

# DESIGN AND DETECTION OF FRUITS AND VEGETABLE SPOILED DETECTION SYSTEM

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## ABSTARCT

India is also know as Agricultural Country.Fruit and Vegetable plays an vital role in Indian economy.Thistechnique is basedon taking the image of the object and examining this imageusing image processing technique to remove the discarded object.Thus the proposed system determines the quality by its color, size, weight and age limit of the fruit and vegetable. By using image Processing Technic the rotten part of fruits and vegetables is detects effetely to separate unhealthy from good one. This method of detecting defected object is carried out by using different library function Python Software. Finally, the notification of the spoiled fruits and vegetables is intimated to the user by displaying the message in display.

## I. INTRODUCTION

India is second largest producer of fruits and vegetable in theworld(china is being first).Sales of fresh fruit is getting enlargedday by day. People being health concious prefer only goodquality of fruits and vegetables. therefore quility detection offruit and vegetables is most important.To enhance the averagelifespan of human it is important to avoid the risk for food borneillness. People belonging to a high risk group mostly depend onfruits and vegetables.So, to ensure their safety it is essential toseparte out the rotten vegetable and fruits from the healthy one.

## II. LITERATURE REVIEW:

Post harvesting process of fruit and vegetables is completed in several steps: washing, sorting, grading, packing,storage and transporting. Automatic fruit quality inspection system (2016)- blob detection technique is used for the detection of the rotten part, colour based segmentation and size detection technique is also used to identify the rotten parts basedon thresholding and binary images. Result will be accurately 90.3%.

A Fruits quality management system based on image processing (2017) Analysing the fruits quality which is based on colour, shape and size should be done by non-destructive techniques because these are delicate material.it is also helpful in planning, packing, transport and marketing operations.

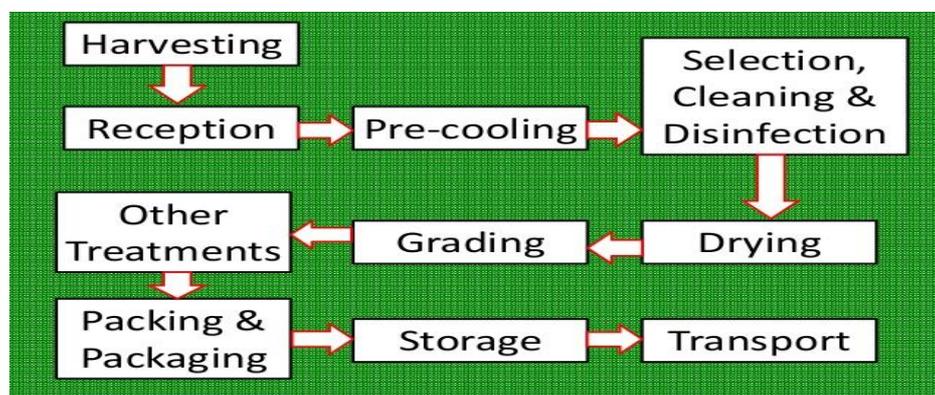


Figure 2.1 post harvesting techniques

### III. DISADVANTAGES

- Indian in particular, we can't afford cost of today's fruit processing facilities.
- Its physical appearance affects its value in the market, so it is important to observe proper handling of fruits after harvesting.

### IV. MATERIAL

- Opencv
- Python
- Image Processing
- Web Camera

### V. DISCUSSION

Texture, Colour and Size are the important parameters for fruit quality identification. Computer vision and image processing techniques have been found increasingly useful in the fruit industry, especially for applications in quality detection. Research in this area indicates the feasibility of using computer vision systems to improve product quality

The use of computer vision for the inspection of fruits has increased during recent years. The market constantly requires higher quality products and consequently, additional features have been developed to enhance computer vision inspection systems. Computer application in agriculture and food industries has been applied in the areas of inspection of fresh products. It indicates whether the fruit is good or bad based on the quality of the fruit.

Exporting of fresh fruit is increased day to day from India. People are very conscious about their health; they prefer only fresh, good quality fruit. Texture, Colour and Size are the important parameters for fruit quality identification. The colour recognition is very important process in ripeness detection. The ripeness detection is external quality factor. But texture is also very important. Because of texture defected fruit can be recognized. Texture analysis detects the non-uniformity of fruit outer surface. The size is also important parameter. It clearly seen parameter all customer select fruit based on size. In this project the features required are colour, texture and size. To get exact feature pre-processing is done on acquired image. The main aim of image processing is an improvement of image so that unwanted distortions are suppressed and enhance image features which are important for further processing. The basic steps of pre-processing are first convert RGB image to gray scale image. Then image histogram equalization is applied on gray image. This helps in adjusting image intensities in order to enhance contrast.

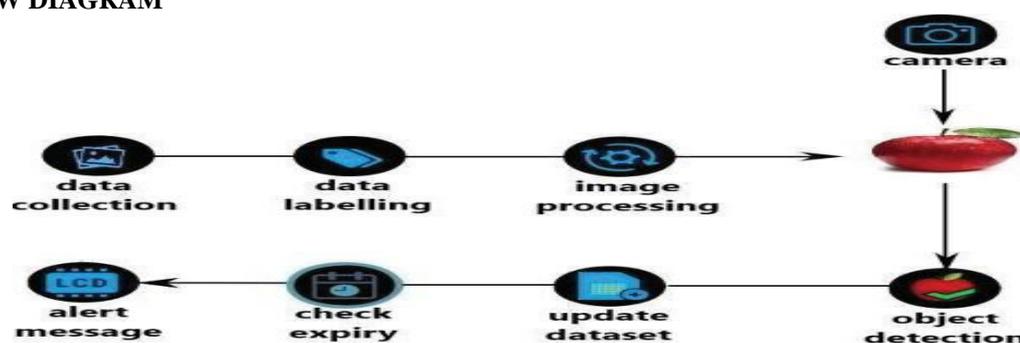
Remove noise with filter, here we use median filter for removing noise here laplacian is used for edge detection as it highlights the region with rapid intensity change. So this enhanced, noise free, filtered image is ready for further processing. In order to fulfil the consumer's desire and socio - economic requirement, fruit quality evaluation becomes very important now a day. Quality of produce encompasses sensory properties (appearance, texture, taste and aroma), nutritive values, chemical constituents, mechanical properties, functional properties and defects.

All the fruits have limited shelf life during which it goes through structural and chemical changes. The ripeness detection is external quality factor. But texture is also very important. Because of texture defected fruit can be recognized. Texture analysis detects the non-uniformity of fruit outer surface. The size is also important parameter. It clearly seen parameter all customer select fruit based on size.

### VI. ADVANTAGES

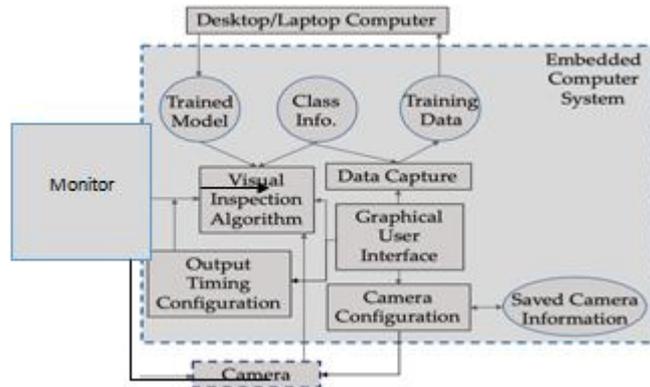
- It is easy to identify the quality of the fruits.
- To replace manual inspection of food, computer vision system is used which provide authentic, equitable.

### VII. FLOW DIAGRAM

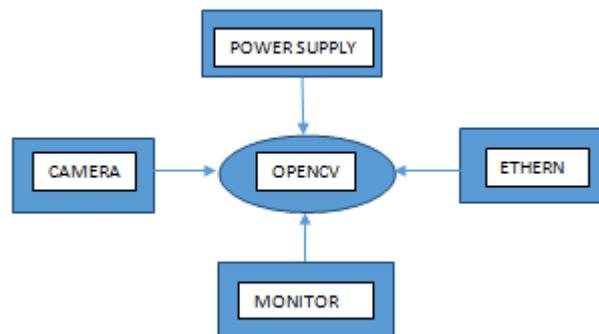


D- DISPLAY

VIII. ARCHITECHTURE



IX. BLOCK DIAGRAM



X. FINDING

- Acquiring the images of the Fruits
- Detection process
- Detection of defective Fruits

a) Acquiring the images of the Fruits

In this project, we collected the number of database of fruit images that is good and bad quality images. These fruit image databases are helpful for more accurate result.

b) Detection Process

RGB image is converted to HSV color space. Then lower and upper ranges are defined. Then ranges of binary image are defined. Then convert single channel mask back into 3 channels. 3. For extracts a colored object to detect red, here we use HSV color thresholder script to determine the lower/upper thresholds. HSV color space is also give the information about the image that is, it either present or not in this system

c) Detection of defective Fruits

Finding out the defective tomato is one of the most important pre-processing steps. A color image of the tomato was used for the analysis. If the pixel value is less than the selected threshold value then it is considered as a part of defective skin i.e. bad quality fruit. Any pixel value greater than the selected threshold value is a part of pure skin i.e. good quality fruit. Then the total number of white pixels are calculated which will be equal to the total number of pixels corresponding to damaged skin.

## **XI. METHODS**

### **i. OPENCV**

Computervision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as Numpuy, python is capable of processing the OpenCV array structure for analysis. To Identify image pattern and its various features we use vector space and perform mathematical operations on these features. The first OpenCV version was 1.0. OpenCV is released under a BSD license and hence it's free for both academic and commercial use. It has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android.

### **APPLICATION OF OPENCV**

There are lots of applications which are solved using OpenCV, some of them are listed below

- face recognition
- Automated inspection and surveillance
- number of people – count (foot traffic in a mall, etc)
- Vehicle counting on highways along with their speeds
- Interactive art installatio

### **1) CHANGING COLOR SPACES**

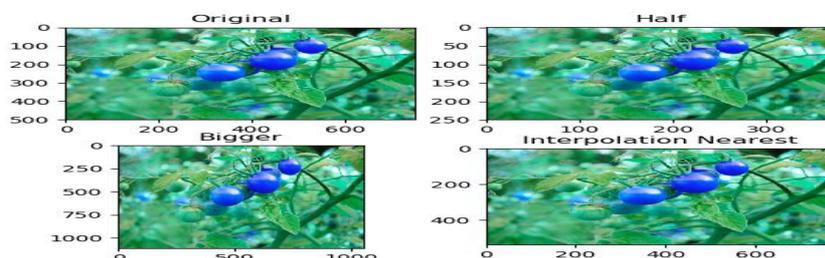
A colour space is a protocol for representing colors in a way that makes them easily reproducible. We know that grayscale images have single pixel values and color images contain 3 values for each pixel – the intensities of the Red, Green and Blue channels. Most computer vision use cases process images in RGB format. However, applications like video compression and device independent storage – these are heavily dependent on other color spaces, like the Hue-Saturation-Value or HSV color space.

As you understand a RGB image consists of the color intensity of different color channels, i.e. the intensity and color information are mixed in RGB color space but in HSV color space the color and intensity information are separated from each other. This makes HSV color space more robust to lighting changes. OpenCV reads a given image in the BGR format by default. So, you'll need to change the color space of your image from BGR to RGB when reading images using OpenCV.

### **1) RESIZING IMAGE**

Machine learning models work with a fixed sized input. The same idea applies to computer vision models as well. The images we use for training our model must be of the same size. Now this might become problematic if we are creating our own dataset by scraping images from various sources. That's where the function of resizing images comes to the fore. Images can be easily scaled up and down using OpenCV.

This operation is useful for training deep learning models when we need to convert images to the model's input shape. Most image viewing programs have a built-in feature to help you change the size of images. Here are our favourite image resizing tools for Windows. We've picked out a built-in option, a couple of third party apps, and even a browser-based tool.



**Figure 11.1 Resizing image**

### 1) OBJECT DETECTION

Object detection is an important task, yet challenging vision task. It is a critical part of many applications such as image search, image auto-annotation and scene understanding, object tracking. Moving object tracking of video image sequences was one of the most important subjects in computer vision

It had already been applied in many computer vision fields, such as smart video surveillance (ArunHampapur 2005), artificial intelligence, military guidance, safety detection and robot navigation, medical and biological application.

In recent years, a number of successful single-object tracking system appeared, but in the presence of several objects, object detection becomes difficult and when objects are fully or partially occluded, they are obtruded from the human vision which further increases the problem of detection. Decreasing illumination and acquisition angle.

The proposed MLP based object tracking system is made robust by an optimum selection of unique features and also by implementing the Adaboost strong classification method. Object Detection is a computer technology related to computer vision, image processing, and deep learning that deals with detecting instances of objects in images and videos. We will do object detection in this article using something known as **haarcascades**.



**FIGURE 11.2 Object Detection**

#### i. PYTHON:

Python is a popular programming language. It was created by Guido van Rossum, and released in 1991. It is used for:

- web development (server-side),
- software development,
- mathematics,
- System scripting.

Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc). Python has a simple syntax similar to the English language. Python has syntax that allows developers to write programs with fewer lines than some other programming languages. Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick. Python can be treated in a procedural way, an object-oriented way or a functional way. Flexible and powerful, Python was originally developed in the late 1980s at the National Research Institute for Mathematics and Computer Science by Guido van Rossum as a successor to the ABC language. Since its introduction, Python has grown in popularity thanks to what is seen as a clear and expressive syntax developed with a focus on ensuring that code is readable. Python is a high-level language.

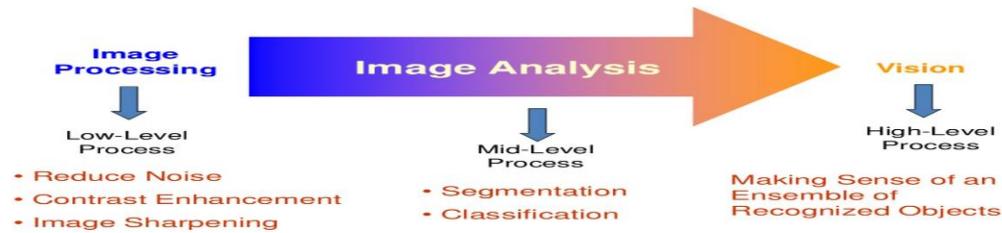
#### ii. COMPUTER VISION

Computer Vision can be defined as a discipline that explains how to reconstruct, interrupt, and understand a 3D scene from its 2D images, in terms of the properties of the structure present in the scene. It deals with modelling and replicating human vision using computer software and hardware. Computer Vision overlaps significantly with the following fields

- Image processing
- Pattern recognition
- Photogrammetry

##### a. Image Processing

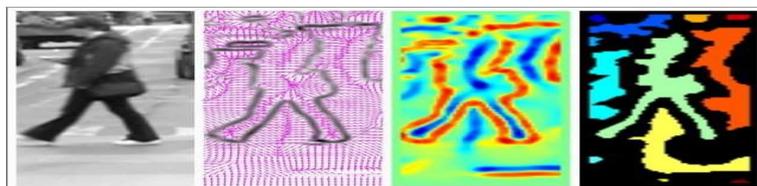
It focuses on image manipulation. Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image.



**Figure 11.3 Image Processing**

**b. Pattern Recognition:**

It explains various techniques to classify patterns. Pattern recognition is the automated recognition of patterns and regularities in data. It has applications in statistical data analysis, signal processing, image analysis, information retrieval, bioinformatics, data compression, computer graphics and machine learning. Pattern recognition has its origins in statistics and engineering; some modern approaches to pattern recognition include the use of machine learning, due to the increased availability of big data and a new abundance of processing power. However, these activities can be viewed as two facets of the same field of application, and together they have undergone substantial development over the past few decades.



**Figure 11.4 Pattern Recognition**

**c. Photogrammetry:**

It is concerned with obtaining accurate measurements from images. Photogrammetry, as its name implies, is a 3-dimensional coordinate measuring technique that uses photographs as the fundamental medium for metrology (or measurement). The fundamental principle used by Photogrammetry is triangulation or more specifically called Aerial Triangulation. By taking photographs from at least two different locations, so-called “lines of sight” can be developed from each camera to points on the object. These lines of sight (sometimes called rays owing to their optical nature) are mathematically intersected to produce the 3-dimensional coordinates of the points of interest.

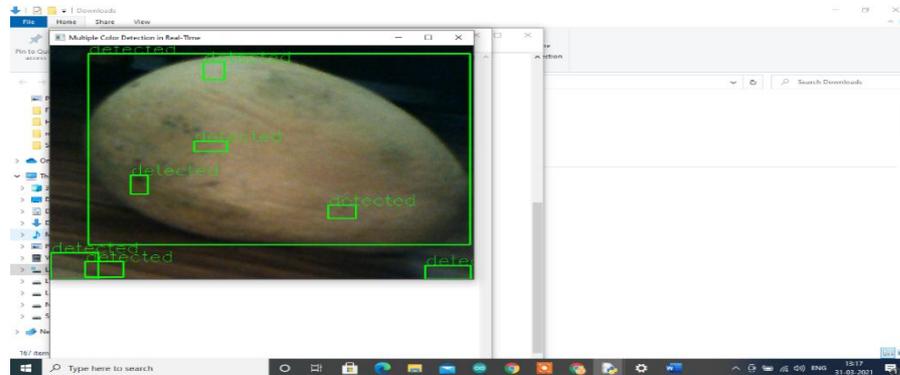


**Figure 11.5 Photogrammetry**

**XII. RESULT**

In the process of fruit sorting and grading to work system efficiently proper image acquisition is very important. The image is captured with camera that image is with noise and its features are not clearly seen so image pre-processing is done on that image. In this project the features required are color, texture and size. To get exact feature pre-processing is done on acquired image. The main aim of image processing is an improvement of image so that unwanted distortions are suppressed and enhance image features which are important for further processing. The basic steps of pre-processing are first convert RGB image to gray scale image. Then image histogram equalization is applied on gray image. This helps in adjusting image intensities in order to enhance contrast. Remove noise with filter, here we use

median filter for removing noise. The laplacian is used for edge detection as it highlights the region with rapid intensity change. So this enhanced, noise free, filtered image is ready for further processing. The image is captured. First convert RGB image to gray scale image. Then OSTU thresholding the binary thresholding is performed on that image. Then morphological operation such as dilation then erosion is performed. For boundary detection opening is performed. Then major axis and minor axis length is calculated. Then size is decided as small, medium and large.



**Figure 12.1 Stage 1: Detecting The Fruit**



**Figure 10.2 Defected Part Is Identified and Shown As Spoiled**

### **XIII. CONCLUSION**

In this project, the identification of normal and defective fruits based on quality using OPENCV/PYTHON is successfully done with accuracy. The use of image processing for identifying the quality can be applied not only to any particular fruit. We can also apply this method to identify quality of vegetables with more accuracy. Thus, this will enable the technology to be applied in many products. To replace manual inspection of food, computer vision system is used which provide authentic, equitable and non-destructive rating. The image processing is done by software OpenCV using a language python. The software is divided into two parts first one is for image analysis and other is for controlling hardware based on image processing results. The system is operated in two different scenarios in first the image is captured with camera the all the image processing is done in the control module. All the process are shown on monitor and then based on decision taken by control module. The conveyor assembly is operated.

#### **a) FUTURE WORK:**

This technique can be massively used in industries but while in transportation system. This pick and place robotic sensors can be used only for the boxes in the top most rows, the further work will be carried out on usage of this sensors for the boxes at the bottom. In this project we can identify the defected objects one by one, in future it can be introduced to use in industries to massive quality checking. We are identified the fruits or vegetables is spoiled or not by its colour, size and texture, this can be extracted in future as the fruit or vegetables is affected by its inside or not.

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