International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 03 | Mar 2023 www.irjet.net p-ISSN: 2395-0072

REAL FRUIT DEFECTIVE DETECTION BASED ON IMAGE PROCESSING TECHNIQUES USING OPENCV

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Abstract – ***India is a nation of farmers. India produces a wide variety of vegetables and fruits. After China, India produces the second most fruit. The use of a traditional method to classify the quality of fruits in the industry is difficult, so the image processing method was developed to do so. Because India's economy is based on agriculture, automation of agriculture and related industries is crucial. In supermarkets, it is difficult to recognize the various varieties of fruits and vegetables because the cashier must indicate the categories for each fruit in order to determine its price. The majority of this issue with packaged goods has been resolved by the use of barcodes; however, since the majority of customers prefer to select their own items, these items cannot be pre-packaged and must be weighed. Issuing codes for each fruit is one option, but this requires a lot of memorizations and could result in pricing mistakes. The cashier could also be given an inventory with pictures and codes, but flipping through the booklet takes time. Due to the diverse characteristics of numerous fruit varieties, it is still challenging to use computer vision to automatically classify fruits. The method for determining fruit quality that relied on the shape, size, and color of the fruit as its external characteristics. The computer vision-based method for determining fruit quality is presented in this project. This technology is being used more and more in the fruit industry and agriculture. Systematic, economical, hygienic, consistent, and objective evaluation is made possible by computer vision. Fruit's appearance is one important quality characteristic. In addition to influencing their market value, consumer preferences, and choice, appearance has an impact on their internal quality.***

Key Words: Image Processing method, appearance, fruit industry.

I.INTRODUCTION

In the fruit industry, computer vision and image processing techniques have become increasingly useful, particularly for quality detection. Computer vision systems could be used to improve product quality, according to research in this field. India is a nation of farmers. India produces a wide variety of vegetables and fruits. After China, India produces the second most fruit. The use of a traditional method to classify the quality of fruits in the industry is difficult, so the image processing method was developed to do so. Because India's economy is based on agriculture, automation of agriculture and related industries is crucial. The computer vision-based method for determining fruit quality is presented in this project. This technology is being used more and more in the fruit industry and agriculture. Systematic, economical, hygienic, consistent, and objective evaluation is made possible by computer vision. Fruit's appearance is one important quality characteristic. In addition to influencing their market value, consumer preferences, and choice, appearance has an impact on their internal quality to some extent. India is a nation of farmers. India produces a wide variety of vegetables and fruits. After China, India produces the second most fruit. The use of a traditional method to classify the quality of fruits in the industry is difficult, so the image processing method was developed to do so. Because India's economy is based on agriculture, automation of agriculture and related industries is crucial. Fruits are processed in several steps after they are picked: sorting, packing, grading, transporting, and washing Countries with high agricultural productivity, such as Israel and Australia, have demonstrated active use of this cutting-edge technology, which must be introduced to the Indian fruit industry.

II. PROBLEM STATEMENT

Colour, texture, and size are the required characteristics. On the acquired image, precise feature pre-processing is performed. The enhancement of an image's features that are crucial for subsequent processing and the suppression of undesirable distortions are the primary goals of image processing. Converting an RGB image to a grayscale image is the first of the fundamental pre-processing steps. The Gray image is then subjected to image histogram equalization. Adjusting image intensities to increase contrast is made easier with this. Filter out noise; the median filter is used to remove noise; the Laplacian filter is used for edge detection because it focuses on the area with rapid intensity changes.

As a result, this improved, noise-free, filtered image is prepared for further processing.

III. EXISTING SYSTEM

Fruits are processed in several steps after they are picked: sorting, packing, grading, transporting, and washing Fruit's appearance is one important quality characteristic. In addition to influencing their market value, consumer preferences, and choice, appearance has an impact on their internal quality to some extent. Fruit quality evaluation has become increasingly significant in recent years in order to satisfy the desires of consumers as well as socioeconomic needs. Sensory properties (appearance, texture, flavor, and aroma), nutritive values, chemical components, mechanical properties, functional properties, and defects are all components of produce quality. All fruits undergo structural and chemical changes during their short shelf life. As a result, knowing how good fruits are during their shelf life is critical. The underlying activity of the biological sample is referred to as bio-activity. The climatic conditions also have an impact on the fruit's bioactivity during its shelf life.

3.1 Disadvantages

- ✓ We Indians, in particular, cannot afford the prices of the fruit processing facilities of today.
- ✓ The market value of a fruit is influenced by its physical appearance, so proper handling after harvest is essential.

IV. PROPOSED SYSTEM

The most important parameters for determining fruit quality are its texture, color, and size. In the fruit industry, computer vision and image processing techniques have become increasingly useful, particularly for quality detection. Computer vision systems could be used to improve product quality, according to research in this field. In recent years, the use of computer vision for fruit inspection has grown. As a result of the market's constant demand for products of a higher quality, computer vision inspection systems have been enhanced with additional features. In the area of fresh product inspection, computer technology has been utilized in the food and agricultural industries. Based on its quality, it tells you whether the fruit is good or bad.

To satisfy the purchaser's craving and socio - monetary necessity, organic product quality assessment turns out to be vital now daily. Nature of produce envelops tangible properties (appearance, surface, taste and smell), nutritive qualities, compound constituents, mechanical properties, utilitarian properties and imperfections. Every one of the natural products have restricted time span of usability during which it goes through underlying and compound changes. In this way, knowing the nature of organic products during timeframe of realistic usability is significant. Bio-action alludes to the hidden action of the organic example. The bioactivity of the natural product's progressions during their time span of usability and it is additionally impacted by the climatic circumstances. Various strategies for quality assessment of horticultural items have been created by various scientists. Laser bio dot method is non-contact and non-damaging method for assessing the fundamental action of organic products which thusly gives their quality data. Surface, Variety and Size are the significant boundaries for organic product quality distinguishing proof. The variety acknowledgment is vital cycle in readiness location. The readiness discovery is outer quality component. In any case, surface is likewise vital. On account of surface deserted organic product can be perceived. Surface examination recognizes the non-consistency of organic product external surface. The size is additionally significant boundary. It plainly seen boundary all client select natural product in view of size.

4.1 Advantages of Proposed System

- ✓ The fruit's quality can be easily determined.
- ✓ A computer vision system is used to replace manual food inspection by providing authentic, equitable

V. RELATED WORK

5.1 ACQUIRING THE IMAGES OF THE FRUITS

In this project, we compiled a list of both high- and low-quality fruit image databases. For better results, these fruit image databases are helpful.

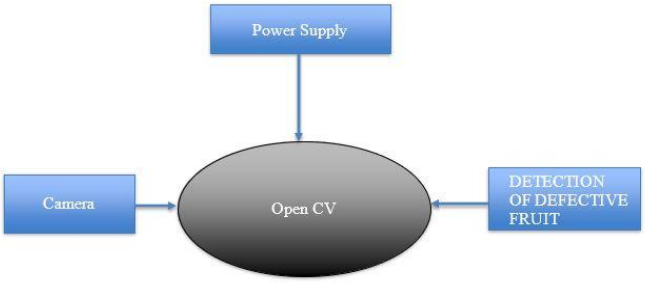
5.2 DETECTION PROCESS

An RGB image is transformed using the HSV color space. The lower and upper ranges are then established. Then, the ranges of binary images are set. Turn the mask back into a three-channel one after that. 3. In this instance, the HSV color thresholder script is used to determine the lower and upper thresholds for extracting a red object. In addition, the HSV color space reveals whether or not an image is present in this system

5.3 DETECTION OF DEFECTIVE FRUITS

Identifying the damaged tomato is a crucial step in the pre-processing process. The color image of the tomato was used for the analysis. If the pixel value falls below the specified threshold, fruit of poor quality is deemed to have defective skin. Any pixel value that is greater than the threshold value chosen is used to represent pure skin, also known as high-quality fruit. After that, the total number of white pixels is calculated, which will be the same as the total number of pixels that represent damaged skin.

VI. SYSTEM ARCHITECTURE



VII.OPENCV

OpenCV is the colossal open-source library for the PC vision, AI, and picture handling and presently it assumes a significant part continuously activity which is vital in the present frameworks. By utilizing it, one can deal with pictures and recordings to recognize items, faces, or in any event, penmanship of a human. At the point when it incorporated with different libraries, for example, Numpuy, python is equipped for handling the OpenCV cluster structure for investigation. To Distinguish picture design and its different highlights we use vector space and perform numerical procedure on these elements. The principal OpenCV form was 1.0. OpenCV is delivered under a BSD permit and thus it's free for both intellectual and business use. It has C++, C, Python and Java points of interaction and supports Windows, Linux, Macintosh operating system, iOS and Android. At the point when OpenCV was planned the fundamental center was ongoing applications for computational proficiency. Everything is written in enhanced C/C++ to exploit multi-center handling.

VIII. SYSTEM CONFIGURATIONS

Proper image acquisition is crucial to the successful operation of the fruit sorting and grading system. Because the image was taken with the camera, it has noise and its features are difficult to see, so it is subjected to image preprocessing. Color, texture, and size are the required features for this project. The acquired image undergoes preprocessing in order to achieve precise feature. The enhancement of image features that are essential for subsequent processing and the elimination of undesirable distortions are the primary goals of image processing. Converting an RGB image to a grayscale image is the first of the fundamental preprocessing steps. The gray image is then subjected to image histogram equalization. Adjusting image intensities to increase contrast is made easier with this. Using a filter, remove noise—in this case, the median filter. Because it highlights the region with rapid intensity change, the Laplacian is utilized for edge detection. As a result, this improved, noise-free, filtered image is prepared for further processing. The picture is taken. First, change the image from RGB to grayscale. Following OSTU thresholding, that image is subjected to binary thresholding. After that, morphological operations like dilation and erosion are carried out. Opening is done in order to detect the boundaries. The lengths of the major and minor axes are then calculated. The sizes of small, medium, and large are then selected.

8.1 OBJECT DETECTION

Proper image acquisition is crucial to the successful operation of the fruit sorting and grading system. Because the image was taken with the camera, it has noise and its features are difficult to see, so it is subjected to image preprocessing. Color, texture, and size are the required features for this project. The acquired image undergoes preprocessing in order to achieve precise feature. The enhancement of image features that are essential for subsequent processing and the elimination of undesirable distortions are the primary goals of image processing. Converting an RGB image to a grayscale image is the first of the fundamental preprocessing steps. The gray image is then subjected to image histogram equalization. Adjusting image intensities to increase contrast is made easier with this. Using a filter, remove noise—in this case, the median filter. Because it highlights the region with rapid intensity change, the Laplacian is utilized for edge detection. As a result, this improved, noise-free, filtered image is prepared for further processing. The picture is taken. First, change the image from RGB to grayscale. Following OSTU thresholding, that image is subjected to binary thresholding. After that, morphological operations like dilation and erosion are carried out. Opening is done in order to detect the boundaries. The lengths of the major and minor axes are then calculated. The sizes of small, medium, and large are then selected.

IX. CONCLUSION

Using OPENCV/PYTHON, this project successfully and precisely identifies normal and defective fruits based on quality. Image processing can be used to determine the quality of any fruit, but not just any fruit. This method can also be used to more precisely identify vegetable quality. As a result, the technology will be able to be used in a variety of products. Computer vision systems, which provide authentic, equitable, and non-destructive ratings, are utilized to replace manual food inspection. Python-based software OpenCV performs the image processing. The first part of the software is for image analysis, and the second part is for controlling hardware based on the results of image processing. The system operates in two distinct ways, with the camera taking the picture and the control module performing all image processing. All of the processes are displayed on the monitor and then based on the control module's decision. The assembly of the conveyor is operated.

REFERENCES

[1] Amitangshu Pal and Krishna Kant, "Magnetic Induction Based Sensing and Localization for Fresh Food Logistics", 2017 IEEE 42nd Conference on Local Computer Networks.

[2] Yating Chai, Howard C. Wikle, Zhenyu Wang, Shin Horikawa, Steve Best et al., "Design of a surface-scanning coil detector for direct bacteria detection on food surfaces using a magneto elastic biosensor", journal of applied physics 114, 104504 (2013).

[3] Amitangshu pal, Krishna Kant, "Smart Sensing, Communication, and Control in Perishable Food Supply Chain", ACM Transactions on Sensor Networks, Vol. 1, No. 1, Article. Publication date: March 2018.

[4] Reiner Jedermann, Thomas Potsch and Chanaka Lloyd, "Communication techniques and challenges for wireless food quality monitoring", published by royal society 2014.

[5] Amitangshu Pal and Krishna Kant, "IoT-Based Sensing and Communications Infrastructure for the Fresh Food Supply Chain", published by IEEE computer society 2018.