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QUALITY EVALUTION OF MANGIFERA INDICA USING NON - DESTRUCTIVE METHOD

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Abstract— The ability to identify the fruits based on Quality in the industry which is most important technology in the realization of automatic mangoes sorting machine in order to reduce work of human and time consuming. In this work the identification of defective and non-defective mangoes focused on the methods using MATLAB. First we use the X-ray images of mangoes, later using different method like segmentation, thresholding and thus we get related databases. Comparing several databases, we get a mango is defective or not. This paper represents analysis of good or bad mangoes with a very high accuracy successfully using image processing.

.**Keywords**— Quality, Spongy Tissue, Morphological Processing, fruit sorting, NRI Spectroscopy, X-Ray Firmness, Astringency, Dilation, Erosion etc.

INTRODUCTION

Agriculture in India is one of the important economic sectors. India ranks first among world's mango producing countries accounting for about 50% of the world mango production. When any agricultural product are exported from India, quality of that product most important. Quality is denotes the degree of excellence. Fruit quality is related to both internal variables Flavor(Sweetness, Sourness, Astringency, Aroma), Texture(Firmness, Crispness, Juiciness),Nutrition (Carbohydrates, Proteins, Vitamins, Functional property), Defect(Internal cavity, Water core, Frost damage, Rotten) and external variables Size (weight, volume, dimension), Shape (diameter/depth ratio) ,Color (uniformity, intensity), Defect (bruise, stab, spot)[17] need to be sorted by different techniques. The consumer demand increasing for high-quality fruit has led to the development of optical, acoustic and mechanical sensors that determine this quality [3]. We are focusing on internal quality of the mango. There are many pests and disorders with which mango is damaged. In this paper, we find out the spongy tissue in a non-destructive manner. Spongy tissue is a ripening disorder, causes of the ST fetches low value in the market. Non-destructive techniques are MRI, NIR, CT, Ultrasonic and X-Ray method etc. In this paper- Ray method has been developed to detect affected mangoes. Narendra V G & Hareesh K S in 2010 developed automatic sorting and quality evaluation of agricultural products by using computer vision system. In 2013, R Renu and D V Chidanand developed internal quality classification of agriculture produce using Non-Destructive (X-Ray) Method. Generally, Manually sorting are less efficient, time consuming and costly. To overcome these problems, the most important technique is automatic mango sorting machine is developed by using MATLAB.

TYPES OF SOURCES

SR.NO.	TYPE	INTERNAL PARAMETER	EXTERNAL PARAMETER
1.	NIR/MRI	Sugar content, Oil, Moisture content, water	-
2.	Machine Vision	-	size, color, texture -
3.	LASER SPECTROSCOPY, Image analysis	Firmness	Shape, Size ,color
4.	X-ray/CT	Firmness, tenderness. internal cavity and structure, ,ripeness	

PROPOSED METHODOLOGY

The fig.1.shows proposed block diagram for automatic mango fruit sorting .

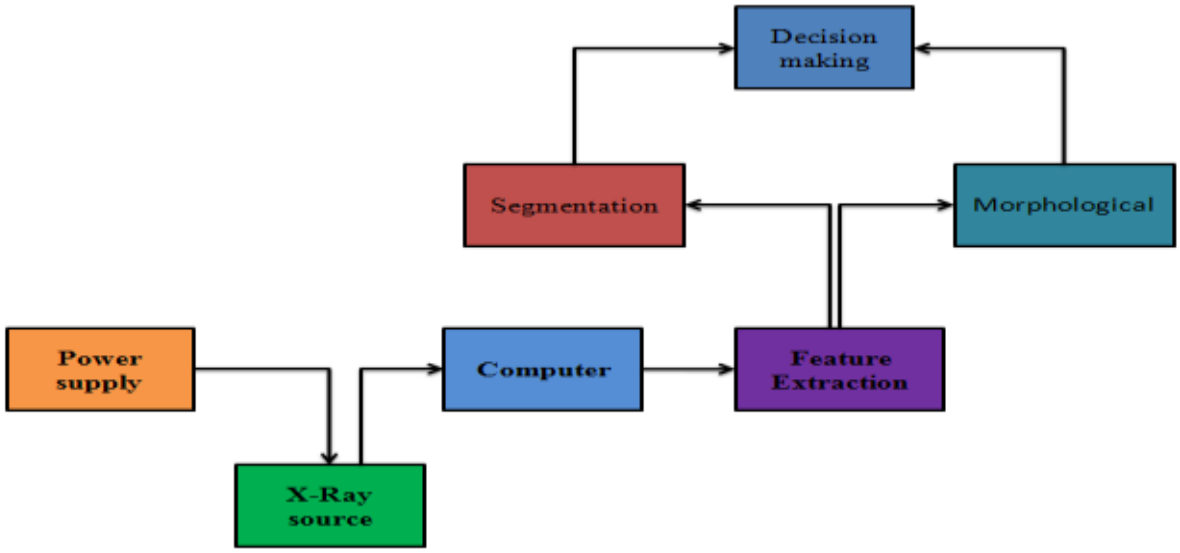


Fig.1 Proposed model automated mango fruit sorting

HISTOGRAM AND THRESHOLD

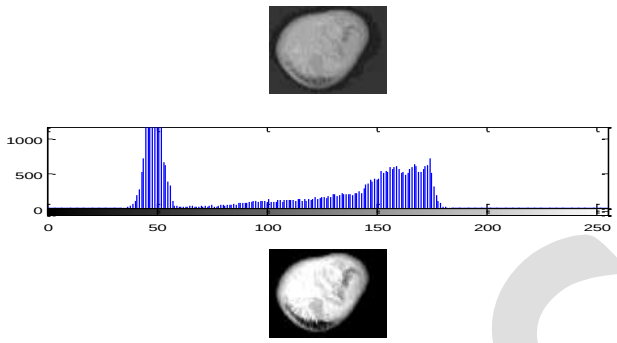


Fig.2 Results of Histogram and Thresholding on Mango Fruit

Overview of Morphological Processing –

A. Dilation-

Let A be a set of pixels and let J be a structuring element. Let $(\hat{J})s$ be the reflection of J about its origin and followed by a shift by s. Dilation, written $A \oplus J$, is the set of all shifts that satisfy the following:

$$A \oplus J = \{s|(\hat{J})s \cap A\}$$

Using Dilation we can repair breaks and intrusions.

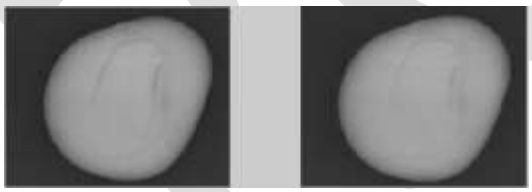


Fig.3 Results after Dilation

B. Erosion

Given sets A and B, written$A \Theta B$, is defined as:

$$A \Theta B = \{s|(B)s \text{ belongs to } A\}$$

That the erosion of A by B is the set of all points s such that B, translated by z is contained in A

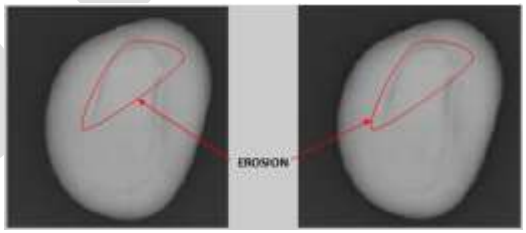
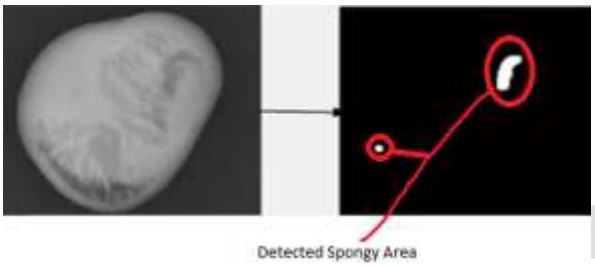


Fig.4 Results after Erosion

For getting the better results from morphological Processing over the input images we applied some operations respectively:

1. Surface Illumination
2. Increase the Image Contrast
3. Threshold the Image

Fig.5 Results after all 3 Morphological Processing.



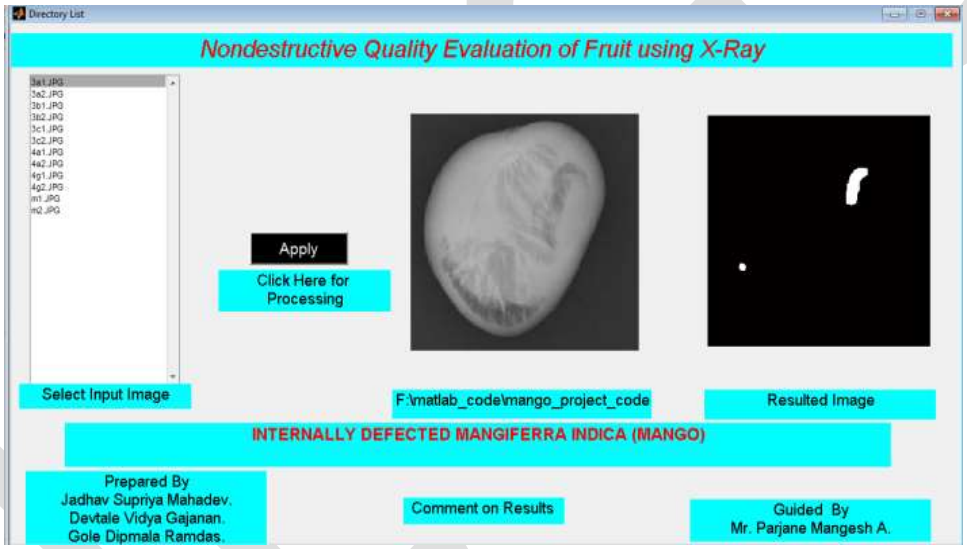


Fig.6 Extracted features that is Spongy Tissue after Processing

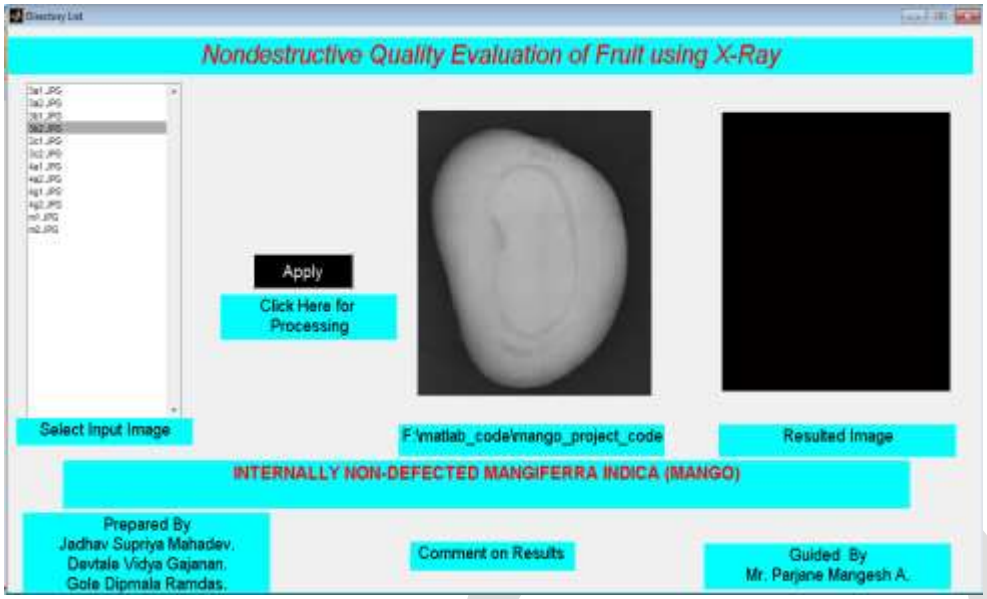


Fig.7GUI of Proposed Methodology

CONCLUSION

Soft X-ray based imaging techniques are powerful tools for non destructive internal quality evaluation. In this paper, we are used different segmentation methods and morphological methods the identification of good and bad mangoes based on quality in image processing using MATLAB is successfully done with 92% accuracy.

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