

DESIGN AND IMPLEMENTATION OF VIDEO CAPTURE SYSTEM USING SYSTEM ON CHIP

Mayuri B. Khodake, Prof. S. V. Shinde

Abstract — Image processing has many application like Medical Science, Fingerprint recognition, Traffic System Monitoring and so on. it is one of it i.e. fruit sorting and grading. Fruit grading and sorting is done in various parameter such as color and weight. Camera captured the fruit image on top view, this image is processed using RGB color space algorithm for color classification system and find the which color of fruit can be detected. Load cell arrangement is used for sorting and grading based on weight parameter. fruits are classified in to three different group such as small, medium and large according to their weight. This paper focuses on developing quality of fruit and new automated technique is presented. The algorithm is then synthesized on FPGA and the result shows on LCD and MATLAB monitor screen. This system has the advantage of high accuracy of grading, high speed.

Index Terms — grading, sorting, image processing, conveyor belt hardware, fruit sorting.

I. INTRODUCTION

Development in agriculture sector is slow as compare to other sector. If fruit quality standards is high increasing market value. There are some fruits are seasonal fruit and they available for certain season. Fruits are used in many processed forms for jam, paste, juice. These processed products of fruits yield good income when it exports. In day to day life fruits plays vital role. Grading of fruit is necessary for meeting quality standard and increasing market value.

Agro industry means industry which is connected with agriculture. The main task of the agro-industry focuses the postharvest process such as processing the agricultural products after harvest and storing the products for domestic applications. Postharvest process includes cooling, cleaning, sorting, grading and packing. One of the post-harvest processes is sorting which upgrades the product is accomplished based on texture, size and shape.

Sorting and grading of fruit is done manually it will be slow, more time consuming and error prone. In food processing industry it has main problem so by using programming we can use proposed method for sorting then it

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Mayuri B. Khodake, Electronics and Telecommunication Department, Sinhgad Institute of Technology, Lonavala, India.

Prof. S. V. Shinde, Electronics and Telecommunication Department, Sinhgad Institute of Technology, Lonavala, India,

work will be faster. It is accurate, less time consuming and high desirable. RGB algorithm can sorting and grading the fruit according to color.

II. CONSTRUCTION

The proposed automated system is design a processes such as feature extraction, sorting according to color and grading according to size. Software development is highly important in this color classification system. Camera and RS 232 connected to PC (Matlab) and 12V power supply is connected to hardware system. AVR microcontroller is used for controlling DC motor which is used for conveyor belt. The block diagram of a system is shown in fig. 1.

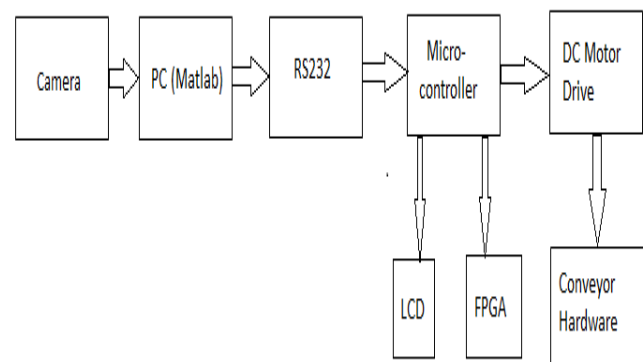


Fig 1 – Block Diagram of System

III. WORKING OF SYSTEM

This system is overcome the problems of manual techniques. Hardware designed contains conveyor system, camera, IR object detection sensor, LCD display, AVR microcontroller and load cell for weight measure. The hardware prototype shown in figure 2.

Camera is continuously scanning the conveyor belt in video mode, Camera capture the live image of fruit on top view when conveyor belt stops as fruit is detected by IR sensor. Two IR sensor are used one is used for start the conveyor belt LED glow when fruit is detected and other is used for stop the conveyor. The taken image is given to Matlab software for which color of fruit detected through RGB color space algorithm. This data transferred to PC through RS 232 and com port.

If we choose red color in Matlab software then it detects only red color and other color i.e. blue or green detected then it shows as defected fruit. In RGB algorithm 01 is used for red and 10 is used for green and 11 is used for blue.



Fig 2 – Hardware prototype

This information is given to FPGA, they give decision if we selected fruit is red and fruit color is detected red so it gives yes and result is display on LCD and monitor screen as detected fruit is red and its weight categories in small medium and large. if fruit detected is not red so it gives no and result is display on LCD is defected fruit and remove it.

IV. COLOR DETECTION

In this process of fruit color is detected based on RGB values. Find color of fruit using RGB value. Image captured from the camera, this taken image is processed in Matlab software and synthesized in FPGA and according to color can be detected.

Algorithm:

1. Start
2. Read input color image.
3. This color image in three different plane(RGB).
4. Read the region of fruit to detect color.
5. Stored in variable r1, g1, b1
6. Calculate the mean of r1, g1, b1 and store in to different variable r2, g2, b2.
7. Compare value with threshold.
8. If $r2 > \text{threshold}$, color detected is red.
9. If $g2 > \text{threshold}$, color detected is green.

V. ADVANTAGES OF FRUIT SORTING AND GRADING

- 1) It increased market efficiency by facilitating buying and selling a produce without personal selection.
- 2) Losses the selling price due to presence of substandard

product or specimen can easily avoided.

- 3) Grading enhanced to set good price for graded products.
- 4) Heavy marketing cost in packing and transportation can be avoided.
- 5) It improves quality of fruit.
- 6) It improves efficiency and accuracy.

VI. APPLICATIONS OF FRUIT SORTING AND GRADING

1) In Industrial Applications:

In industry millions of fruits are used, if fruits are manually sort and grade its more time consume so it use automated technique for sorting and grading. Sorting and grading based on size, color and shape. Weight sorting is very accurate method and is used for valuable fruits. It is also easy for packaging.

2) In Food Applications:

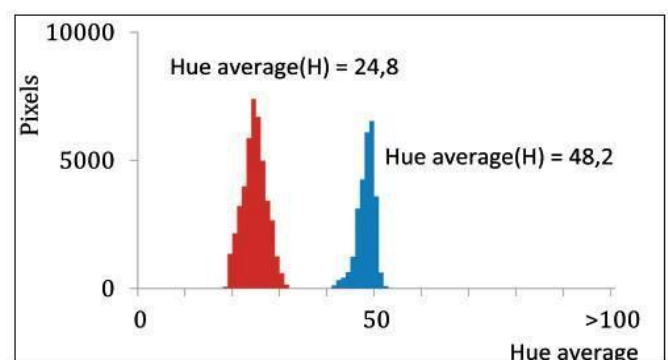
In food industry, many fruits are used for making jam, paste and juice. For this fruits are going through post-harvest processes such as cleaning, sorting, and grading. So we used this automation technique for sorting and grading.

VII. RESULTS

The result is the final step in which outcome of the project is being displayed. The fruit image is captured from a fixed distance and accordingly camera is calibrated. The grading using color and size detection, the user with proper buttons to use them on the query image and features of the object are displayed on to the monitor screen and weight is displayed on the LED. It has been simulated using knowledge of FPGA design tools such as HDL, MATLAB.

Fig 3 – Histogram of apple and its fault

Figure 3 shows the histogram of normal apple as well as also rippen apple. Figure 4 shows the histogram stored in



the database of the normal fully red apple, while figure 5 shows how normal red apple histogram changed with rippen apple histogram.

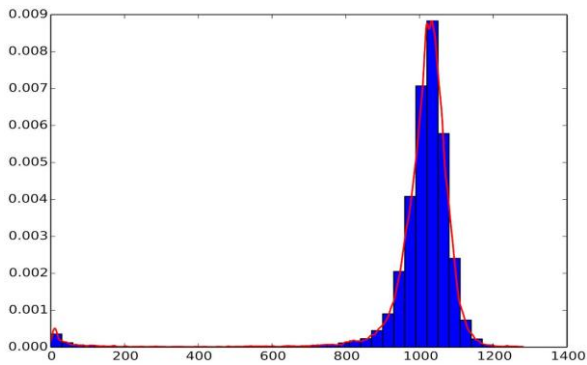


Fig 4 – Histogram of fully red apple

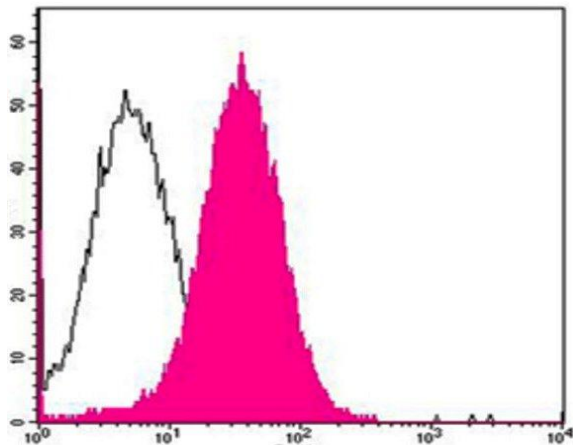


Fig 5 – Ripeness fruit detection using change in histogram

VIII. CONCLUSION

The proposed system is a demo version, so for a large scale production the number of cameras and length of conveyor system can be modified. This work presents for sorting and grading of different fruits.

Generally image capture is a big challenge as there is a chance of high uncertainty due to the external lighting conditions, so we are taking the advantage of gray scale image which are less effected to the external environment changes as well as beneficial for finding color and size of a fruit. Speed and efficiency of a system improved by using FPGA.

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