

# Food Quality Grading and Prediction Through Image Processing

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*Abstract- In previous system automatic grading system is used only in large food/fruit storage industries. The packed fruits which are graded may also get spoil after sometime, and customer may receive that spoil fruits. Using this system customer/user can detect the spoiled or the fruits which will get spoiled after sometime is detected before eating. This paper presents the food size grading and prediction using image processing and OpenCV algorithm. Image processing technique have been applied increasingly for food quality evaluation in recent years. This paper shows the recent advances in image processing techniques for food quality grading which includes device camera, image acquisition, image pre-processing, image processing region-based and classification-based for image segmentation, size, shape, color and neural classification Method.*

**Keywords-** Quantity detection, size detecting, fruit grading, image processing, prediction, classifier, naviebayes algorithm, histogram analysis.

## I. INTRODUCTION

As India is the agricultural country, the main resource of income is from the farm. Farmer sells their product to the fruit transport companies/seller/directly to the customer. But some fruits are get damaged or starts spoiling, this fruit get removed in large fruit transport companies using some techniques. But some packets not get sell in time, the fruits start spoiling, and this some defecting fruits are purchased by the customer. So, the customer can do the quality checking of fruits before eating the fruits by using the fruit quality grading and prediction through image processing.

This technique will used by farmer they can describe their product with features and expected price. They can directly communicate with customer hence; they reduce the time session and get more

profit instead of using traditional techniques. This technique will used by customer agent and government agency for same purpose. For developing this technique, we are going to use are Java, My SQL, HTML/CSS, JSP, JavaScript.

In previous system the food/fruit quality is decided by using human inspection, experience and so on. Which requires large man power and it is more time-consuming work. The previous system has the disadvantage of time consuming, low efficient, having low speed and high cost. To overcome this problem nowadays automatic food/fruit grading, size detection, quality detection and prediction is done through image processing and using Naïve Bayes algorithm. Advantage of this system is its speed is faster than previous techniques, having low cost, and it is easy to operate.

### A. The maturity of fruits is defined as following parameters

- a) Color: Verities of fruits having different color. It measures fruit in various classes that is dark, medium, light green color of fruits.
- b) Size: It measures diameter, size by (x,y) co-coordinators. Fruits size is determined by maximum diameter of fruits. It will be measured as center of the origin.
- c) Shape: It will be measured for aspect ratio, roundness of the fruit.
- d) Data: Some fruit images have been collected for fruits quality System. These fruit images will be classified into high quality, medium quality and low quality of fruit. fruit images are required to be sent in and processed by the system when develop the classification algorithm for the fruits quality system. RGB Values for every fruits pixel computed by using mean function provided.

As Fruits play main role in day to day life, grading of fruits is necessary in evaluating agricultural products. The present existing technology are also used for fruit quality managing purpose but they are not more effective. There are some disadvantages like less reliability, less efficiency and less accuracy. That's why it is necessary to develop a new technology for fruit classification those consist of high accuracy. In this project image processing technique is applied.

This system consists of both hardware and software. The hardware includes cameras, modem, mobile phone, PC/laptop. At present work computer vision technique is also used for detecting the defect and finding the spoilage of food/fruit based on their appearance. This system uses different techniques like food/fruit image pre-processing, classifier, histogram method, RGB colour model, grayscale, support vector machine(SVM), HSI technique.

The fruit colour is the most visual property and fruit size is the physical property. If using the previous techniques, classification, grading and prediction is done then it will be too slow and it will be error prone. The fruit quality is decided from its colour, shape and size of it. If this quality grading

system is mapped with the automated fruit grading system using appropriate programming language then will be faster and it will be error free.

The proposed automated classification, grading and prediction system is designed to combine the processes like image acquisition, feature extraction, grading and prediction. The software development is very important for this colour classification system. In classification system the colour of the fruit is very important because some fruits colour is same. So, in that case fruit size and shape helps to identify the type of fruit and helps to solve the such kind of problems. The fruit size and colour classification help for extraction of useful information from its surface and classify it to its respective type.

This system is designed to overcome the previous system problem. The image of fruit is captured by using camera or high resolution mobile phone camera. After this, the image is given as input to the system using vision technique for obtaining the fruits feature. The system consists of some steps like image acquisition, image pre-processing, feature extraction, classification and prediction. After all this classification, grading and prediction it gives the message to the user about the fruit quality on the user's mobile phone. The main advantage of this system is to classify and to grade the fruits.

## II. PREVIOUS WORK

In previous work, the most of the systems have used the concept of fuzzy logic, and they have used lots of cameras for capturing the fruits images, and it was so expensive because they have used many hardware devices for other processing.

(Njoroge et al.,) they have developed a system using image processing referred as automated grading system. This system detects the fruit's internal and external defects. The system consists of six CCD cameras, two cameras are mounted on right, two are on left side and another two are mounted on the top of the fruit. X-ray imaging used for inspecting the biological defects. Also, image processing is used. Fruit grading is done using features of fruits like shape, size, colour and this feature can be extracted using image processing.

( Aidil Azwin Zainul Abidin, Syed Khaleel Ahmed, Nur Badariah Ahmad Mustafa, Zaipatimah Ali, Zainul Abidin Md SharifWong Bing Yit, et al.,) they developed an automated grading system. The system classify vegetable and the four types of fruits namely carrots and apples, bananas, oranges, mangoes . The features of a system such as area, minor axis, major axis and perimeter have been used to classify the samples.

(Daniel. E Guyer et al. and Ismail Kavdir, 2003) have developed a system which grades the apple using fruit size and colour and fuzzy logic is used for this process. They have implemented a system, in that the same set of apples are graded using human expert and fuzzy logic. The fuzzy logic result shows that the 89% of the result matches with the results from the human expert, providing good flexibility in reflecting the expert's expectations and grading standards into the results.

(Guo Feng and Cao Qixin et al., 2004) they have developed a sorting and classification system the for the fruit. In that system the classification is done using fruit colour ratio which was calculated using HSI colour space technique.

### III. SYSTEM OVERVIEW

#### A. Software flow

The flow includes various steps as follows:

- Capturing Image
- Pre-processing
- Feature extraction
- Match with database
- Displaying result

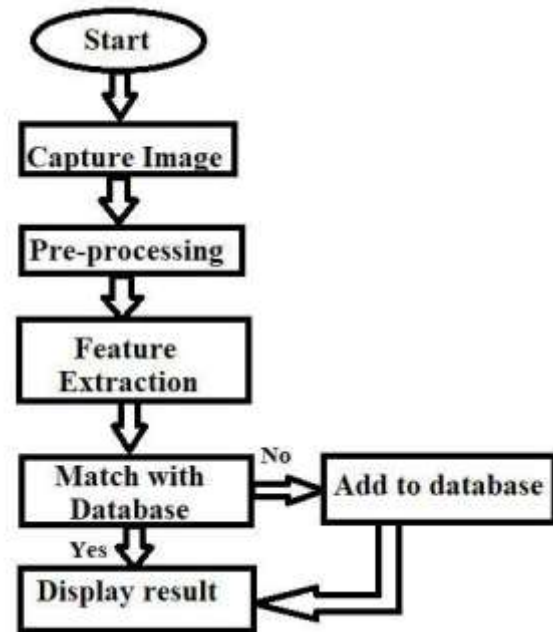


Fig 1. Flow chart

#### Step 1: Capture image:

Image acquisition means generally capturing the image of fruit. It is the first step in the image processing. It is the creation of photographic images such as of a physical scene.

fruit image is captured using the digital camera or any mobile phone camera. After capturing the fruit image, it is transmitted to PC/laptop using Vision technique for further processing where feature extraction of fruit is done.

#### Step 2: Image Pre-processing

In Image pre-processing operation of the images at the nearest level of abstraction both like output and input are images intensity. These iconic images are of the same kind as the original data captured by the sensor, with an intensity image usually represented by a matrix of image function values (brightness). The main aim of the pre-processing of image is to improve the quality of image and it may enhances some important features for image processing, although geometric transformations of images (e.g. translation, scaling, rotation) are methods that are classified among pre-processing.

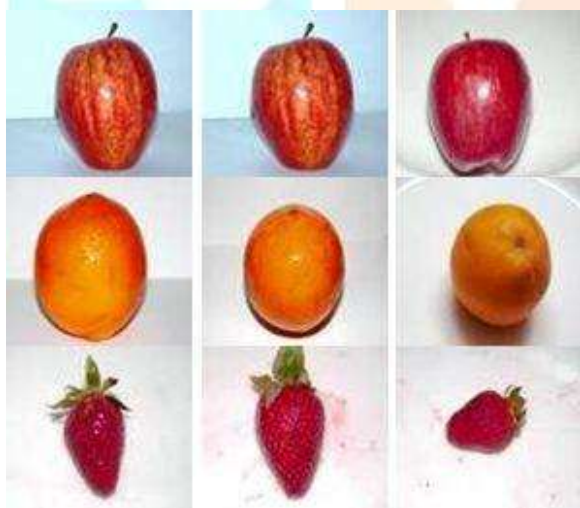
Here initially RGB image of fruit is taken into the consideration. Converting the RGB image into the gray scale image. The main purpose of image



processing is to convert an image into its digital form, in order to enhance some important information from that image. It is one of the type of dispensation of signal where input is considered as image and output is considered as characteristics of image that associated with that images. In image processing the main features such as grading, prediction etc. Nowadays, image processing is among rapidly growing technologies.

**Step 3: Feature Extraction**

In this step the necessary features of fruit are extracted and from that extracted features it is classify accordingly. Feature extraction is the process of measuring or calculating the features from the image samples such that which are sufficient to distinguish between one type of image from another type. Certain fruits can be easily identified by color and size. The extraction process begins with the conversion of the original image to grayscale image.



**Fig. Feature extraction and testing**

**Step 4: Match with database**

The extracted features of fruit are entering into the database. The dissimilarity values of obtained by matching the features of query image with the values of fruit stored in the database for all features and summed up.

**Step 5: Display result**

The value of query fruit is displayed which is the closet match of query fruit image with the stored image.

**B. Classification**

Image classification analyze the properties of images and that are categorized according to their features of images. classification algorithm is just two types of employ like training and testing. In the phase of training, classification properties of image are isolated and based on these, then each classification unique description is created. The classification is based on size, color, and texture etc.

For class descriptors extraction the classification, statistical processes or distribution-free processes can be used. Unsupervised classification relies on clustering algorithms to automatically segment the training data into prototype classes To achieve this by computer, the computer must be trained. Training is key to the success of classification.

It also includes the information like shape, colour, texture extraction from captured fruit image.

System Or Paper	Perfor- mance	User Friendly	Classifi- cation of fruit	Gap Between customer reduced
Naturebasket.co	✓	✗	✗	✓
Onlinesubjiwala.com	✓	✓	✓	✗
Proposed system	✓	✓	✓	✓

**C. Histogram**

In this project it performed the analysis of RGB of the filtered image to obtain color parameters required for classification by ripeness. With the histogram the amount color is obtained according to the RGB space, as evidenced in Figure.

**F. Advantages**

- Less cost
- Less time required
- Customer satisfies with the quality

**G. Limitations**

- Vision Oriented
- It becomes costly when more and expensive cameras are used

**H. Applications**

- Food industries
- Large fruit transport companies
- For small scale unit it can be used in fridge

**IV. FUTURE WORK**

Using this system, it will be possible to detect the food/fruit quality in refrigerator, in tiffin box, and also in any environment, at any place in few minutes. This method can also be used in food storage systems where large amount of food is going to be stored. It can also be used in the fridge unit for grading the fruits. This will reduce the power consumption since the spoiled food can be eliminated at start of storing.

**V. CONCLUSION**

It is expected from the technology that method can process, analyse and recognize fruits based on color and texture features. Using this technology we can conclude that the expiry date of fruit and also quality of that.

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