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# DETECTION OF DISEASES IN FRUITS AND VEGETABLES USING IMAGE PROCESSING

**Maduguri Sudhir[1], Mr. Eluri Venkata Narayana[2] Thalluri Amani[3], Siddireddy Satyaveni[4], Yarrabothula Durga Bhavani[5], Potu Yamini [6]**

*[1,2] Asst. Prof, ECE Department, KITS Guntur, AP, INDIA*
*[3,4,5,6] Student, ECE Department, KITS Guntur, AP,INDIA*

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**ABSTRACT -** We are developing an automated system to find the diseased part in fruits and vegetables by using digital image processing. The main purpose of this project is to help the farmers to find the cracked area, order, intensity, angular view of the cracked part. Here we are using two techniques that is wavelet transform and radon transform. As the defected area have some specific straight elements in the space area. It accepts the way of pixels in defected area is brighter than that normal area. The captured image is wavelet transform asses so the detection of the infected part. So the defection of diseases is achieved by the two dimensional wavelet transform. Then the random transform evaluate the defected area in the vegetables and fruits.

## 1. INTRODUCTION TO IMAGE PROCESSING

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps:

- Importing the image via image acquisition tools;
- Analysing and manipulating the image;
- Output in which result can be altered image or report that is based on image analysis.

The diseases present in the fruits and vegetables decreases the productivity and the quality before and after harvesting them. There is more involvement of labor, mall owners and scientists to identify the defected part in fruits and vegetables. In the previous days to find the diseases in fruits and vegetables. The farmers used to take more time to know the cracked area, order, disease depth because of that the farmers has to face so many problems. Sometimes because of wastage of time the crop is damaged more and there is a huge amount of loss to the farmers. To reduce that problem we are creating an automated system that is used to detect the cracked area, order ,depth of the disease using image processing which takes less time and more efficient it is not only useful for farmers but also to the common people. In this methods sometimes workers may not pay attention to identify the defected vegetables and they pack them along with the healthy vegetables this leads to the spoiling of major vegetables due to the organisms present in the defected area.

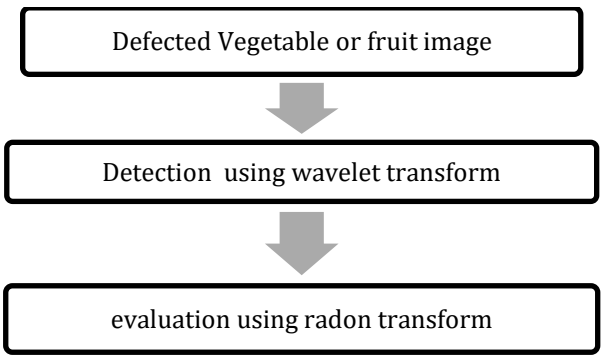
## 2. PROPOSED TECHNIQUES

This fragment briefly tells the projected algorithm of the paper. This algorithm that can automatically progress the each fault vegetable image. The major task is to find and assess the disease .Our algorithm consists of three stages

(1) Capturing of Defected Vegetable Image

(2) Detection using Wavelet Transform

(3) Evaluation Using Radon transforms




### 2.1. WAVELET TRANSFORM

The wavelet transform is similar to the Fourier transform (or much more to the windowed Fourier transform) with a completely different merit function. The main difference is this: Fourier transform decomposes the signal into sines and cosines, i.e. the functions localized in Fourier space; in contrary the wavelet transform uses functions that are localized in both the real and Fourier space. Generally, the wavelet transform can be expressed by the following equation:

$$F(a,b) = \int_{-\infty}^{\infty} f(x)\,\psi^{*}_{(a,b)}(x)\,\mathrm{d}x$$

where the * is the complex conjugate symbol and function ψ is some function. This function can be chosen arbitrarily provided that it obeys certain rules.

A wavelet is a the small part of waveform. The average value of all wavelets is zero. The wavelets have start point and end point. But Sinusoids extends from minus infinity to plus infinity. All Wavelets not similar, non symmetrical and not regular.

### 2.2. RADON TRANSFORM

The Radon transform is an integral transform whose inverse is used to reconstruct images from medical CT scans. A technique for using Radon transforms to reconstruct a map of a planet's polar regions using a spacecraft in a polar orbit has also been devised.

The radon transform is used to evaluate and classify the defect. But in our method the classification is not necessary. We use this transform for the evaluation purpose. The function f is integral transformed with a plane of the function Rf is called Radon Transform ,defined on the (two-dimensional) space of lines in the plane, whose value at a particular line is equal to the line integral of the function over that line. Radon transform uses a array of projection with different angles of the image f(x, y). The final result projection will be the addition of the intensities of the pixels in all direction, i.e. a line integral. The result is a new image.

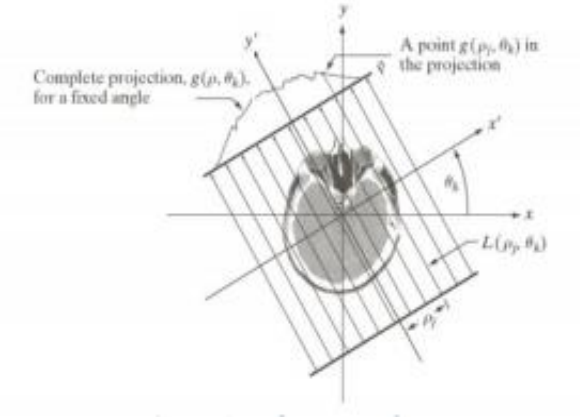



**Figure 01. Radon Transform**

### 2.3. Detection

The original image is a color image. This color image is converted into gray scale image using RGB to Gray syntax "rgb2gray (image)". This converted Gray image processed with the 2D wavelet Transform with the command "dwt2 (image)" .

Then four Sub images formed named LL, HL, LH, and HH.

a) LL: Row and column both are Low pass filtered.

b) LH: Row Low pass Filtered and Column High Pass filtered.

c) HL: Row High Pass filtered and column Low Pass filtered

d) HH : Both Row and column are high pass filtered This decomposition can be represented as

| | M/2 | M/2 |
|---|---|---|
| N/2 | LL | LH |
| N/2 | HL | HH |

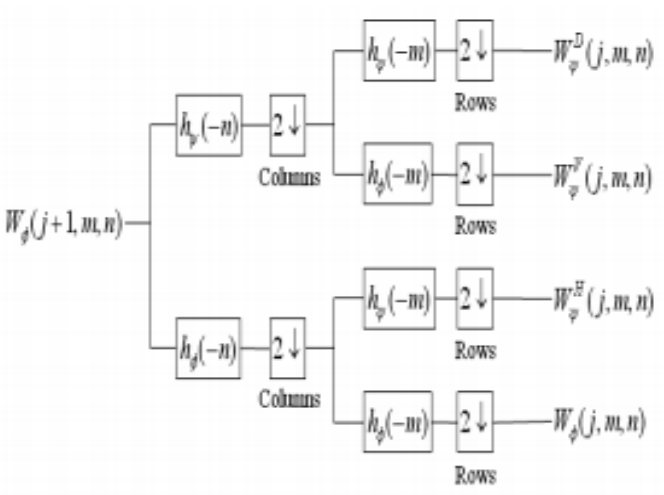
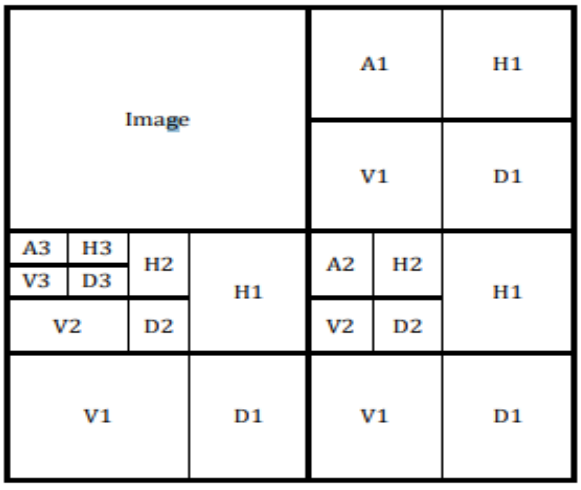



**Figure 02.Wavelet Transform Structure**



The fault region identified by the wavelet transforms, in that the noise is represented by the high values of the wavelet. To reconstruct the approximation matrix next pseudo color matrix scaling is performed. Then a new image is formed with the detected defection.

### 2.4. Evaluation

The final task is to evaluate defected area using the Radon transform. This transform construct the association linking the peaks and cracks. This uses a command "Radon(image, angle)" Wavelet coefficient are integrated in all possible directions (angles), and then it highlights the features of wavelet modules. Then a image is formed with peaks. The intensity of the peaks represents the infection of Vegetable.

## 3. TESTING AND RESULTS

We know that infected part defer from the other parts in color to differentiate from healthy area and infected area the wavelet transform and radon transform gives the detection and evaluation of the defect presenting fruits and vegetables.

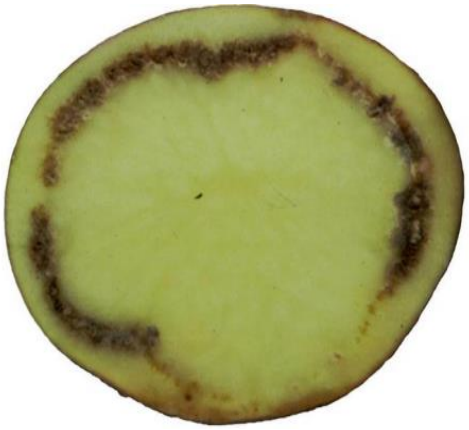


**Figure 03. orginal defected image**

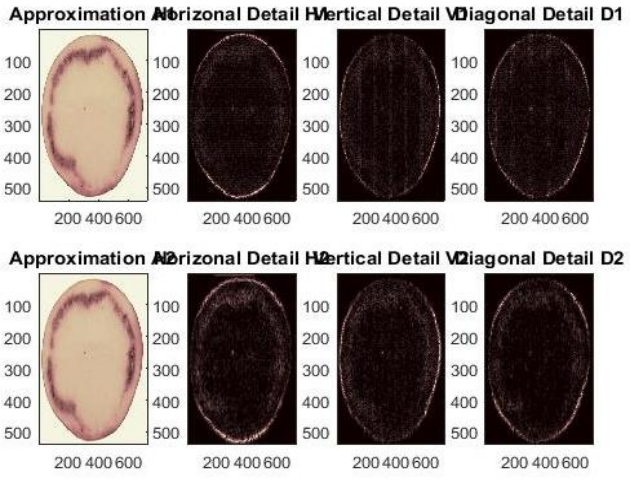



**Figure 04 Detection by wavelet transform**

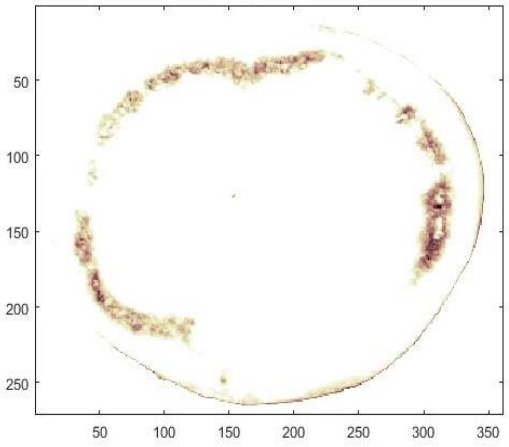



**Figure05. detection of Crack**

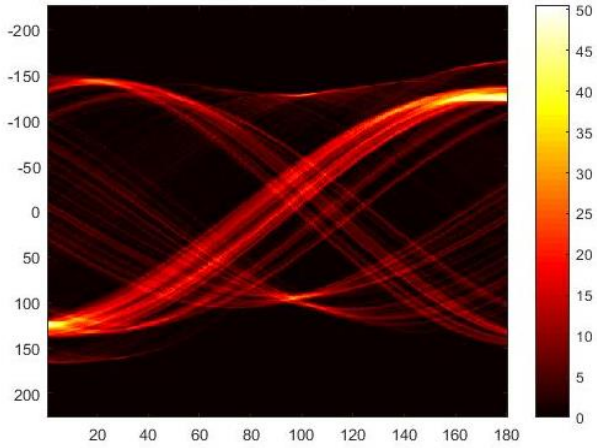



**Figure06. Evaluation of image**

## 4. CONCLUSION

As India is a agriculture country and Indian farmer select wide range of fruits and vegetable crops the cultivation can be improved with the help of our project which detect the diseases present in the fruits and vegetables .

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## BIOGRAPHIES

**Mr. Maduguri Sudhir,** (M.Tech. with specialization in Digital Electrinics and Communication System ), He have special interest on Digital Image Processing. He has 8 years of experience in academics. Presently he is working as Assistant Professor in KITS Engineering College , Guntur, AP.

**Mr. Eluri Venkata Narayana,** (M.Tech. with specialization in Digital Electrinics and Communication System ), He have special interest on Digital Image Processing. He has 8 years of experience in academics. Presently he is working as Assistant Professor in KITS Engineering College , Guntur, AP.

**Mrs. T.Amani** is a UG Student of Electronics and Communication Engineering, JNTUK, Kakinada, AP. She is very interested in automation systems.

**Mrs. S.Satyaveni** is a UG Student of Electronics and Communication Engineering, JNTUK, Kakinada, AP. She is very interested in MATLAB Coding and Digital Image Processing.

**Mrs. Y.Durga bhavani** is a UG Student of Electronics and Communication Engineering, JNTUK, Kakinada, AP. he is very interested in automation systems.

**Mrs. P.Yamini** is a UG Student of Electronics and Communication Engineering, JNTUK, Kakinada, AP. She is very interested in automation systems.