms and they can be successfully detect and classify the tested disease and get better result for color and morphology they reported 90 % result as compared to texture. And also he developed mango grading system depending on weight using mathematical formula weight of mango calculated classify in to 5 different grades.

Nur Badariah et al. [10] proposed an intelligent fruit sorting system using Digital Image Processing and Artificial Neural Networks. For these work apples, bananas, carrots, mangoes and oranges fruits are used. Morphological and color characteristics are used to extract Seventeen Features. Introduction of color features has significantly improved the performance of the system. The classification efficiency has improved to between 79 - 90%.

Brendon J et al. [11] proposed the image processing, and neural network classification methods like neural network classifier using wavelets applied to the task of recognizing the pest that causes the damage to apple fruits and leaves in orchards. Author has obtained the good classification rate on a standard neural network without any special alteration to the learning algorithm offers 95 % recognition rate.

Siti Sofiah et al. [12] implemented a simple color identification algorithm using a Neural Network technique and applied to the system to evaluate the ripeness of a banana. The captured image of the banana is resized and its RGB color components are extracted. The color components of the resized images are rescaled using a simple heuristic method. Further, a histogram for the rescaled image is obtained and used as a feature vector to identify the ripeness of the banana. They reported 96% accuracy using Neural Network classifier with the error back propagation model for ripeness classification is used.

Yizhong Wang et al. [13] proposed a non-destructive and evaluating method for fruits based on color recognition. The color images of various fruits were captured and RGB histograms are used as quality

features for recognition. A three-layer BP neural network is developed wherein its input and output were the RGB histograms and evaluating results, respectively.

Devrim Unay et al. [14] proposed a technique for apple defect detection and quality classification using MLP neural networks. Here, the analysis of a quality classification system for „Jonagold and „Golden Delicious apples were represented. Later, texture, color and wavelet features are extracted from the apple images. Principal components analysis was applied on the extracted features and some preliminary performance tests were done using single and multi-layer perceptrons. The best results were 89.9 and 83.7 per cent for overall and defected pixels of 6 defected images.

Devrim unay et al.[15] proposed computer vision based system to automatically sort apple. Artificial neural network used for segmentation. 2- Layer, back-propagated network of perceptron neurons (BPNN), which makes binary decision (defected-healthy) for each pixel introduced. Total thirteen features are extracted from each fruit. Linear Discriminant Classifier (LDC), Nearest Neighbor Classifier (k-NN), Fuzzy Nearest Neighbor Classifier (fuzzy k-NN), Adaptive Boosting (AdaBoost), Support Vector Machines (SVM), classifiers were tested for this work. Highest recognition rate is observed with ad boost and support vector machines classifier by 90.3 %.

Patel, Jain and Joshi [16] proposed the fruit detection system which helps to improved multiple features-based algorithm. To detect the fruit, an image processing algorithm is trained for efficient feature extraction.

Arivazhagan, Shebiah, Nidhyanandhan and Ganesan [17] proposed an efficient fusion of color and texture features for fruit recognition. The recognition is done by the minimum distance classifier based upon the statistical and co-occurrence features derived from the wavelet transformed sub-bands.

Bindu Tiger and Toran verma [18] presented apple recognition techniques for normal and infected. Proposed method classifies and recognizes apple images based on obtained features values by using two-layer feed-forward network, with sigmoid hidden and output neurons. This work represents the MATLAB 7.8.0 software and the recognition of generated signals by artificial neural network technique. Sandoval, Prieto and Betancur [19] have proposed a machine vision-based classification system to sort coffee fruits (cherries) according their ripeness stage is presented. Eight categories were defined and a Bayesian classifier was implemented using a set of 9 features which include color, shape and texture computed on an image of the fruit.

IV. PROPOSED METHODOLOGY

Nondestructive quality evaluation of fruits is important and very vital for the Food and agriculture industry. This project presents food quality detection system. The system design considers some feature that includes fruit colors and size, which increases accuracy for detection of roots pixels. Histogram of oriented gradients

is used for background removal, for color classification support vector machine is used. The main idea behind the histogram of oriented gradient is that the local appearance and shape of object in an image can be described by the intensity distribution of gradients or direction of the contours. At present, most existing route quality detection and grading system have the disadvantage of low efficiency, low speed of grading, high Cost and complexity. Image processing of course solution for the automated size trading to provide accurate, reliable, consistent and quantitative information apart from handling large volumes, which may not be achieved by human grades. The hardware prototypes also created by using open CV ultra-low power micro controller.

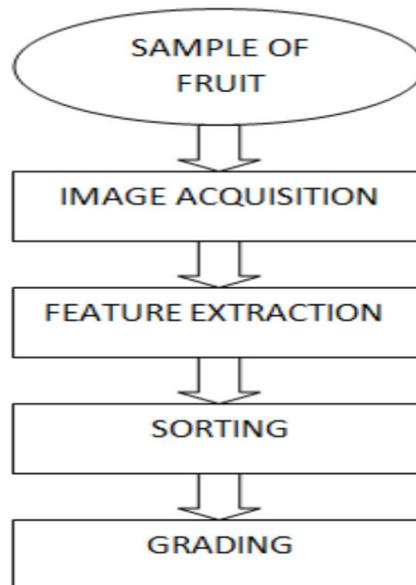


Fig. 1: Flow chart of sorting and grading process

This proposed automated system is designed to overcome the problems of manual techniques. The system consists of several steps like feature extraction, sorting and grading. It is designed to combine three processes as shown below in a flow chart. Features like color of fruit, shape of fruit and size of fruit are extracted. Size features are extracted in height and width. Extracting the size of fruit is called grading. The flow chart of sorting and grading process is given in the above fig. 1.

V. CONCLUSION

In this paper, different image processing-based classification techniques for fruit grading and sorting system is reviewed. Machine vision-based fruit grading systems are capable of replacing labor work for inspection of fruit grading. Different researchers used algorithms for image segmentation, feature extraction, training and classification of fruit disease. Out of morphological, color and texture feature, morphological gave

highest accuracy rate. In color model, HIS (Hue, Saturation, Intensity) color model is commonly used for grading because it is related to human perception. In machine learning techniques, SVM (Support Vector Machine) gave highest accuracy, but Fuzzy gave lowest accuracy rate result, but it is easy to implement. Hence, using color or shape features analysis methods are still not effective enough to identify and distinguish fruits images. Therefore, computer vision and image processing techniques have been found increasingly useful in the food industry, especially for applications in quality detection.

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