Fruit Quality Inspection System Using Image Processing

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Abstract -- This paper proposes a fruit quality inspection system, in the following year's automation based technology which has become more important to food substances. Thus the proposed system determines the fruit quality by its color, size and weight. Examining large quality of fruits manually takes more time, high cost and less accurate process. This process is based on taking the image of the fruit and examining this image using image processing technique to remove the discarded fruit. The present method of detecting defected fruit is been carried out by using different library functions in MATLAB software. This proposal gives some advantages over current practices.

Indexed Terms: Web camera, Arduino NANO, MATLAB, Audio module

I. INTRODUCTION

In India there is a rapid growth of population .The main factor which have been affected due to the population growth is quantity of food. Due to increasing population the increasing demand for the food of good quality have been required. In this proposal we have been discussing about the fruits. For the development of accurate, fast quality determination of fruit, grading process is takes place. It is done based on the overall quality features of the fruit like shape, color and size.

Generally the condition of the fruit like size, shape, color and so on cannot be evaluated by the traditional methods. The development of image processing technology and computer software and hardware ,it become more attractive to detect fruits quality by using image detecting technology . In recent times, the development of fruit defect detection technique is been provided with result of less efficiency, moderate speed of grading, more cost and little bit of complex. So it is significant to develop high speed and low cost fruit quality inspection system.

In this proposal we have been going to sort the single fruit based on the color and grading is done according to the size.

In this proposal Software part is more important in this color identification system and for identifying the size of the fruit. The entire system is proposed or designed over the MATLAB software to inspect the color and size of the fruit. In this paper we are going to capture the image of the fruit using camera or webcam, after that from the captured image unwanted noises have been removed and undergoes image processing techniques using MATLAB software and finally defected fruits have been identified from the following fruits and the following output for the defected fruit have been obtained from the audio module using serial communication interface.

II. PROPOSED METHODOLOGY

- Description:

The automated fruit defect detection counting consisting of following steps which are nothing but the acquisition of the image, noise removal of image, segmentation of the image, object recognition, automatic fruit defect detection and lastly the identification of the image. These functions have been carried out using MATLAB software which is known as automated fruit defect detection technique. The main platform which is used in this project is known as image processing.

The first step of our proposal is to capture the live fruit image that we have been taken. In this part we have been taken the apple fruit, the image that has been captured is been saved into the personal computer or laptop. After that image processing technique is takes place in MATLAB software. By using various libraries in the MATLAB software and

MATLAB code which have been written for identifying the defected fruit. This process is based on clustering techniques. The clustering technique is the partition of an image data set into number of number of disjoint groups or clusters.

After running the MATLAB code Detect Disease_GUI dialog box have been opened which have been provided with the sections of Load Image, Enhance contrast and the segment image . The image of the live fruit which have been given to the load image and the enhanced image of the given fruit is obtained in the next part, then segmentation of the image is taken place in which the different cluster have been provided , then any one of the cluster have been selected and the disease name of the fruit is displayed with the accuracy percentage and then how much of area is affected is been given.

We have been already fed the training data image which has been provided certain threshold values of mean, entropy, variance, smoothness, kurtosis, skewness, IDM, contrast, energy and homogeneity. The code which we written can bring out the threshold values of live fruit and compare the values and assume that given fruit is affected by the disease or not.

The following output from MATLAB is interfaced with the Arduino NANO using serial communication interface and the alarm sound which have been risen for the coming defected fruit. Thus the Image processing technique is done by following three steps.

- Image acquisition:
The capturing of fruit image is the first step in the image processing technique. The various parameters are used for improving the quality of the image which is picture background, light source and the distance between the object and camera.

- Image noise removal:
For removing background noise of the image, here Gaussian filter is used among various Gaussian filters here we using 2x2 filter for optimal performances. The captured input image is pre-processed to remove poor illumination conditions at the corners. To improve intensity of the image by

transforming into nonlinear form to less affect the brighter pixel and also contrast the darker pixels in wider range. In the image the RGB component is rearranged so that the image false color and the fruit will be distinguished from the background of the input image.

- Image segmentation:
Image segmentation is defined as the process of partitioning of a digital image into multiple segments. This process has been takes place to simplify the image into something that is more useful and easy way to analyze. In segmentation process thresholding technique is used. Here the selected image is divided into numerous small areas and it is based on the gray levels of the image. In Manual thresholding selection where trial and error by using histogram of the selected image. In the selected image the different areas are separated by clustering techniques. There are many segmentation techniques used that is thresholding, improved watershed transform and LVQ network adaptive, edge detection, histogram based etc.

III. BLOCK DIAGRAM
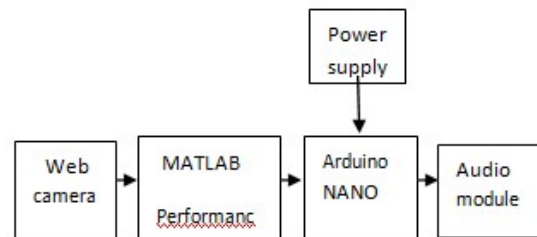
IV. HARWARE USED

The devices which are used in this project are:
A. Web Camera
B. Laptop or Personal Computer
C. ARDUINO NANO

A. Camera:
The camera which have been used to capture the image of the fruit which have been placed in the box. In this case we have been taken apple fruit with the defected part placed in the box and image is been

captured and fed to the computer and image processing is been carried out using MATLAB.

B. Laptop or Personal Computer:
Image of the fruit is been undergoing image processing technique using MATLAB software in Personal Computer and the fruit with the disease is been identified and output is been fed to ARDUINO NANO.

C. Arduino nano:
For the output which have been coming from MATLAB is been interfaced with the ARDUINO NANO by using serial communication interface. In our proposal we have been using HyperTerminal applet software for interfacing. It is emulation program capable of connecting to system through COM port.
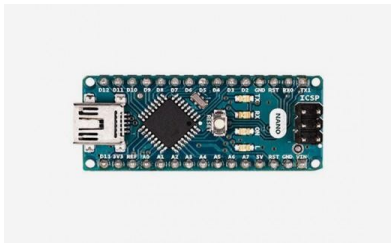
Fig. 1: ARDUINO NANO

V.   FLOW CHART
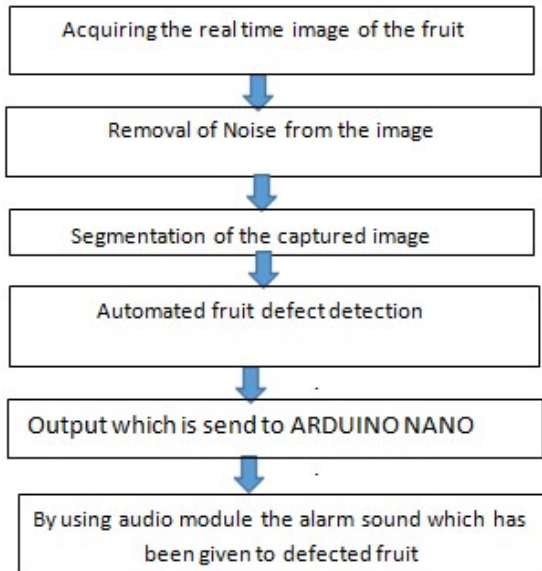
Fig. 2: Flow Chart

VI.   SOFTWARE USED

The software part which have used for our proposal are:
A.   MATLAB Software
B.   HyperTerminal applet

A. MATLAB Software:
MATLAB act as the great tool for introductory in science and engineering. Image Processing is been takes place in the MATLAB by using different library functions. Accuracy of the result is been better in the MATLAB. The results have been provided with percentage of how much area is affected in fruit.
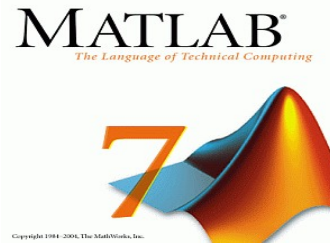
B. HYPERTERMINAL APPLET:
It is the serial communication tool for interfacing the output of MATLAB into ARDUINO NANO and the code is been written for alarming the defected fruit passes through the camera
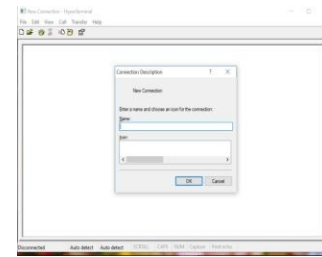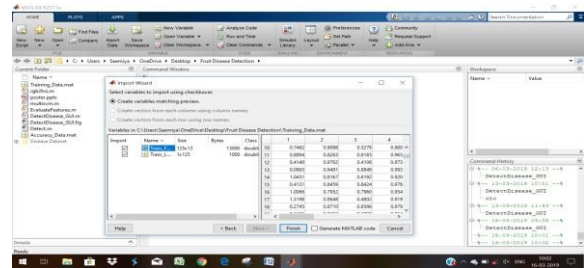

VII.   RESULTS

Fig. 5: Fig 1: Threshold values of training data samples which is to be compared with live fruit image
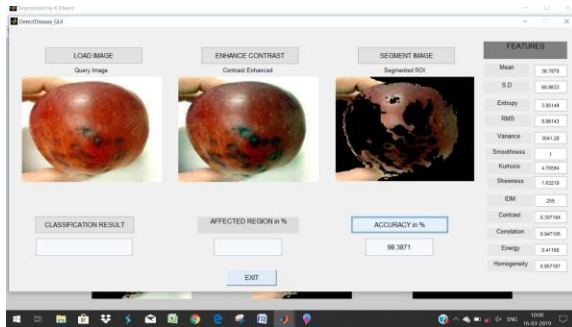
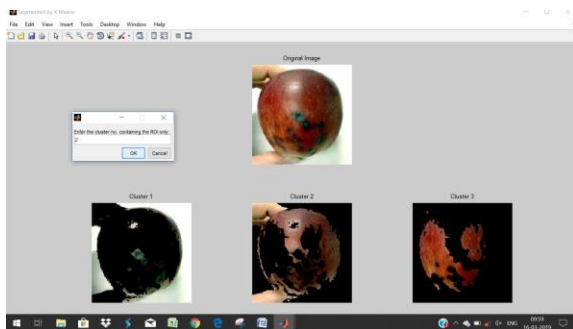Fig 6: Analyzing of defected fruits by using sample values

Fig. 7: Clustering process takes place and the disease have been identified for the given fruit and output is been given to ARDUINO NANO board

VIII. CONCLUSION

In our project we conclude that manual method of fruit defect detection technique is replaced by automatic vision based technology. Based on the Image processing technique defected fruits have been identified. The actions to be performed are with good accuracy and efficiency. Thus it can be modified according to the developing technology for the large amount of fruit in the area like food factory. This system has many advantages such as low operation cost, effective and user friendly.

IX. ACKNOWLEDGMENT

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