

# Automated Color based Object Sorting for Quality Control

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**Abstract-** The quality evaluation process of cherry tomato only dependent on mechanical size-based sorting methods. Consumers are always demanding high quality products. This project revolves around applying image processing techniques to achieve effective quality maintenance in food processing industries. This method works by making pair ways comparisons between a defective group and a non-defective group and generating the correct HSV (Hue Saturation value) to separate the defective group from the non-defective group using Open CV(Open Source Computer Vision).

**Keywords:** Size sorting-machine, Image-processing technique

## 1. INTRODUCTION

In Industrial automation it uses various control system for operating equipments.

The advantage of automation is that it saves labor; it is also used to save energy and materials. The automation also used to improve quality, accuracy and precision.

Automation has been achieved by different methods including mechanical, hydraulic, pneumatic, electrical, electronic devices and computers, sometimes in combination. Complicated systems usually use all these combined techniques.

The idea for incorporating image processing or machine vision to streamline industrial automation has not been implemented in a large scale. Our project aims at implementing machine vision to improve the efficiency of industrial automation [2]. Our work revolves around quality assessment of vegetables based on their color.

Moreover this integration has been done on an open source platform, with Linux operating system using a library tool called OpenCV. OpenCV is completely free and can be used on either Linux or on windows using Visual studio (On Windows). But, OpenCV exclusively combined with a customizable Linux operating system, will pave way to expected, estimated results.

The cherry tomatoes sorting technique always requires non-destructive, effective, less time consuming and higher quality standards. Cherry tomato quality grading is always performed on employ drums or bar shaped-sorting equipment, it based on size sorting [5].

The problem of size sorting technique is that it deficient in satisfying consumer demands in Asian countries [4]. Consumer's requirement always is the higher quality products. Not only size but other factors are also important for evaluating the overall quality market value of the

vegetable. Other factors include color, surface defects, firmness, and sugar/acid contents of cherry tomatoes. But the color of the cherry tomatoes is a major decision factor for determining what product to purchase [3].

The color of the cherry tomatoes develops through green and the light red or red phases. It is always necessary to export the red cherry tomatoes to nearby countries and the green cherry tomatoes to some other countries. This is because the process of determining the color of the cherry tomato is so imperative to the market operation.

## 2. LITERATURE REVIEW

Inspection means it is the process of measuring, examining, testing or gauging one or more characteristics of a product or service. It compares the results with specified requirements [6]

The purpose of visual inspection is quality control, data acquisition, and data analysis. Inspections using Ultrasonic, X-Ray equipment, Infra-red, etc. are not considered as Visual Inspection because these Inspection methodologies require specialized equipment, training and certification. [7]

In automated optical inspection (AOI) a camera autonomously scans the device .It is a non-contact test method used in the manufacturing process. It is implemented through the manufacturing process including bare board inspection, solder paste inspection (SPI), pre-reflow and post-reflow as well as other stages. [8]

The current automated visual inspection methods employ the usage of MATLAB and visual studio which are commercial software and are quite expensive. [1]

## 3. SYSTEM OVERVIEW

### 3.1. Block diagram

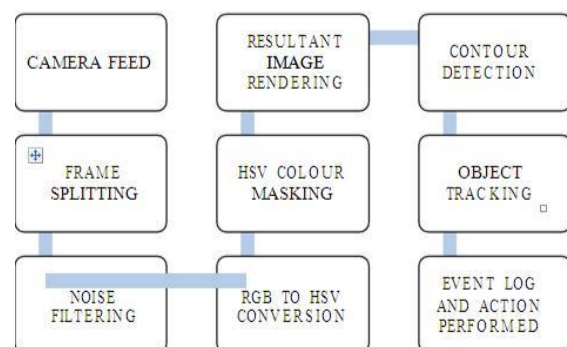


Figure 3.1 Block diagram

**Camera Feed:**

The camera feed is to receive the input image and to transmit it to the system internally. The feed is a live stream.

**Frame Splitting:**

The live feed is split into individual frames on which the image processing operation are performed.

**Noise Filtering:**

Noise filtering technique is used to eliminate unwanted frequency disturbances occurring to the image.

**RGB to HSV conversion:**

RGB filtering is done and the color space is changed to HSV (Hue Saturation Value).

**HSV color masking:**

HSV range for the color of interest is fixed and the region of interest from the image is masked and separated.

**Contour & Color Detection:**

The color of interest is detected based on the HSV values and the contour is obtained by the LOGICAL AND operation of original frame and processed frame.

**Object tracking:**

Object that is processed is tracked to make a log and to prevent repetitive processing once it's detected and identified.

**Event log:**

The date and time of detection is maintained in a text file.

**4. EXPECTED RESULT**

Cherry tomatoes were harvested from a farm. On the basis of ripeness the harvested tomatoes were divided into six different categories. Each cherry tomato was measured and classified into 3 stages, and these are provided in Figure 4.1.

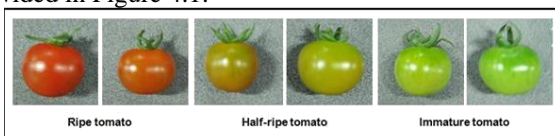


Figure 4.1: Photos of the tomato samples

The real time operation started with the acquisition of the original image of cherry tomatoes (RGB color).

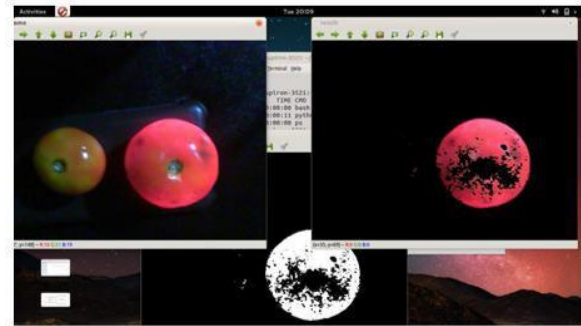


Figure 4.2 Differentiation – Ripe vs Unripe - colour detection

The figure 4.3 shows the event log for the detection .whenever an expected object is detected the date and time of detection is stored in a text file. The event log is a part of HCI.

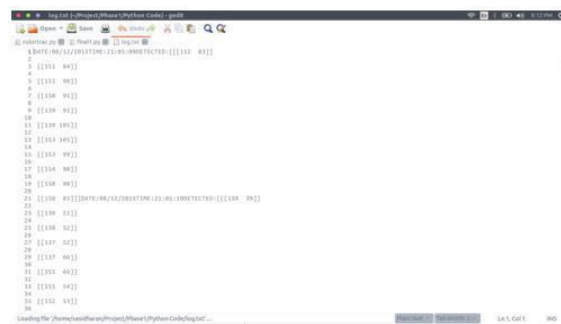


Figure 4.3: Event log

**5. CONCLUSION & FUTURE ENHANCEMENT**

Thus, with the help of image processing techniques coupled with a mighty and effective library OpenCV, quality control is completely attainable. The above technique is also found capable of providing exemplary efficiency and dynamic operation. The above result is planned to be implemented on a credit card sized computer known as the Raspberry Pi which runs on Linux OS and operates on python, primarily. An appropriate rejection or selection mechanism is also planned to be developed in order to give in effective rejection results, thereby operating as a separate entity

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