SORTING OF FRUITS USING IMAGE PROCESSING

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***Abstract*: Agriculture plays a major part in the economic growth of India. As there is high demand for quality fruits in the market fruit grading process is considered as very important. Fruit grading by a human may cause inefficient and it may also leads to some error. Another problem is labour intensive and to solve the above problems agricultural industries introduce many automated grading systems. In this paper a concept was introduced to get quality fruits by observing its color. Due to cost and inaccurate process, sorting tons of quality fruits to produce food products made from fruits is another problem that is faced by most of the agricultural industries. Here a sorting process is introduced where the image of the fruit is captured and analyzed using image processing techniques and the defected fruit is discarding by this process. The main aim of this paper is to do the quality check of the fruits within a short span of time.**

***Keywords*: Image processing, segmentation, classification, mangoes, ripeness, defect, agriculture**

1. Introduction:

Traditionally, quality inspection techniques of fruits have been manual, but these have been highly inconsistence in accuracy, time consuming, tedious and relatively expensive. Thus, the application of new techniques in fruit quality assessment is necessary in order to minimize wastage because most of these fruits are readily perishable. Furthermore, fruit quality grading is becoming a mandatory condition in recent time, although quality of fresh fruit could be defined differently depending on consumer's preference and final utility, but a standardization to identify the degree of quality in commodity is necessary for marketing fresh and safe products. An intelligent segmentation and automatic yield calculation of fruits using image processing approach the tree are acquired from real time and simulation using MATLAB in real time using digital camera under different lighting conditions with application software. Fruit images are first filtered to remove noise from environment and then fruit region is separated from its background. Then the resultant image is segmented based on the color. The resultant image can be classified and used for further analysis with help of features selected through image approach. The images are then labeled for detection. The color analysis was utilized to do the segmentation of the fruits in an input image. The input color image was first converted from the RGB color space into the L*a*b color space coarse detection of fruit region. The L*a*b color space has been designed to resemble the human visual perception. The idea was to do the coarse processing of the image so that the fruit were visually well distinguishable and then to use the L*a*b color space to segment fruit regions with its perceptually uniform property. (i.e. the colors which are visually similar are close to each other in color space).

China is one of the largest fruit producing countries in the world. Since the quality of fresh food varies greatly, efficient technologies are needed for assessment of fruits quality in order to cope with the increasing market expansion and segmentation. Since consumers use fruits appearance to make first evaluation of the quality of fresh food, the presence of skin defects seems to be one of the most influential factors in the quality and price of fresh food. This reason, packinghouses demand appropriate systems that are capable of detecting fruit skin defects. So in this paper we can distinguish between healthy fruits and fruits infected by disease

2. Objectives:

1 .To analyse fruits before their complete growth.

2. To sort the fruits depending on their condition.

Block Diagram:

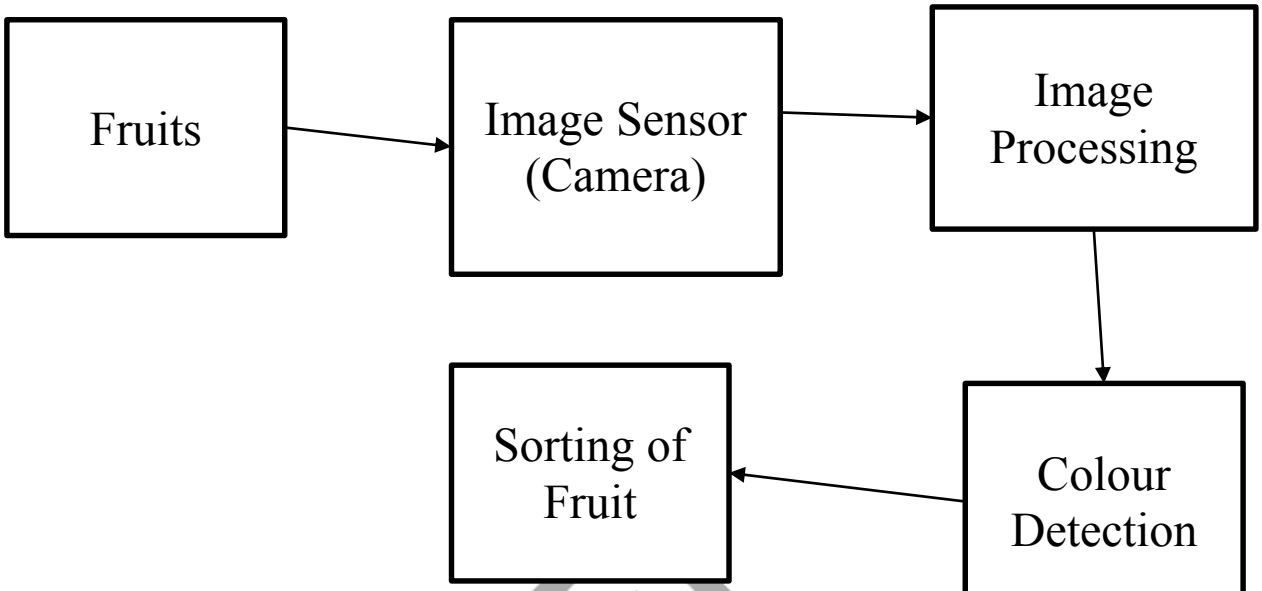

Fig.1: Block Diagram

Flow Chart:

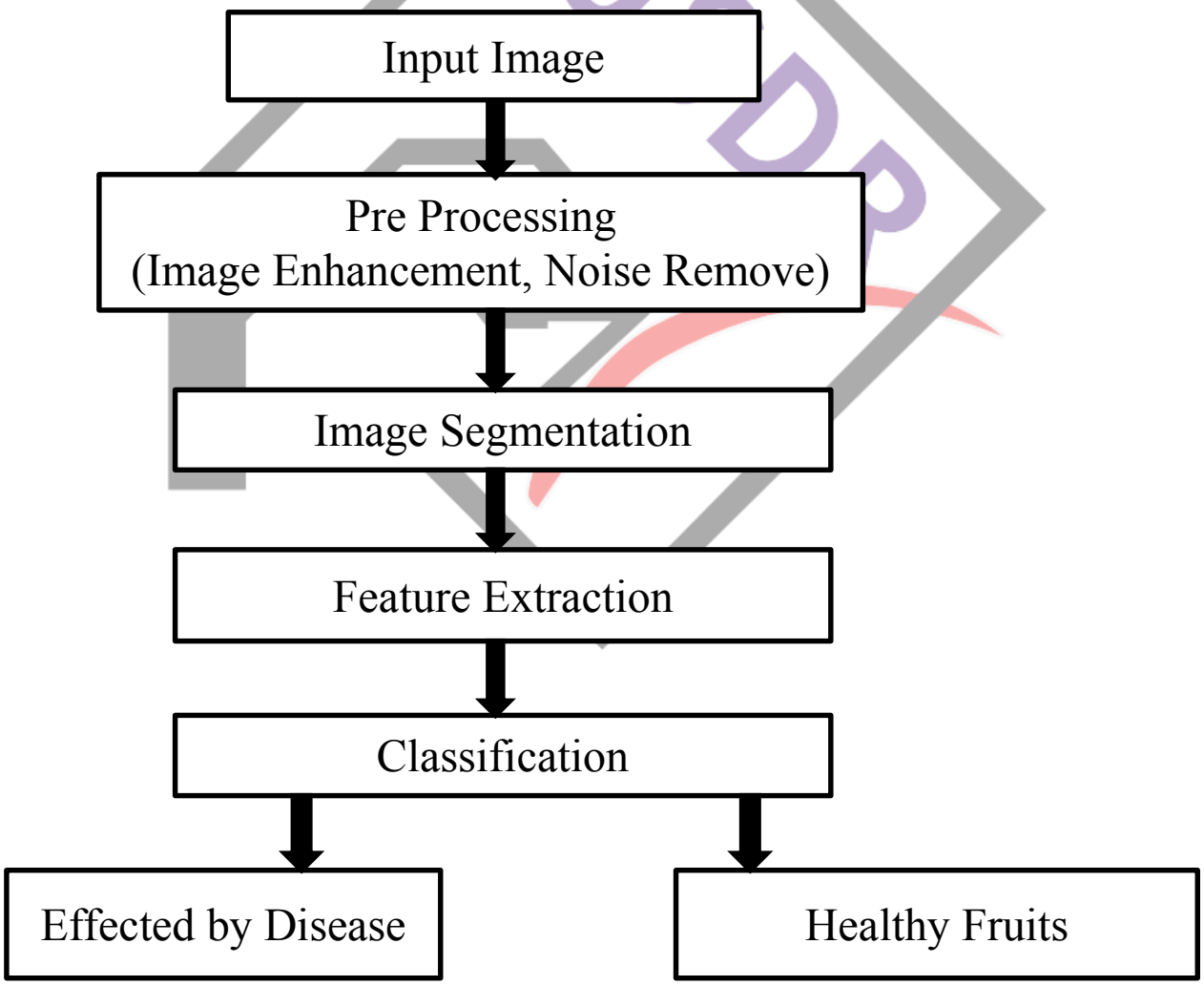

Fig.2- Flow Chart

3. Methodology:
Some image processing technique are carried out to detect the number of fruits on trees, and to recognize whether it is good or infected by disease by its external appearance with the help of flow chart we can understand it more properly.

3.1 Image Acquisition
This is the first step to collect sample images of fruit. All this images are stored as .JPG standard format and resize into 429x322 pixels. The main application of this task is in production system. So for that the environment remains same including white background.

3.2 Image Preprocessing
The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing. Here there are two approaches used for Image Pre-processing.
a) Image Enhancement
b) Noise Remove

3.2.1 Image Enhancement
Enhancement of the image is necessary to improve the visibility of the image subjectively to remove unwanted flickering, to improve contrast and to find more details. In general there are two major approaches. They are spatial domain, where statistics of grey values of the image are manipulated and the second is frequency domain approach; where spatial frequency contents of the image are manipulated. Although Spatial Domain methods are developed for gray valued images and it can be applied directly on pixels. Whereas in Frequency Domain methods, operations applied on Fourier transform of an image. Here we used Discrete Cosine Transform method to transform an image from RGB scale to Gray Scale.

3.2.2 Noise Remove
To remove Noise, in this phase Masking is used. A mask is a filter. Concept of masking is also known as filtering. The general process of filtering and applying mask is consists of moving the filter mask from point to point in an image. At each point (x , y) of the original image, the response of a filter is calculated by a pre-defined relationship All the filter values are pre defined and standards. Proposed technique accurately classifies and grades the fruits. The results are good for the five chosen fruits of same color and sizes. This kind of system can be employed in Agriculture Produce Marketing Corporation, etc.

3.3 Image Segmentation
In this step for Segmentation Partition method is used. Partition clustering algorithm splits the data points into k partition, where each partition represents a cluster. The partition is done based on certain objective function. One such criterion functions is minimizing square error criterion which is computed as,
$E = \Sigma \Sigma \| p - mi \| 2$
Where p is the point in a cluster and mi is the mean of the cluster. The cluster should exhibit two properties, they are (1) each group must contain at least one object (2) each object must belong to exactly one group. The main drawback of this algorithm is whenever a point is close to the center of another cluster; it gives poor result due to overlapping.

3.4 Feature Extraction
In this phase, color feature used. For color feature color space conversion method is used.
The enhanced image is further processed to count the black pixels in it. If the count of black pixels is more than a threshold value of black pixels then we can differentiate that fruit as a defective fruit. Another way is of plotting a histogram. Histogram can show the frequency of a particular intensity of pixels. When it is plotted for an enhanced image, then it can help to count the frequency of black pixels above a particular intensity. This count helps us to differentiate fruits.

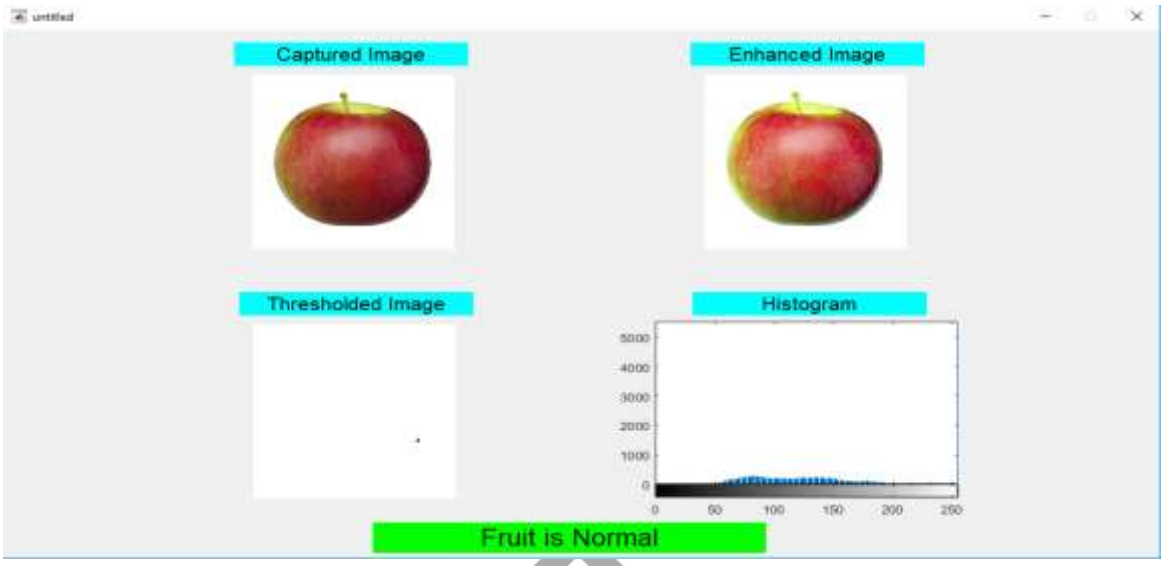

Fig. 3(a)- Output (When fruit is normal)

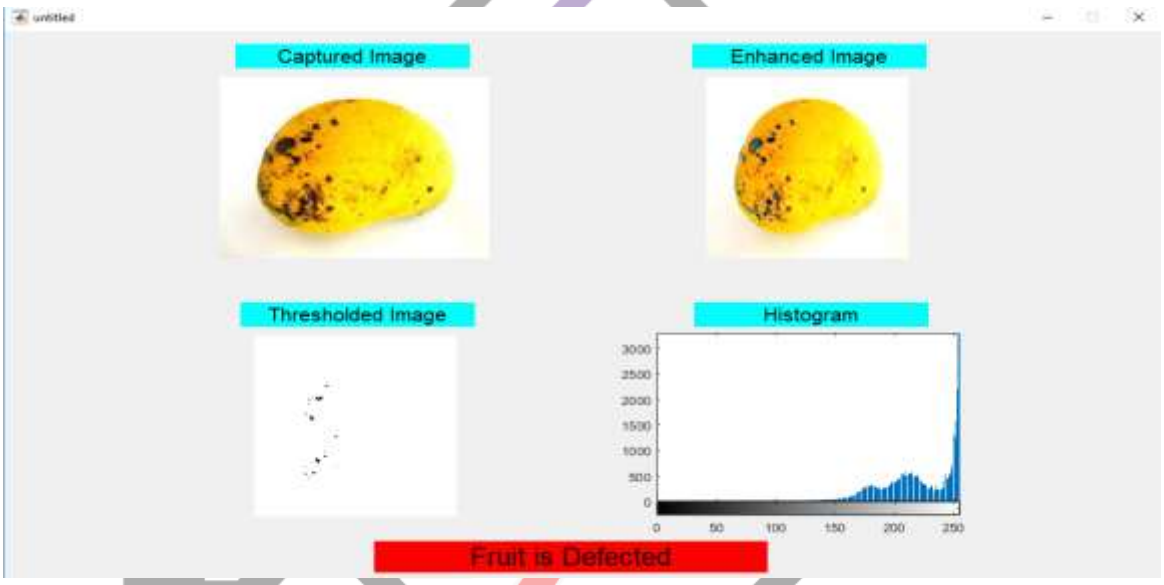

Fig. 3(b) - Output (When fruit is defective)

4. Conclusion:

Traditionally, quality inspection techniques of fruits have been manual, but these have been highly inconsistence in accuracy, time consuming, tedious and relatively expensive. Here in this algorithm, automatic counting of fruits using image processing is done and we can differentiate between good fruits and infected fruits. Packinghouses can adopt this system to distinguish damaged fruits from good ones before packing them into batched, therefore the quality of the products can be guaranteed in this stage.

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