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IMAGE PROCESSING BASED ON TREE FRUIT IDENTIFICATION AND COUNTING SYSTEM

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Abstract:

The main objective of this project is to identify the fruits on tree from given input image. Here the K-means algorithm plays an important role to identify the fruits. In current system on tree fruits are found if the full part of fruit present in an input image otherwise it will miss the fruit to identity and count. But here the code has been developed to find all the fruits present in an image that may be fulfilled or half shaped. The harvesting robots play a vital role in agriculture. The first major process of a harvesting robot is to distinguish and focus the fruit on the tree. The K-means algorithm is one of the Machine learning algorithms which can be used in fruit recognition system. This project aims to develop a machine vision system with K-means clustering algorithm to locate the on tree fruits, which can be implemented in a harvesting robot. The fruits on tree are detected using K-means based segmentation methods then the results of count and identification is found to be accurate. Digitized images of on tree fruits along with its background are selected from the Google Images in order to find a fruits in each image and to locate its exact position and providing proper count of fruits.

Keywords — Algorithm, fruit recognition, Images, Identification.

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I. INTRODUCTION

The fruits recognition system could be applied as an image contents descriptor which is able to describe the low level visual features or contents of the fruit images for the system. The most popular analysis techniques that have been used for both recognition and classifications of two dimensional fruit images are gray scale based analysis methods. However, different fruit images may have similar or identical color and shape values. Hence, using color or shape features analysis methods are still not robust and effective enough to identify and distinguish fruits images. Therefore, a recognition approach for fruit images is proposed, which gray scale methods in order to increase the accuracy of the recognition result. System recognizes provided query fruit image by extracting features values, including color, shape and size and computing extracted features values to measure the distance between the computed features values of query image with the stored standard features values of every fruit example. Fruit Recognition System is an attractive and valuable system that has been developed based on various motivations. Hence,

proposed system is developed to research on pattern recognition system, especially on fruits spherical pattern recognition and classification system. In this system, a pattern recognition system is designed that is combination of three different features together, including color, shape, and size to perform sequential pattern classification.

This method can be applied as a useful tool for other object classification and recognition problems. The software solution is able to serve as a useful tool in a variety of fields, such as education, image retrieval, and plant science research. It can be applied for educational purpose to enhanced learning, especially for small kids and Down syndrome persons, of fruits pattern recognition and fruits features classification based on the fruit recognition result. It can be used as a fruit recognition system in grocery store to automate labeling and computing the price. The fruits recognition system could be useful for the plant scientists. The shape and size values of the fruit images that have been computed could assist the plant scientist to do further analysis on variation in morphology of fruit shape in order to help them understand the genetic and molecular mechanisms of the fruits.

II. RELATED WORK

In agriculture science, automation increases the quality, economic growth and productivity of the country. The export market and quality evaluation are affected by assorting of fruits and vegetables. The crucial sensory characteristic of fruits and vegetables is appearance that impacts their market value, the consumer's preference and choice. Although, the sorting and grading can be done by human but it is inconsistent, time consuming, variable, subjective, onerous, expensive and easily influenced by surrounding. Hence, an astute fruit grading system is needed. In recent years, various algorithms for sorting and grading are done by various researchers using computer vision. This paper presents a detailed overview of various methods i.e. pre-processing, segmentation, feature extraction, classification which addressed fruits and vegetables[1] quality based on color, texture, size, shape and defects. In this paper, a critical comparison of different algorithm proposed by researchers for quality inspection of fruits and vegetables has been carried out.

The market prices are determined by such inspections and, also, the ‘‘best-if-used-before date”. The trained human investigators have done the quality inspection by feeling and seeing. This method is significantly inconsistent, fickle and decisions are seldom same among investigators. In this type of environment, the analysis of fruits and vegetables for several aspect criterions is a continual task; machine vision systems are best befitted for conventional analysis and quality assurance. In agriculture, computer vision system and image processing is readily growing research area which is a significant analyzing technique for pre to post harvesting of crops[2].

Efficient locating the fruit on the tree is one of the major requirements for the fruit harvesting system. This paper presents the fruit detection using improved multiple features

based algorithm. To detect the fruit, an image processing algorithm is trained for efficient feature extraction. The algorithm is designed with the aim of calculating different weights for features like intensity, color, orientation and edge of the input test image. The weights of different features represent the approximate locations of the fruit within an image. The Detection Efficiency is achieved up to 90% for different fruit image on tree, captured at different positions.

The input images are the section of tree image. The proposed approach can be applied for targeting fruits for robotic fruit harvesting. Fruit detection system is primarily developed for robotic fruit harvesting. However this technology can easily be tailored for other applications such as on tree yield monitoring, crop health status monitoring, disease detection, maturity detection and other operations which require vision as a sensor[3]. For fruit harvesting system, it is very necessary to detect the fruit on the tree more efficiently. The vision based fruit harvesting system for the fruit detection basically depend on the contribution of different features in the image. The four basic features which characterize the fruit are: intensity, color, edge and orientation. This paper proposes an efficient multiple features based algorithm for the fruit

detection on tree. Color features in image could be successfully used to segment defects on "Jon gold" apples are demonstrated in[4]. Texture features are found to contain useful information for quality evaluation of fruit and vegetables, e.g., classification of grade of apples after dehydration with the accuracy of 95%. Color and texture features are used to locate green and red apples. Combining many features and classifiers, where all features are concatenated and fed independently to each classification algorithm. The fusion approach is validated using the multiclass fruit vegetable categorization task in a semi controlled environment, such as a distribution center or the supermarket cashier.

This paper shows the importance and necessity of intelligent identification technology of fruit detection[5]. (Methods) We enumerate several state-of-the-art methods and illustrate the specific application in the process of recognition, by selecting eleven highly related literatures. (Results) On this basis, we make an analysis and comparison on the advantages and disadvantages of each approach. This summary can be beneficial to researchers who are interested in fruit identification.

With the vigorous development of fruit industry, the use of effective technical methods to classify all kinds of fruits is a general trend. As we all know, manual checks not popular any more, we should apply pattern recognition methods to deal with this problem. The emergence and development of pattern recognition technology is based on the people who use visual and auditory to identify various information. Pattern recognition is a state-of-the-art technique to process complex information automatically using computer and mathematical theory. For these reasons, the researchers use pattern recognition as an intelligent technology to replace and even expand human daily mental activities. Pattern recognition is used in many domains, such as remote sensing, multiple sclerosis detection, Alzheimer's disease identification, cerebral micro bleeding detection, breast cancer classification, tea category identification, brain image classification, etc. The methods covered in this paper are applied on analyzing the category information of the fruit. We focus mainly on fruit detection and compare the accuracy of each approach.

We searched the newly published literatures related to fruit identification in several important academic databases: Web of Science, Elsevier, Springer link, IEEE, Engineering Village, etc. Eleven literatures are selected and described below. It is presented a novel method that on the basis of multi-feature fusion to identify five kinds of fruits. The authors take advantage of global histogram, LBP, HOG and Gabor LBP for selecting the optimal block. Before that it was proved that the four feature extraction methods when used together have the highest accuracy. Finally, the result achieves 81.35% using Lib SVM. This has put forward a novel approach to classify fruits..

III. EXISTING WORKS

In agriculture sector the problem of identification and counting the number of fruits on trees plays an important role in crop estimation work. At present manual counting of fruits is carried out at many places. Manual counting has many drawbacks as it is time consuming and requires plenty of labors. The automated fruit counting approach can help crop management system by providing valuable information for forecasting yields or by planning harvesting schedule to attain more productivity. This work presents an automated and efficient fruit counting system using computer vision techniques.

IV. PROPOSED SYSTEM

Several fruit recognition techniques are developed based upon K means algorithm. However, different fruit images may have similar or identical color and shape values. Hence, using color features and shape features analysis methods are still not robust and effective enough to identify and distinguish fruits images. A new fruit recognition system has been proposed, which color based segmentation is ignored and grayscale conversion has overlapped. The proposed method classifies and recognizes fruit images based on obtained feature values by using binary conversion technique. The proposed fruit recognition system analysis classifies

and identifies fruits successfully up to 90% accuracy. This system also provides numbers of fruits count.

The proposed system uses minimum Euclidean distance based segmentation technique for segmenting the fruit region from the input image. Further circle overlaying is done on the fruit region and in the last fruit is counted on the basis of the center position of the fruit regions. This proposed system is correctly detecting and counting the fruits on the test images.

V. EXPERIMENTAL RESULT

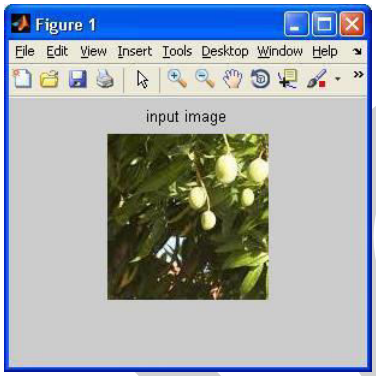

Figure (1)

The above figure shows the sample input image given by user through mat lab. It has a control to read and display specified image from specified location. We can see the exact input image without any changes. The input can be taken in any image format. It will show the actual image before showing the output to the users. Now the input image is ready for predicting the fruits present in it

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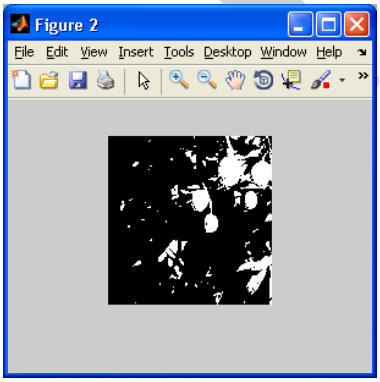


Figure (2)

Figure (2) shows the binary conversion output of an input image. A binary image is one that consists of pixels that can have one of exactly two colors, usually black and white. Binary images are also called bi-level or two-level. This means that each pixel is stored as a single bit i.e., a 0 or 1. The names black-and-white, B&W, monochrome or monochromatic are often used for this concept, but may also designate any images that have only one sample per pixel, such as grayscale images. In Photoshop parlance, a binary image is the same as an image in "Bitmap" mode.

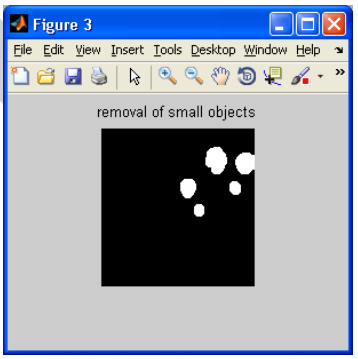
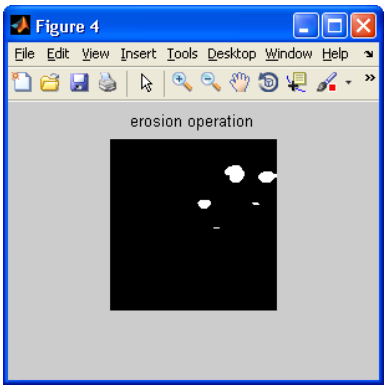


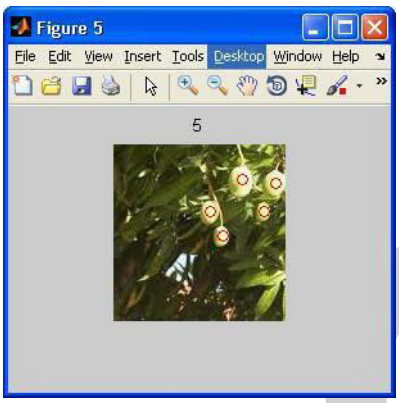
Figure (3)

This process removes all the small objects presents in binary image. Pixels are connected if their edges touch. Two adjoining pixels are part of the same object if they are both on and are connected along the horizontal or vertical direction. Pixels are connected if their edges or corners touch. Two adjoining pixels are part of the same object if they are both on and are connected along the horizontal, vertical, or diagonal direction.



Figure(4)

Erosion is one of two fundamental operations (the other being dilation) in morphological image processing from which all other morphological operations are based. It was originally defined for binary images, later being extended to grayscale images, and subsequently to complete lattices. The erosion operation usually uses a structuring element for probing and reducing the shapes contained in the input image.



Figure(5)

In mathematics and physics, the centroid or geometric center of a plane figure is the arithmetic mean position of all the points in the figure. Informally, it is the point at which a cutout of the shape could be perfectly balanced on the tip of a pin. The definition extends to any object in n-dimensional space: its centroid is the mean position of all the points in all of the coordinate directions. While in geometry the word center is a synonym for centroid, in astrophysics and astronomy, the center is the center of mass of two or more bodies that orbit each other. In physics, the center of mass is the arithmetic mean of all points weighted by the local density or specific weight. If a physical object has uniform density, its center of mass is the same as the centroid of its shape.

VI. CONCLUSION

The new system eliminates the difficulties in an existing system. It is developed by using Matlab as front end for an effective image processing. The system is very fast and any image format can be viewed or retaken at any level. This research work is very particular in reducing the work and achieving the result. It will reduce fruit recognition time than existing system. The user can easily understand from graphical output representation. This work will support for the future development. The research work has covered almost all the requirement. Further requirements and improvements can easily be done since the coding in mainly structured or modular in nature. Improvements can be appended by changing the existing modules or adding new modules. Several areas to be developed in future, so the application must be upgraded for the new ones required and it is possible to modifications according to new requirements and specifications.

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