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Shelf-Life Estimation of Perishable Fruits in Cold Storage using Image Processing Techniques

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Abstract*— The base paper work shows that the fruits are merely identified by their shape and color based features. However, the algorithm does not support of there is any ripening issue or any infection due to the disease. This leads to an incomplete picture of the fruit condition. If the algorithm is enriched by the complete information about the fruit then it can be a fruitful report that will help in segmenting the fruits into different grades of quality and therefore costing can be done as well in the same accordance. This problem has been considered in the proposed research work. Main aim of the research is to develop a new and efficient algorithm for identify the quality of fruits. The goal will be achieved through the attainment of following objectives: Fruit quality extraction in terms of its shape, size and ripen stage, Fruit stage with respect to any disease, Penetration of disease into the fruit and Final fruit quality. A k-means clustering for color extraction and statistical features like area, radii and perimeter are used for estimation of fruit quality.

Keywords*— Thresholding, Image Enhancement, Otsu Algorithm, Fruit Grading

I. INTRODUCTION

It is very much required to estimate the shelf-life of fruits stored in cold storage so that before the rottening starts, the fruits could be cleared to market for consumption. Normally it is always not possible to adjudge the fruit quality individually to each rack in the cold storage, for, a vision system is required that could acquire the images of the shelf containing fruits and send the same to the monitor. However, images sending to monitor is not sufficient. Rather, an algorithm is required that could process the images and tell the quality of the fruits on-line.

In the proposed work, a noval algorithm is presented that can estimate the storage life of the fruits under scanner and present quality to the storage manager who can take the required action to proceed

.The algorithm's accuracy primarily depends upon the image acquisition system so that no surrounding noise due to illumination is not entered into the image that may lead to wrong results. Further, the acquired images are pre-processed to enhance the vision and exposed to feature extraction process, on the basis of which the shelf-life is computed.

II. RELATED WORK

Human Problem can be easily solved by using Technology. their is rise in the agribusiness after adopting the Information technology (IT) in agronomics. For quality analysis on color appearance of fruits, an open planning intelligent systems are developed. [1]

Agronomist and food production industry in whole world should carry out necessary process for identification of ripen fruits on the bases of their color, texture. Existing techniques mainly comprises manual inspection, which leads to inaccurate classification, which in turn would cause economical losses. [2]

The capability to analyzing the fruits on the bases of their quality in the food production, is the most important in the realization of fruit categorize machine in order to decrease the human task and also lengthy. [3]

Today, aboard commerce has rise intensely in many countries. In large amount fruits are imported from one nation to the other nations such as oranges, apples etc. Recognition of defected fruit, manual is very time consuming. This research gives a defect segmentation of fruits based on color. Color images (RGB) of fruits for defect segmentation. Segmentation of defects is carried out into two stages. At first, on the bases of colour and spatial features the pixels are clustered. [4]

For food and agronomics industry non destructive excellence estimation of fruits is very essential. The food products in the marketplace must assure the customer preference. Grading of fruits is carried out primarily by sight analysis using size as a particular quality aspects. [5]

In this study , the technique is proposed to detect orange on tree using image processing techniques for developing software for an auto-orange collector robotic system, Computer vision used for fruit detection based includes some problems..[6]

Content of carbohydrate in meal of diabetic patients should be estimated by computer vision-based food recognition. For identification and optimization of components involved in the bag-of-features an extensive technical investigation was conducted, as well as for corresponding parameters the estimation.[7]

To cover the local market requirements and for exporting high quality of fruits to foreign markets Hass-variety-avocado farming has become an important economic activity in Colombian agronomics. To increase efficiency during harvesting and transportation and storage many regions in Colombia where Hass variety is found needs to be improved. [8]

Wireless image-sensor node are implemented to take images of plagues that attacks fruits and destroy them. For suitable treatment in case of infection and to create the database of plague population these images are used. Wireless sensor networks are appropriate for implementing such relevance however the knowledge is definitely trained by money-making constraints and the tendency is to use low-cost marketable nodes with constrained hardware resources..[9]

In present paper, maturity level and quality of fruits is graded by a machine vision based scheme. The fruit used in the study is mango. Visual inspection done by the human causes the some problems, such as maintaining and accuracy, and this task is also time consuming and labour demanding process.[10]

In this paper to evaluate the quality the of coffee a system is developed using an algorithm which is based on the retinex theory called multi-scale retinex with color restoration (MSRCR).[11]

In this project image processing techniques are applied to check the maturity of oranges by identifying their physical characteristics to determine their ripen stage .Using benchmark ,with standard CODEX , Oranges varieties and qualities are analysed. [12]

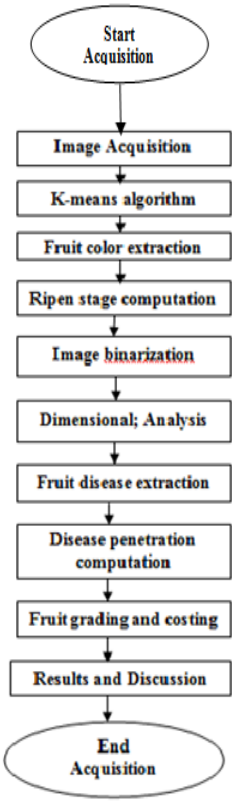
This paper proposes, colour and texture features of processed gross berry using image processing are categorized using non-destructive quality evaluation method. Russia is one of the vital gooseberry producers in North Asia, than U.K, Poland Germany, India etc, but analysing of fruit in some area is still done by human which is boring and faulty..[13]

The Study aims to detect the quality of glass bottles by visual inspection. The production of glass products are increasing day by day ,Human inspection for managing the product quality it is very difficult , Because naked eye cannot identify of different defects.[14]

III. ALGORITHM

The basic method for extracting the Fruit data is divided into following steps

- Image Acquisition in RGB format
- Fruit color extraction using k-means clustering
- Ripening stage computation based on fruit color
- RGB to gray scale conversion
- Image Enhancement
- Any abnormal color formation that can lead to fruit disease identification
- Penetration of disease computation
- Location of disease identification
- Image Thresholding
- Image size – dimensional analysis in terms of size and figure aspect
- Fruit grading and costing



The fruits images are grabbed using the Nikon Colpix (14 MP) digital camera. The acquired images are in jpeg format i.e. 24-bit color images. They are converted to gray scale image i.e. in 8-bit color format. Further, the images are enhanced using the histogram equalization technique and binarized using the Otsu algorithm. The binary images are analysed dimensionally as well as statistically for feature extraction. A decision based on features range is inference out based on certain criteria for the quality of the product/food.

IV. RESULTS AND CONCLUSIONS

The proposed work is extremely helpful in shelf life computation of the fruits in cold storage while the online estimation of the fruits could be estimated so that the fruit can be brought to the market before the quality starts deteriorating in cold storage. This also helps in estimating the shelf life f the fruits. The proposed algorithm is quite useful in the grading or monitoring of fruits that have short life like banana.

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