GRADING AND SORTING OF APPLE BY USING IMAGE PROCESSING

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Abstract - *In recent years, automatic visual inspection system has become useful tool in industrial process. The apple sorting and grading process has now been completely automated with the exception of the final stage of classification concerned with visual inspection. Due to the growing demand of quality apple, an automated and reliable identification and classification mechanism in order to handle the bulk of data is implemented. Human vision sometimes leads to mismatch between the fruits. Using machine vision system, it will be simple to reduce human effort and achieve a better output. The objective of this project is to assess the apple by color grading. we describe an integrated system developed for the sorting on apple and for the color grading of the defected fruits. The following project aims at implementing such an automated system using image processing with color images of apple as a basis of classification depending on its different characteristics such as color, shape. The goal of the inspection is not to give a statistical analysis of the production but to classify every apple into quality constant batches.*

1.INTRODUCTION

Inspection for quality is an important procedure for marketing, storing and processing of fruits. Size, shape, color and defects are some of the significant properties related to the quality of fruits, Evaluation of these quality parameters. Also, such inspection results in fruits having a better appearance and improved consumer acceptance.

Traditionally, the fruits are inspected for quality by human inspectors. Manual inspection of large quantities of fruits is a tedious and labor-intensive task. Human inspectors view the fruits and assign quality scores depending on fruit quality for suitable grading. Although human vision is best at analyzing very complex scenes, it looses its precision for carrying out a repeated task like the inspection of fruits.

The machine vision inspection system essentially involves three main Processes namely image acquisition, image processing and decision-making. Cameras under appropriate lighting conditions carry out image acquisition. The visual information is converted from analog to digital format. The acquired images are analyzed by image processing hardware and/or software to extract the required object features and quality parameters. Based on these results, a decision on the fruit quality is taken by software considering the end user's requirements.

1.1.LITERATURE SURVEY

The application of machine vision based system, aimed to replace manual based technique for grading and sorting of fruit and vegetable. The manual works obtained problems in maintaining consistency in grading and uniformity in sorting. To speed up the process as well as maintain the consistency, uniformity and accuracy, a prototype computer vision based automatic grading and sorting system is developed. The main aim of the proposed system is to sort and grade The simulated version of the proposed system is developed using MATLAB R 2013 version and desktop application of the project is developed using MATLAB GUIDE [1].

Automated inspection of apple quality involves computer recognition of good apples and blemished apples based on geometric or statistical features derived from apple images. In agricultural sector the efficiency and the accurate grading process is very essential to increase the productivity of produce. Automatic grading system not only speeds up the process but also gives accurate results. Therefore, there is a need for an efficient fruits grading or classification methods to be developed. Fruit's color, size. component texture, ripeness are important features for accurate classification and sorting of fruits

such as oranges, apples, mangoes etc. Objective of this paper is to emphasize on recent work reported on an automatic fruit quality detection system. This paper presents the image processing techniques for feature extraction and classification for fruit quality measurement system [2].

Table -1:

No	Type	Color	Size
1.	Grade 1	Red	Large
2.	Grade 2	Faint Red	Medium
3.	Grade 3	Green	Small

The size(height & radius) are displayed on the o/p screen, the control is transferred towards the microcontroller . again conveyor is started for sorting the apple according to the categories shown in table

Depending upon the above parameters we are giving the grades to the apple .e.g GRADE A,GRADE B etc. these grades are also displayed on the LCD display.
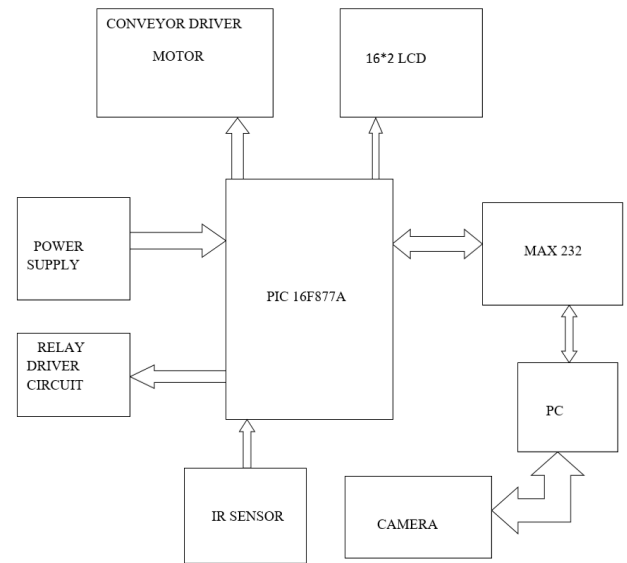

Chart -1:Flow chart

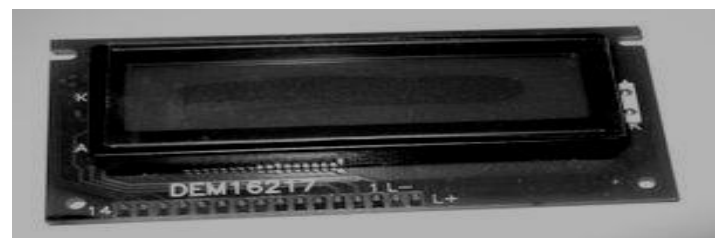**Fig -1**: Block Diagram

a)16*2 LCD:

Fig -2

We use here 16*2 LCD.

In recently years, the LCD is finding widespread use replacing 7-segment LED's. This is due to following reasons.

1. It is more versatile than LED's which are used in 7-segment display.

2. The declining prices of LCD's.

3.The ability to display numbers, characters& graphics. This is in contrast to LED's, which are limited to numbers & a few characters.

4. Incorporation of a refreshing controller into the LCD, thereby reliving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
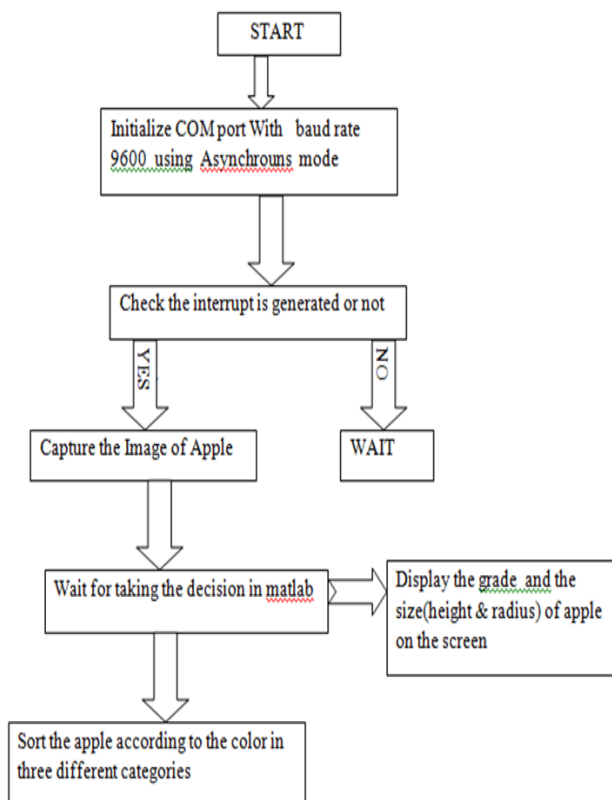
5. Ease of programming for characters & graphics.

b)MAX 232:

Since the RS 232 is not compatible with today's microcontrollers, there is need of line driver such as MAX 232 which converts RS232 voltage levels to TTL levels and vice versa. It is used to convert TTL logic level into RS232 logic levels during serial communication of microcontrollers with printer. Dual driver/receiver that includes a capacitive voltage generator to supply RS232voltage levels from a single 5v supply.

c)Relay system:

Fig -3

A relay system used here for giving supply to the motor. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts as shown in the diagram.
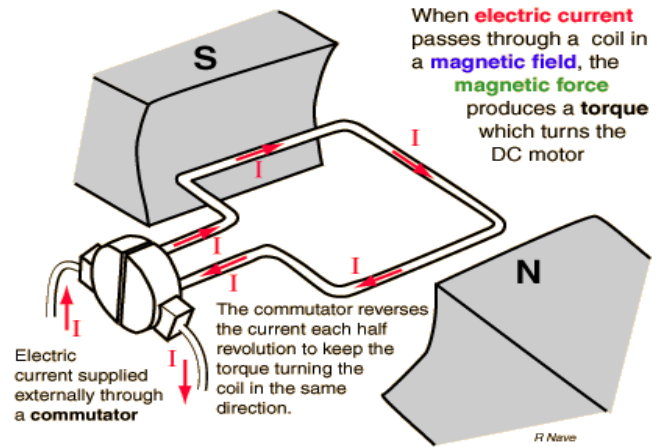
d)DC Motor:

Fig -5

A DC motor is a mechanically commutated electric motor powered from direct current (DC). The stator is stationary in space by definition and therefore its current. The current in the rotor is switched by the commutator also be stationary in space. This is how the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees, which generates the maximum torque.

DC motors have a rotating armature winding (winding in which a voltage is induced) but non-rotating armature magnetic field and a static field winding (winding that produce the main magnetic flux) or permanent magnet. Different connections of the field and armature winding provide different inherent speed/torque regulation characteristics. The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current. The introduction of variable resistance in the armature circuit or field circuit allowed speed control. Modern DC motors are often controlled by power electronics systems called DC drives.

The line shaft DC motors can operate directly from rechargeable batteries. Today DC motors are still found in applications as small as toys and disk drives.

e)IR SENSOR

Fig -6

Infrared proximity switch module is a reflection-type photoelectric sensor which integrates transmitting and receiving infrared beams function. Infrared proximity switches work by sending out beams of invisible infrared light. A photo detector on the proximity switch detects any reflections of this light. These reflections allow infrared proximity switches to determine whether there is an object nearby

f)Image Capturing Unit

Fig-7

The fruit images are captured to analyze the fruit surface for extracting the

color, size. For that we are using two cameras.

1.4 Mechanical Assembly:

1) Image Capturing Unit
2) Conveyor Belt
3) Sorter

4) Decision terminal

IMAGE PROCESSING

Image processing by itself implies,

- ✓ Image acquisition.
- ✓ Pre-processing.
- ✓ Segmentation.
- ✓ Recognition & interpretation.

Image acquisition:-

This section illustrates the basic steps required to create an image. Detects movement in a scene by performing a pixel-to-pixel comparison in pairs of incoming image frames. If nothing moves in the scene, pixel values remain the same in each frame. When something moves in the image, the application displays the pixels that have changed values.

To run the code, we must have an image acquisition device connected to system. The device can be a professional grade image acquisition device, such as a frame grabber, or a generic image acquisition device, such as a webcam.

1) Step 1: Install Image Acquisition Device

Follow the setup instructions that come with image acquisition device. Setup typically involves:

- Installing the frame grabber board in your computer.
- Installing any software drivers required by the device. These are supplied by the device vendor.
- Connecting a camera to a connector on the frame grabber board.
- Verifying that the camera is working properly by running the application software that came with the camera and viewing a live video stream.

Generic Windows image acquisition devices, such as webcams and digital video camcorders, typically do not require the installation of a frame grabber board. You connect these devices directly to your computer via a USB or FireWire port.

After installing and configuring image acquisition hardware, We do not need to perform any special configuration of MATLAB to perform image acquisition.

2) Step 2: Retrieve Hardware Information

Device ID

The device ID is a number that the adaptor assigns to uniquely identify each image acquisition device with which it can communicate. Specifying the device ID is optional; the toolbox uses the first available device ID as the default.

Image format

The image format specifies the image resolution (width and height) and other aspects of the image. Image acquisition devices typically support multiple image formats.

Pre-processing:-

This dealswith improving the image in ways that enhances the chance of success of the other succeeding processes.Some examples of preprocessing techniques are enhancing contrast, removing noise.

Segmentation

This partitions the input image into its constituent parts (or objects). The output of segmentation is usually raw pixel data constituting either the boundary of a region or all points in the region itself. A decision has to be made whether the data should be represented as a boundary or complete region. Description,also called feature selection deals with extracting features that result in some quantitative information of interest or features that are the basis for differentiating one class of objects from another.

Segmentation is the process of partitioning a image into multiple segments (sets of pixels, also known as superpixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics

Recognition & interpretation

- Recognition is the process that assigns a label to an object based on the Information provided by its descriptors.

- Interpretation involves assigning meaning to an ensemble of recognized objects.

- Here we grade the apple in different categories ,as grade A , grade B, grade C etc.

2.WORKING

First start all the system properly. Place the apple on the conveyor belt, when the apple is detected by the IR sensor ,the conveyor belt will stop moving ,and the control is transferd towards the PC (MATLAB) for capturing the image.

The cameras capture the image of apple from side and upper view.

1. Upper camera for calculating radius.
2. Side camera for calculating heightand color.

After calculating the above parameters, the size(height & radius) are displayed on the o/p screen, the control is transferred towards the microcontroller . again conveyor is started for sorting the apple accourding to the categories shown in table

Depending upon the above parameters we are giving the grades to the apple .e.g GRADE A,GRADE B etc. these grades are also displayed on the o/p screen.

For sorting the apple ,here we are placed DC motor containing the shaft to sort them in required fashion.

LCD we are using for displaying the count of the apple & which color of apple is.

3. CONCLUSIONS

fruits are inspected for quality by human inspectors. Manual inspection of large quantities of fruits is not possible so Application of machine vision for quality inspection of fruits can solve many of the limitations related to the manual inspection. This has great potential for Supplementing human labor for the visually intensive inspection work. Machine vision inspection involves determining the fruit quality by analyzing the images of the fruits.

REFERENCES

[1]. The author namely Dr. S.USHA 1 , Dr.M.KARTHIK2 , R.JENIFER3(International Journal of Engineering Research and General Science Volume 5, Issue 6, November-December, 2017 ISSN 2091-2730) describes the paper "**Automated**

Sorting And Grading of Vegetables Using Image Processing.

[2]. The author namely Dr. Vilas D. Sadegaonkar (ISSN 2278 – 0211) describes "**Automatic Sorting Using Computer Vision & Image Processing For Improving Apple Quality**"

[3]. The author namely Sapan Naik, Bankim Patel (International Journal of Computer Applications (0975 – 8887) Volume 170 – No.9, July 2017) describes "**Machine Vision based Fruit Classification and Grading – A Review**"

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