

# Image Processing Based Fruits Sorting System: A Review

Potphade Priyanka L, Kharat Govind U

**Abstract**— this system aims at presenting the concept of fruits quality management, a system which determines the quality of fruit by its color and weight. Manually sorting of fruits is a time consuming, costly, and an inaccurate process. This sorting system is developed in order to increase the quality of food products made from fruits. The sorting process depends on capturing the image of the fruit and analyzing this image using image processing techniques to discard defected fruits. IR rays in photodiode are used for detection. The objects of different sizes are passed through the sensors and the object having specified size is sorted. The belt is driven by drive circuit which is controlled by drive controller. By developing such sorting system the production rate of the manufacturing industry has been increased since these sorting systems replaced the human resources. The main emphasis is to do the quality check with a short span of time so that maximum number of fruits can be scrutinized for quality in minimum amount of time. The absolute reference point is the way to perceives and interpret the quality of fruit. This system performs the sorting using MATLAB software and gives some advantages over traditional practices.

**Index Terms**— Web-cam, MATLAB, PIC controller, conveyor belt, load cell, IR sensor

## I. INTRODUCTION

Agriculture is one of the largest economic sectors and it plays the major role in economic development of our country. In our country the ever-increasing population, losses involved in processing and the increasing demand of fruits of high quality with good appearance, there is a need for the development of accurate, fast and focused quality determination of food and agricultural products like fruits and vegetables. Handling process of agricultural product is performed in several steps like first cutting of fruits or vegetables from the farm, washing, sorting, grading, packing, transporting and finally storage. But among all these steps eye observation of experts is main approach. In all these steps sorting and grading are major processing tasks. Associated for preserving the quality of fresh-market stuff. Sorting of agricultural products is done based on appearance of fruits. Whereas grading is done based on the overall quality features of a fruits by considering a number of attributes like shape, size, and color. Classification is necessary for the quality evaluation of agricultural product like fruits and vegetables. Fresh market fruits like tomatoes, pomegranates, onions are graded into categories based on several factors such as color, size and presence defects and blemishes on it. So there is a increasing need to supply quality fruits within a short period of time has given rise to the development of automated grading of fruits to improve the quality.

With the development of image processing technology and computer software and hardware, it becomes more attractive to detect fruits quality by using vision detecting technology. At present, most existing fruit quality detecting and grading system have the disadvantage of low efficiency, low speed of grading, high cost and complexity. So it is significant to develop high speed and low cost fruit size detecting and grading system. Here two choices are provided for grading either by color and weight. In first case we are going to sort circular shaped fruits according to color and grading is done according to weight. Computer techniques include capturing, processing and analyzing images to facilitate the objective and non-destructive assessment of visual quality characteristics in agricultural and food products.

The proposed automated classification and grading system is designed to combine three processes such as feature extraction, sorting according to color and grading according to weight. Software development is highly important in this color classification system and for finding size of a fruit. The entire system is designed over MATLAB software to inspect the color and size of the fruit. Here grading can be categories into four ways red small, red big, green small, green big. Work in this system considered three different fruits tomatoes, pomegranates and onions.

## II. LITERATURE REVIEW

In 2012, Mahendran, Jayashree and Alagusundaram reported that the recent development and application of image analysis and computer vision system in quality evaluation of products in the field of agriculture. The speed and accuracy were main concern of these automated system [1].

In 2013, Ms. Rupali S. Jadhav and Prof. S. S. Patil reported that nondestructive quality evaluation of fruits is important and very vital for the food and agricultural industry. This paper presents a fruit size detecting and grading system based on image processing which is accurate, reliable and efficient[2].

In 2014, J. Ramprabhu and S. Nandhini considered the gray scale image instead of capturing image, which are less effected to the external environment changes as well as beneficial for finding the size of a fruit. Generally image capture is a big challenge as there is a chance of high uncertainty due to the external lighting conditions [3].

In 2015, Seema, A. Kumar and G. S. Gill observed that in case of red apple, with increase in surface area under yellow patches, the probability of the fruit to be classified as an orange increase. This may be due to the fact that the increase in yellow component shifts towards the color profile of an orange. Since apple and orange shares almost similar geometrical profile when viewed in two dimensionally [4].

In this paper Dr. Vilas D. Sadegaonkar and Kiran H. Wagh designed system to emphasize on recent work reported on an

automatic fruit quality detection system. Automatic grading system not only speeds up the process but also gives accurate results [5].

In this paper, Mr. Ashutosh Kumar, Ms. P.T. Narale, Ms. A.V. Patil and Ms. S. I. Mulani designed and implemented intelligent fruit quality detection using microcontroller that avoids visual inspection. The fruits in the market should satisfy the consumer preferences. This paper presents a fruit size detecting and grading system based on embedded system [6].

In 2016, Anitha Raghavendra and Dr. Mahesh Rao designed the system for mangoes with all kinds of defects such as, diseases physiological disorders and damage due to pests are discussed and defect detection in some fruits using non-intrusive method has been presented [7].

Table 1 gives the summary of literature review based on “image processing based fruit sorting system”.

**Table 1: Summary of literature review**

Year	Author	Techniques
2012	Mahendran, Jayashree and Alagusundaram	Application of computer vision technique on sorting and grading of Fruits and vegetables
2013	Ms. Rupali S. Jadhav and Prof. S. S. Patil	A fruit quality management system based on image processing
2014	J. Ramprabhu and S. Nandhini	Enhanced technique for sorting and grading the fruit quality using msp430 controller
2015	Seema, A. Kumar and G. S. Gill	Computer vision based model for fruit sorting using k-nearest neighbour classifier
2015	Dr. Vilas D. Sadegaonkar and Kiran H. Wagh	Automatic sorting using computer Vision & image processing for improving apple quality
2015	Mr. Ashutosh Kumar , Ms. P. T. Narale, Ms. A.V. Patil and Ms. S.I. Mulani	Fruit quality measurement system
2016	Anitha Raghavendra and Dr. Mahesh Rao	A survey on internal defect detection in fruits by non-intrusive methods

### III. NEED OF TECHNOLOGY

The manual sorting of fruits replaced by machine vision with the advantages of high accuracy, uniformity and processing speed and more over non-contact detection is an inevitable trend of the development of automatic sorting and grading systems. The exploration and development of some fundamental theories and methods of machine vision for poor quality detection and sorting operations has been accelerate the application of new techniques to the estimation of agricultural products quality. Color image processing techniques are proposed to judge maturity levels or growing of the agricultural products. To complete vision 2020 and to make India digital such automated system is most useful.

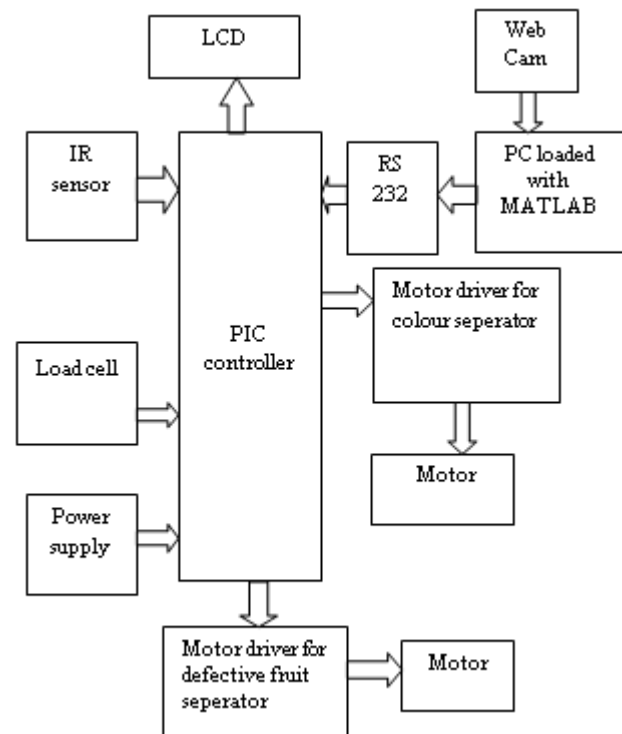
### IV. OBJECTIVES

The objectives of proposed system are as below:

1. To sort fruits according to color of fruit.
2. To sort fruits according to weight of fruits.
3. To develop algorithm for fruits sorting.
4. To develop mechanical system for such system.
5. To develop hardware for the system.

### V. SYSTEM OVERVIEW

This section included the block diagram and block diagram description of the corresponding system. When fruits are present on conveyor belt, IR sensor sense the existence of fruits. Then webcam captured the image of fruits and webcam sends the signal to PC which is loaded with MATLAB software for color detection.



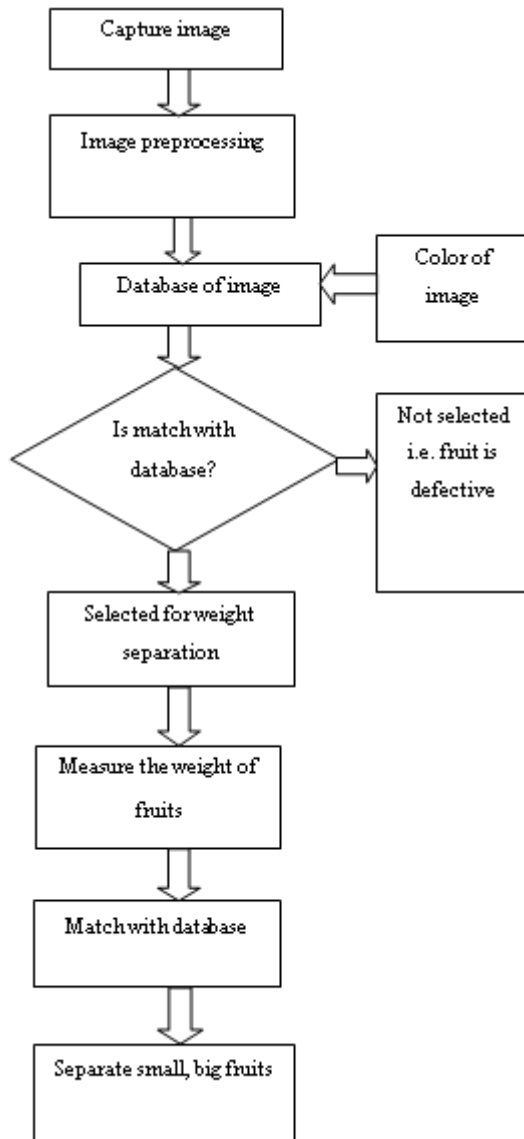
*Fig.1: Block diagram image processing based fruits sorting system.*

This system combines two types of processes, gesture recognition and speech recognition. Figure shows the block diagram of proposed system. Here, load cell is use for sorting the fruits based on its weight. According to this DC motor

rotates and fruits are separate out based on color and weight.

### VI. DESIGN FLOW

The important discussion of the corresponding section is to study the design flow of the system. There are two processes has to be done i.e. sorting of fruits according to color and weight. Both the processes are based on the MATLAB. This will differ in very few manners as the techniques used for both these are little bit similar. Now, let us discuss the flowchart of this system as below.



*Fig.2: Design flow of image processing based fruits sorting system.*

This system proposes a fruits sorting method for tomatoes, onions and pomegranates quality classification by using image analysis. In this sorting system input is in the form of image of testing tomatoes, pomegranates, onions. The database consists of good or defective quality of tomatoes, pomegranates, onions. Then these fruits are separated and next process based on weight separation in done with the help of load cell. This is mostly useful in farmer’s welfare sector to increase accuracy. Now the image processing starts the detection and separation process as the design flow.

The steps for this system are as below:

- Step 1: Image read module

This module is designed to readcapture image and display the image.

- Step 2: Image preprocessing

This module is designed to extract features of hand gesture.

- Step 3: Create database

This module creates a sample of good, medium & bad qualities of sampled image.

- Step 4: Image features

This module calculates the features of hand gesture.

- Step 5: Comparison

This module compares the input gesture with templates stored in database.

### VII. CONCLUSION

A computer vision and image analysis method has been proposed for sorting of fruits. There are two majors part that involved, the first part is a digital image processing that sort out fruits according to different algorithms and methods used in MATLAB and the second part is classifying the fruits according to its weight. We have studied the literature of previous technology. Also we have found the problem in previous technology and decide the objective to develop such system which is fully automated.

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