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Identify Quality Index Of The Fruit Vegetable By Non Destructive Or With Minimal Destructive Methods.

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Abstract - *The quality evaluation process of fruits and vegetables are used to measure the color, shape, size, and external defects which will be helpful for the people. Quality evaluation of fruits and vegetables can be of destructive and nondestructive types. In the former the entire fruit is destroyed while evaluating the quality. In non-destructive quality evaluation the fruits and vegetables are not destroyed while evaluating its quality. Now-a-days, various mechanical, optical, electromagnetic, and dynamic non-destructive methods are gaining importance due to ease in operations, faster turn over and reliability. In this, we are inspecting the quality of fruits based on size, shape and color. 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. Color, texture, size, shape, as well the visual flaws are generally examined to assess the outside quality of fruits.*

Key Words: *Camera, Filtering, ANN Technique, Geometric Feature Extraction, Canny Edge Detector, etc.*

1.INTRODUCTION

Quality components of fruits and vegetables are classified into the external such as size, color, shape, external defects etc. and the internal such as sugar content, acid content, firmness, maturity, internal breakdowns etc. The color and firmness of fruits affect the product appearance and consumer acceptability. Non-destructive methods are effective than traditional conventional methods as non-destructive methods are mainly based on physical properties which correlate well with certain quality factors of fruits and vegetables. Non-destructive methods are advantageous over traditional destructive methods as they do not rupture the fruit tissue, can be used to assess internal variables of fruits.

Quality of fruits and vegetables is based on its sensory properties, nutritional value, safety and defects. Various methods are used for external and internal quality evaluation. Methods to measure fruit quality can be of destructive and non-destructive. With destructive methods, a sample of fruit must be measured in order to estimate the quality of a batch: besides the economical loss, due to fruit destruction, there is also the problem of how the sample is representative of the whole batch. If we use the internal quality factors and do not destroy the fruit while measuring them, such approaches are referred to as nondestructive quality evaluation. By applying this method, it can overcome possible discrepancies between different batches and samples of fruit, without destroying a certain amount of sample fruit post. Agriculture has an important role in socio-economic development of India. Various types of fruits produced through-out the year.

2. LITERATURE REVIEW

Inkyu Sa *et al.* [1] presents a new approach for fruit identification using deep convolutional neural network. Fruit detection system has been trained with a many number of images using a Deep Convolutional Neural Networks (DCNN) and rapid training was done about 2 hours on a GPU named as K40. Fruit identification from image was acquired from two models :Near-Infrared (NIR) and color RGB Faster Region-based CNN uses color RGB images to perform general object detection. They perform supervised machine learning algorithms that teach a model of object interest. They had perform fine-tuning of the VGG16 network which was depnd on the pre-trained ImageNet model.

To detect defected apple fruits A. Raihana *et al.* [2] uses AFDGA-Apple Fruit Detection, Grading and Analyzation techniques. Modify Watershed Segmentation was used to segment the defection and analyze the fruits using Gray Level Co-occurrence Matrix based feature extraction method, and finally classify the images by support vector machine (SVM) in terms of the its features. Textural, statistics and

some geometrical features has utilized to classify the apple fruits and grade it. Mean, Variance and a portion of the shape features [area, perimeter] has taken for FPGA examination. Simulation results obtained from MATLAB and VLSI had compared for performance evaluation.

M. Bulanon *et al.* [3] presents algorithm to automatic recognize the fruits for a machine based vision system that teaches a robotic harvesting. Fuji apple fruit images which was increased by using the red color threshold. Results explain that apple fruit had the greatest red color threshold within the object in the image. The histogram was obtained by the increased image had a bimodal distribution for the object as a fruit portion and the background such as leaves and branches portion. Maximum grey level threshold of the red color difference between the fruit, leaves and branches was determined by the maximum threshold value.

3. SYSTEM ARCHITECTURE

3.1 IMAGE ACQUISITION

An image is analysed as it is clicked. Then the user is given tools to discard that he considers noise. The image acquisition is done using a digital camera and it is loaded and saved using MIL software. MIL works with images captured from any type of colour (RGB) or monochrome source (Grey). MIL supports the saving and loading of images. It supports file formats such as TIF (TIFF), JPG (JPEG), BMP (bitmap), as well as raw format. Here the input image got is an RGB image.

3.2 PREPROCESSING

Basically, the images which are obtained during image acquisition may not be directly suitable for identification and classification purposes because of some factors, such as noise, weather conditions, and poor resolution of images and unwanted background etc. We tried to adopt the established techniques and study their performances.

3.3 FILTERING

The purpose of filtering is to smooth the image. This is done to reduce noise and improve the visual quality of the image. Often, smoothing is referred to as filtering. Here filtering is carried out by median filter since it is very useful in detecting edges. The best known order-statistics filter is the median filter, which replaces the value of a pixel by the median of the gray levels in the neighborhood of that pixel.

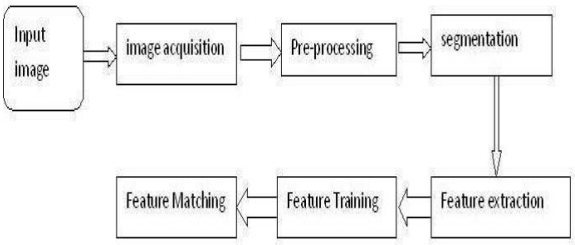


Fig 3.1 : Block Diagram Of Image Processing

3.4 SEGMENTATION

The purpose of image segmentation is to divide an image into meaningful regions with respect to a particular application. The segmentation is based on measurements taken from the image, may be grey level, colour, texture, depth or motion. Here edge-based segmentation is properly suitable. As edge detection is a fundamental step in image processing, it is necessary to point out the true edges to get the best results from the matching process. That is why it is important to choose edge detectors that fit best to the application. In this way canny edge detector is chosen.

3.5 FEATURE EXTRACTION

Feature extraction is defined as grouping the input data objects into a set of features. The features extracted carefully will help to extract the relevant information from the input data in order to perform the feature matching using this we can reduce the representation input size instead of the full size input. Here clustering process has been used to extract features form good and bad fruits.

3.6 IMAGE CLASSIFICATION

Classification for the image is the nest step and used for the classification of the colour of the fruit depends on the data given by image segmentation part, on the basis of which further fruit colour is classified.

4. SYSTEM DESIGN

4.1 FRUIT SIZE DETECTING AND GRADING

- **Colour Detection:**

In the process of fruit color is detected according to RGB values [8], here fruits are sorted according to color and size. So for e.g.two fruits are considered say Apple,Tomato having red color and Kevi(Guava) having green color, so in this step work is going tofind out color of a fruit by using RGB values

of an image taken from the camera, this image can be processed by using python.

- **Color Detection Algorithm:**
  1) Start

  2) Read the input color image using imread function.

  3) Read the input pixel of color image in three different planes (RGB) and

  store it into three variable r, g, and b.

  4) Read the small region of fruit to detect color of fruit.

  5) Store in different variable r1, g1, b1.

  6) Calculate the mean of r1, g1, b1 and store into variable r2, g2, b2.

  7) Compare the value with threshold.

  8) If b2>threshold, Color detected is black.

  9) If r2>threshold, Color detected is Red.

  10) End.

Figure 4.1(a) : Healthy Tomatoes

Figure 4.1(b) : Diseased Tomatoes

Fig 4.2(a) Original Image Of Defective Area

Fig 4.2(b) Binarised Image Were Defective Skin Is Represented As White

5. FLOWCHART OF IMAGE PROCESSING

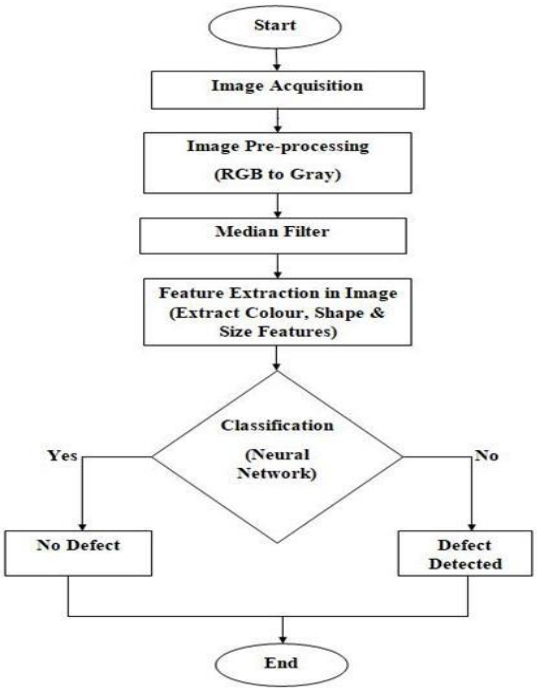
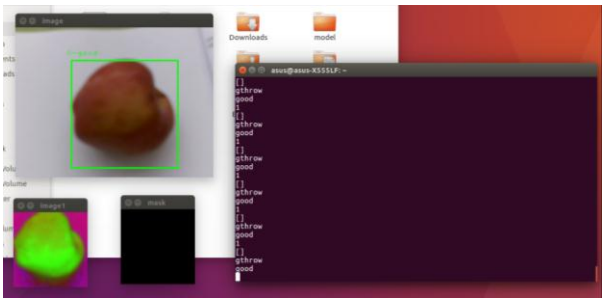


Fig 5.1 : Flow Diagram Of The Proposed System

6. IMEPLEMENTATION AND RESULT

The hardware used for this a multiple camera for image acquisition, a computer, a light source and a black background. A Webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and emailed as an attachment. Webcam typically include a lens, an image sensor, support electronics, and may also include a microphone for sound. Now, the capability is bigger and not impossible to increase in the near future. An image is

analyzed as it is clicked. Then the user is given tools to discard that he considers noise.



Screenshot 6.1 : Apple with good quality

7. CONCLUSIONS

In India normally grading is done manually. The grading and sorting is mainly based on external and internal quality factors. The external factors are color, size, volume, shape and texture. Among these color and size are mainly used for features for grading of fruits. Grading based on Size is very easy method and less expensive method used for sorting of apples, tomatoes etc. In color based grading Direct color mapping technique is flexible and efficient method. For skin defect detection at higher resolution wavelets are used and at low resolution curvelets are best option. The grading based on size manually can be performed but result obtain are not accurate and grading and sorting based on other external factor is not possible to done manually. So there is need of automation in fruit quality inspection.

External properties of fruits like color, size, shape, texture and different defects are very important attributes of fruits for classification and grading. Now a days due to advancement in machine vision and availability of low cost hardware and software, manual work of fruit classification and grading has been replaced with automated machine vision systems. Other reason of non-destructive automation can be its ability to produce accurate, rapid, objective and efficient results over manual work.

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