

# Image Processing for Fruit Grading

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**Abstract:** Image processing is one of the widely used applications. In India, the demand for various fruits and vegetables are increasing as population grows. Researchers have developed numerous algorithms for quality grading and sorting of fruits. The objective of the paper is to provide introduction to machine learning and color based grading algorithms, its components and current work reported on an automatic fruit grading system. This research work present identification of good and bad vegetable is focused on the image processing techniques like segmentation and classification. Due to cost and inaccurate process, sorting ton of quality fruits to produce food products made from fruits is another problem that is faced by most of the agricultural industries. First extract certain features from input vegetable image, later using different method like thresholding, segmentation using k-means clustering and classification using SVM (Support Vector Machine) and ANN (Artificial Neural Network). It gives result in accuracy percentage.

**Keywords:** Fruit grading, Image processing, Image acquisition, Ripeness.

## 1. Introduction

In recent years, use of image processing has been increasing day by day in different areas such as industrial image processing, medical imaging, real time imaging, texture classification, object recognition, etc. Image processing and computer vision in agriculture is another fast growing research field. Different image processing techniques and lots of algorithms have been developed by researchers with the help of MATLAB for accurate fruit disease identification. In land identification, image processing is used for identification of land that will be suitable for agriculture [1]. In plant nitrogen identification, image processing can be used for estimation of plant nitrogen identification and chlorophyll identification [2]. In pest control, image processing is a good tool for identification of pest infected areas because it favors to build up the pest population [3] [4]. Using computer vision, image processing is used to automatic detection and classification of plant disease from color, texture and shape [5]. Food quality can be improved by quality inspection using computer vision [6].

In general, the gradation indices are shape, size, color, maturity, defection, etc. With the progress in computer image vision technology, the gradation technique based on computer vision has developed. The computer vision gradation

technology is real-time, objective, nondestructive, and can detect multi-index simultaneously, such as size, defection, color, shape and the maturity. There are many reports about qualitative evaluation of agricultural products like in order to determine the influence of mechanical harvest, tomato varieties were mechanical harvested and evaluated in laboratory.

In the paper used the different fruit used to done the sorting and grading process. Fruits are used to implement the sorting and grading process. The automated sorting, grading system mainly consists of some simulation process to implement image pre-processing, Histogram equalization, Color detection, segmentation, extracting grading characteristic, desktop application of the project is developed using MATLAB GUIDE.

## 2. Methodology

### A. Steps for image processing

Step-1: Image Acquisition: This is the first step of image processing in which camera is used for capturing fruits images in digital form and store in any digital media.

Step-2: Image Pre-processing: This section removes noise, smoothen the image also perform resizing of images. RGB images are converted to the grey images also contrast of image is increased at certain level.

Step-3: Image Segmentation: Segmentation is used for partitioning an image into various parts.

Step-4: Feature Extraction: This section is used for obtaining features like color, texture and shape which reduce resources to describe large set of data before classification of image.

Step-5: Classification: This section analyzes numerical property of image features and organize its data into categories. It uses neural network which performs training and classification of fruits diseases.

#### 1) Image acquisition

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 color or monochrome source. 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.

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Fig. 1. Input image

### 3. Conclusion

This paper presented an overview on image processing for fruit grading.

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