

Microcontroller Based Fruit Sorting Using MATLAB Image Processing

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Abstract: The purpose of the system is to done fruit sorting. It can be done in many food industries for making various food products. The fruits are sorted by their color by considering color ratio measured by RGB model. This system is used to maintain the hygiene of food and reduce the human error. It can also reduce the time taken for traditional sorting.

Keywords: PIC microcontroller, MATLAB, Camera, Motor, Sensor, Conveyor belt.

1. Introduction

In the food industry generally traditional method is used for sorting of fruits in which human labors are sort the fruits. The appearance of fruit plays important role in sorting. Usually, the fresh fruit is recognized by their color. The color is important phenomenon in sorting of the system. We considered the color of fruit for sorting, which allows ripeness defect or damages. it also reduces the time taken by traditional method of fruit sorting. The system is divided into three parts that is software design, hardware design and programming. The MATLAB software is used for image processing and PIC controller is used in hardware design. The project requires both MATLAB and Controller programming to handle the whole system.

2. Literature Review

“Fruit Quality Management Sorting system” by Madhura R. Lodam, proposed the system based on GUI in MATLAB is used as a reference point to calculate size, height & weight on the basis of that the fruits are sorted. They are mainly focused on to increase the quality of food products and to check the quality with minimum amount of time and the GUI displays all the features and the fruits sorted.

“ARM Based Fruit Grading and Management System Using Image Processing” by Manoj.

Avhad, proposed that the system has ARM as the main processor and it used to check the quality of fruits based on fruits color, size detection and grading system and has used GSM module for getting the idea of grading system to head office.

“A Fruit Quality Management System Based On Image Processing” by Ms. Rupali. S.

Jadhav, proposed that to investigate and control quality, embedded system is used to provide

high accuracy of grading, consistent and quantitative information. They also used grey scale images to get proper images and to find size of a fruits.

Hongshe Dang, Jinguo Song, Qin Guo has proposed “fruit size detecting and grading system” based on image processing. The system takes raspberry pi as main processor and develops the fruits size detecting program using image processing algorithms on the QT/Embedded platform. Authors in have proposed system which finds size of different fruits and accordingly different fruits can be sorted using fuzzy logic, here author proposed MATLAB for the features extraction and for making GUI.

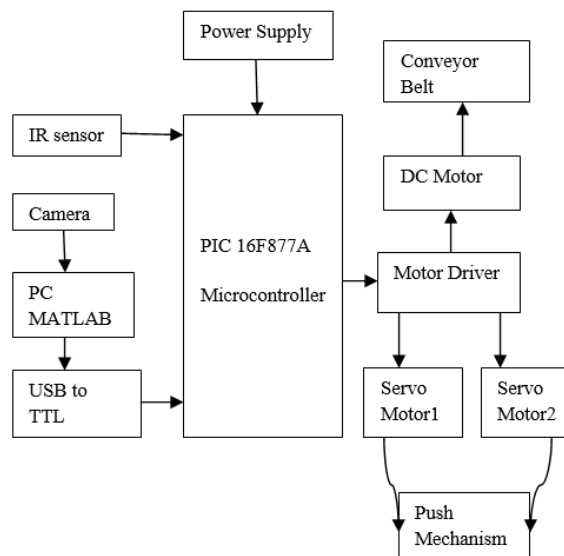


Fig. 1. Block diagram

3. Methodology of Software

Step-1: Capturing the image

The web cameras interface with computer, it is used to capture the image. Initially the captured images are in the form of RGB format. It is the combination of three primary colors as red, green and blue. In color image, each pixel is composed of RGB values and each of these colors require 8-bits (1 Byte) for its representation. Hence, each pixel is represented by 24-bits.

Step-2: Conversion of image

For comparison, the image should be in black and white form. Thus the RGB image is converted in black and white image. But, here before converting it into black and white image, it should be converted in gray scale image. Gray scale images have black, white and various shades of grey color. each pixel is usually stored as a byte (8-bits) because of these each pixel can have values ranges from 0 to 255.

Color image can be easily converted to gray scale images using the equation,

$$X=0.30R+0.59G+0.11B$$

Also, it can be measured as,

$$X= \frac{R+G+B}{3}$$

Step-3: Comparison of images

The captured image can be compared with standard image. then it can be compared on the basics of colors. if the image possesses large amount of required color then the fruit is good or else it is damaged. For this comparison the images can be selected from Data. The imread() command is used to access the image in MATLAB .

Step-4: Recognize the color

In this, we have to find the value of centroid pixels. it can be measured by function $P= \text{impixel}(x, y)$. Here ' I ' returns the value of pixel and x & y are the values of centroid for the captured image. If the value of centroid pixel has large amount

of red color than the blue and green, then fruit is good quality. If the pixel contains large amount of green and blue, the fruit is damaged.

4. System Overview

First we initialize camera, IR sensor and DC motor of conveyor belt. Conveyor belt will start first. after some time, conveyor will stop in front of IR sensor. It detects the object, if object is not present then IR sensor continuously check the object is present or not and if object is present then camera capture the real image of object.

After this, it recognize the color of object. If object is red then put it into trolley 1. If object is green color then put in trolley 2 and if object is damaged then throw out from conveyor. This process will repeat for several times.

5. Conclusion

In our project we are sorting red, green and damaged apples using image processing technique in MATLAB. From this we are maintaining quality as well as hygiene of product.

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