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FRUIT QUALITY DETECTION USING OPENCV/PYTHON

Miss. Supriya V. Patil[1], Miss. Vaishnavi M. Jadhav[2], Miss. Komal K. Dalvi[3], Mr.B.P.Kulkarni[4]

[1,2,3] Student, Department of E&TC Engineering, Shivaji University, PVPIT Budhgoan,416304,Maharashtra,India.
[4]Professor, Department of E&TC Engineering, Shivaji University, PVPIT Budhgoan, 416304, Maharashtra, India.

Abstract - *This paper presents the Computer Vision based technology for fruit quality detection. Use of this technology is increasing in agriculture and fruit industry. Computer vision systems provide rapid, economic, hygienic, consistent and objective assessment. One of the important quality features of fruits is its appearance. Appearance not only influences their market value, the preferences and the choice of the consumer, but also their internal quality to a certain extent. In this paper, tomato fruit is used for the result. There are many different types of tomatoes, in this project rishika 225 tomato species has taken which is available in any season.*

Key Words: **Computer Vision, Python, Fruit image analysis, Fruit quality detection, Classification.**

1. INTRODUCTION

India is an agriculture country. Different types of fruits and vegetables are produced in India. India is at second number after china in production fruit. It is difficult in industry to classify the quality of fruits using traditional method so the image processing technique was introduced to classify the fruits. Indian economy based on agriculture, so automation of agriculture and agriculture related industry plays important role. Post-harvest process of fruits is completed in several steps: washing, sorting, grading, packing, storage and transporting. Agriculturally efficient countries like Israel and Australia have manifested active use of this modern technology and it needs to be inoculated to Indian Fruit Industry. The targeted beneficiaries from this project include farmers, Indian in particular, who can't afford cost of today's fruit processing facilities. One of the important quality features of fruits is its appearance. Appearance not only influences their market value, the preferences and the choice of the consumer, but also their internal quality to a certain extent.

Computer vision and image processing techniques have been found increasingly useful in the fruit 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 fruits has increased during recent years. The market constantly requires higher quality products and consequently, additional features have been developed to enhance computer vision inspection systems. Computer application in agriculture and food industries has been applied in the areas of inspection of fresh products. The new technologies of image analysis and computer vision have not been fully explored in the development of automated machine in agricultural and food industries.

Tomato is one of the world's favorite tropical fruits. In general, the color of the fruit indicates its maturity and the presence of defects. Its physical appearance affects its value in the market, so it is important to observe proper handling of fruits after harvesting. There are many different types of tomatoes. In this project we worked on rishika 225 tomato species which is available in any season. Demand from the consumer for quality produces, the consistent behavior of machines in compare with humans, the insufficiency of labor and attempt to reduce labor costs are the primary motivations of identification and classification of any fruit system.

2. LITERATURE SURVEY

C. S. Nandi, B. Tubu, and C. Koley, "A machine vision-based maturity prediction system for sorting of harvested mangoes," IEEE Trans. Instrum. Meas., vol. 63, no. 7, pp. 1722–1730,2014. This paper process machine vision based system, suitable for grouping for mango according to the expiry day available after harvesting. The average performance of the proposed machine vision-based system found to be better than the human experts [1].

Miss. Shital A. Lakare1, Prof: Kapale N.D2, "Automatic Fruit Quality Detection System". This paper presents the recent development in automatic vision based technology. Use of this technology is increasing in agriculture and fruit industry. An automatic fruit quality detection system for sorting and grading of fruits and defected fruit detection discussed here [2].

Nandhini. P, Dr. J. Jaya , " Image Segmentation for Food Quality Evaluation Using Computer Vision System", Nandhini. P et al Int. Journal of Engineering Research www.ijera.com ISSN : 2248-9622, Vol. 4, Issue 2(Version 5), February 2014, pp.01-03. Thus this paper provides various steps for identifying defects in the food material using the computer vision systems. Various steps in computer vision system are image acquisition, Preprocessing, image segmentation, feature identification and classification [3].

M. Z. Hashim, N. H. Mohamad, Z. Zakaria, H. Bakri, F. Sakaguchi , International Journal Of Engineering And Computer Science (Volume 2 Issue 8 August, 2013) was about development of tomato inspection and grading system using image processing. This paper focused on quality of tomato for inspection. It works by capturing image from tomato fruit and calculating percentage value of color of in order to classify the grade of tomato [4].

D. Sahu and C. Dewangan, "Identification and Classification of Mango Fruits Using Image Processing," Int. J. Sci. Res. Comput. Sci. Eng. Inf. Technol., vol. 2, no. 2, pp. 203–210,2017 on Identification and Classification of Mango Fruits Using Image Processing. The Proposed algorithm for identification and classification of mango fruits [5].

3. METHODOLOGY

The Fig.1 represents the flowchart of the developed system.

The system consists of 3 main stages:

Stage1: Acquiring the image of the Tomato:

It involves the capturing of the images of the tomato using camera. In this system we collected the number of database of tomato fruit images that is good and bad quality images. These fruit image databases are helpful for more accurate result. So in this system we collected the rishika 225 tomatoes database and these images used as input images in this system.

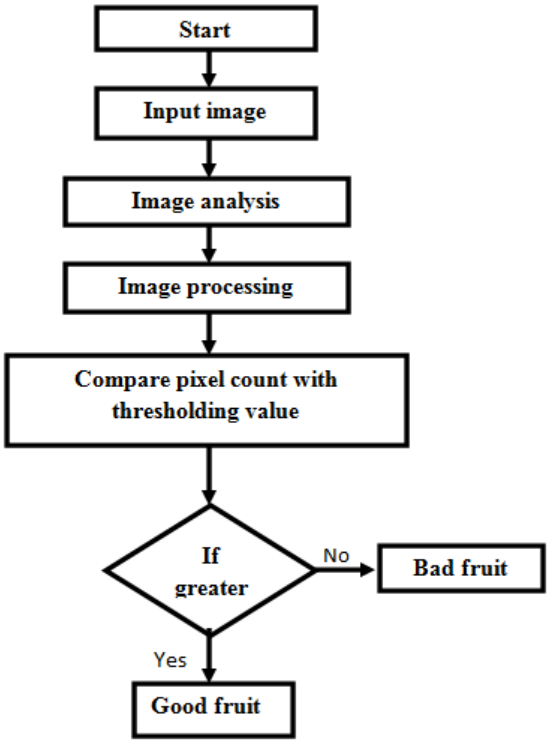

Fig.1 flowchart of the system

Stage 2: Detection process:

Choose an input image from collected database images. Fruit is detected by feature extraction process.

The proposed methodology in this paper, to perform the analysis for image features extracts using following steps

1. Capture input images using camera and collect number of images as a database images. It includes good as well as bad quality images.
2. RGB image is converted to HSV color space. Then lower and upper ranges are defined. Then ranges of binary image are defined. Then convert single channel mask back into 3 channels.
3. For extracts a colored object to detect red, here we use HSV color thresholder script to determine the lower/upper thresholds. HSV color space is also give the information about the image that is, it either present or not in this system.
4. Using by this input image we obtain the mask images. In mask image we get black and white colored image.

Stage 3: Detection of defective Tomato:

Find out defective tomato is one of the most important preprocessing steps. The defective skin is calculated. A color image of the tomato was used for the analysis. If the pixel value is less than the selected threshold value then it is considered as a part of defective skin i.e. bad quality fruit. Any pixel value greater than the selected threshold value is a part of pure skin i.e. good quality fruit. The image is mask then pure part of the image indicated by black while the damaged ones white. Then the total number of white pixels are calculated which will be equal to the total number of pixels corresponding to damaged skin.

4. RESULT

The Fig. 2 (a) shows the original image, Fig. 2 (b) shows the mask image were white represents the defective skin and Fig. 2 (c) shows the final output of the proposed system.

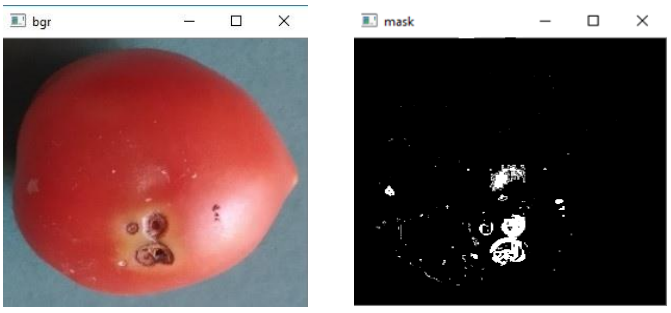

Fig. 2: (a) Original Image of defective fruit (b) Mask image were defective skin is represented as white.

Fig.2: (c) Bad quality fruit

Similar result for good quality detection shown in [Fig. 3], Fig. 3 (a) shows the original image Fig. 3 (b) shows the mask image and (c) shows the final output of the system.

Fig. 3: (a) Original Image of defective fruit (b) Mask image were defective skin is represented as white.

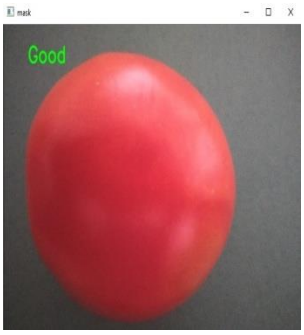

Fig.3: (c) Good quality fruit

5. CONCLUSION

In this paper the identification of normal and defective fruits based on quality using OPENCV/PYTHON is successfully done with accuracy. The use of image processing for identifying the quality can be applied not only to any particular fruit. We can also apply this method to identify quality of vegetables with more accuracy. Thus, this will enable the technology to be applied in many products. To replace manual inspection of food, computer vision system is used which provide authentic, equitable and non-destructive rating.

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