

# Region of Interest of Diseased Leaf using Overlapping Window Technique

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## Abstract

Most of the leafs are defective because of diseases, it reduces the quantity and quality of crop production significantly. Early detection and estimation of plant disease is a way to control these diseases and minimize the severe infection. This paper proposes a method to find the ROI of diseased leaf using overlapping window technique. This method is adopted because it is necessary to find the ROI of the diseased leaf. For disease detection of leaf, the system needs selected area which consist of maximum disease. This area is available from 100 x 100 pixels window which moving with 50% overlapping area on the whole leaf image. By taking ROI the accuracy of disease classification can be increased.

**Keywords:** Segmentation, Overlapping Window technique, ROI, standard deviation.

## Introduction

India is a large crop production country. About 15% of leafs are defective because of diseases, it reduces the quantity and quality of crop production significantly. Early detection and estimation of plant disease is a way to control these diseases and minimize the severe infection. The diseases in plant is not only reducing the yield but also deteriorating of the variety. There are various types of diseases, which infect the tropical yield. To control this disease and minimize the infection of whole plantation, the disease must be identified and treated earlier. For detection and classification of disease we have to select the ROI of segmented diseased leaf which consist of maximum disease part[1].

ROI means a selected subset of samples within a dataset identified for a particular purpose. In image processing, the Region of Interest is identified by the boundaries of an object. The encoding of a Region of Interest can be achieved by basing its choice on: (a) a value that may or may not be outside the normal range of occurring values; (b) purely separated graphic information, like drawing elements; (c) separated semantic information, such as a

set of spatial and/or temporal coordinates. For finding ROI, the diseased leaf image is divided into various pixels with overlapping of various percentage based on input image.

The diseased leaf used here to find the ROI is grape leaf. There are various types of diseases of grape leaves which appears as a spot on leaf. The diseases are Downy, Mildew, Powdery mildew, Anthracnose, Greenaria bitter rot, Bacterial leaf spot, Alternaria blight, rust etc.

Disease Symptoms of the above grape leaves are as follows,

1. Downy mildew: The fungus is an obligate pathogen which can attack all green parts of the vine. Symptoms of this disease are frequently confused with those of powdery mildew.

2. Powdery mildew: Powdery mildew caused by the fungus *uncinulanecator*, can infect all green tissues of the grapevine. Tissues are generally susceptible to infection throughout the growing season.

3. Anthracnose: Anthracnose caused by fungus *Elsinoe ampelina* is also known as bird's eye rot from its appearance on the fruit. The disease appears first as dark red spots on the berry. Later these spots are circular, sunken, ashy-gray and in late stages these spots are surrounded by dark margin.

4. Greenaria bitter rot: This fungus can infect all green parts of the vine including leaves, tendrils, new shoots, as well as berries. However, mature leaves and ripe fruit are not susceptible. Infections of leaves first appear as red spots on the upper leaf surface in late spring.

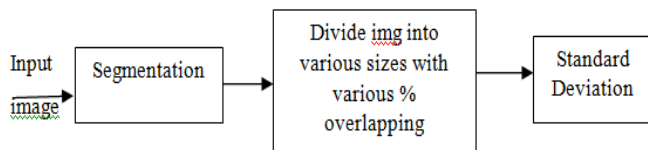
5. Bacterial leaf spot: The young growing shoots are affected first. Disease infects leaves, shoots and berries. The symptoms appear as minute water soaked spots on the lower surface of the leaves along the main and lateral veins.

6. Alternaria blight: The disease attacks both leaves and fruits. Small yellowish spots first appear along the leaf margins, which gradually enlarge and turn into brownish patches with concentric rings. Severe infection leads to drying and defoliation of leaves.

7. Rust: The symptoms are in the form of numerous orange coloured pustules on the lower surface of the leaves. In case of

severe infection such pustules cover the entire leaf surface leading to severe defoliation.

### Methodology



The proposed method consists of following steps,

- 1) Take the input image
  - 2) Apply k means segmentation
  - 3) Divide segmented image into 100x100 pixels window which moving with various % overlapping area on the whole leaf image.
  - 4) Find out the standard deviation of each 100x100 window
  - 5) Select the window having maximum standard deviation. That window is taken as ROI.
- Standard deviation of two dimension matrix is computed in each window using Equation, where  $u$  is the data,  $\mu$  is mean of data, and  $M$  is the total data[1].

$$\sigma_i = \sqrt{\frac{\sum_{i=1}^M |u_{ij} - \mu_j|^2}{M-1}} \quad 1 \leq j \leq N$$

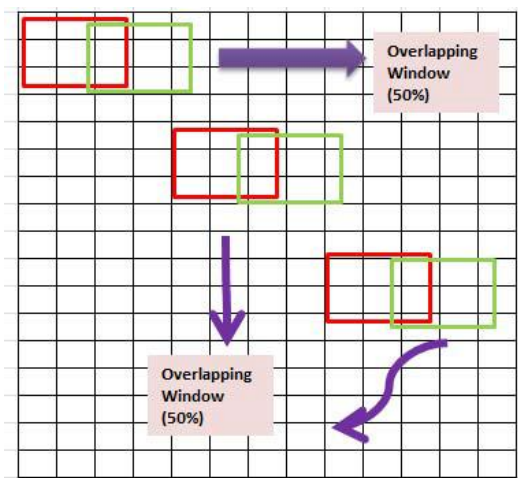

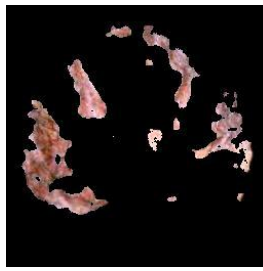
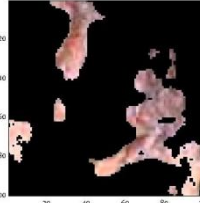
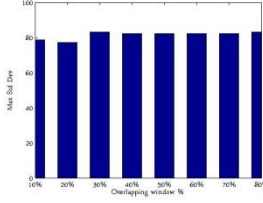
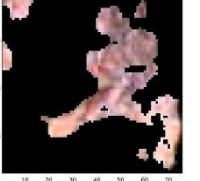
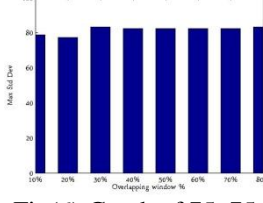

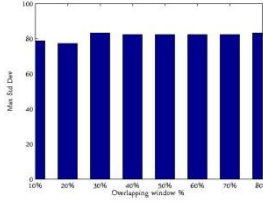

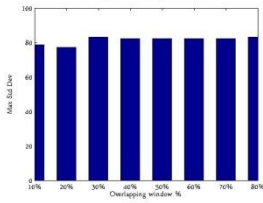
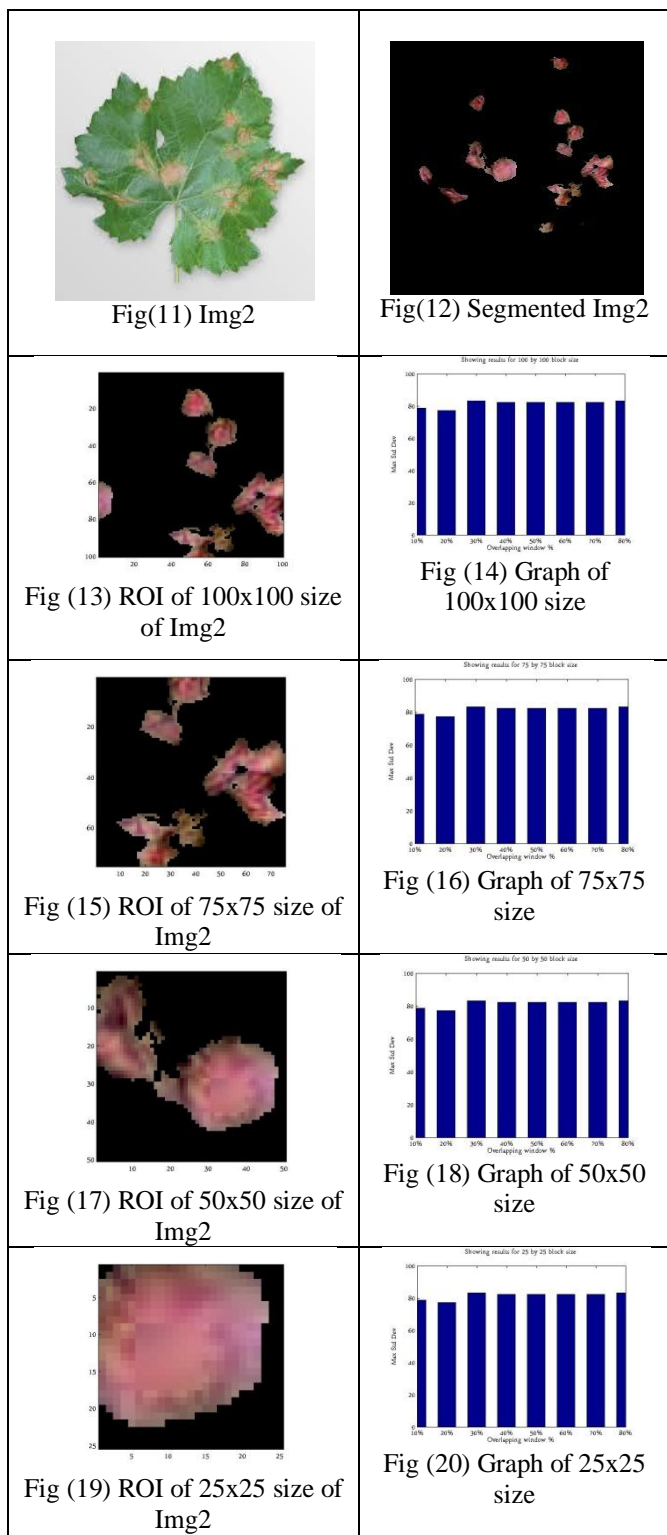


Fig 1. Maximum standard deviation to find ROI

### Performance Analysis and Results

For experimental analysis, we have taken two input images and find the region of interest by varying pixel window size and overlapping percentage.

 <p>Fig(1) Img 1</p>	 <p>Fig(2) Segmented Img 1</p>
 <p>Fig (3) ROI of 100x100 size of Img 1</p>	 <p>Fig (4) Graph of 100x100 size</p>
 <p>Fig(5) ROI of 75x75 size of Img 1</p>	 <p>Fig(6) Graph of 75x75 size</p>
 <p>Fig(7) ROI of 50x50 size of Img 1</p>	 <p>Fig(8) Graph of 50x50 size</p>
 <p>Fig(9) ROI of 25x25 size of Img 1</p>	 <p>Fig(10) Graph of 25x25 size</p>



**Table 1:**Shows overlapping window size and percentage by standard deviation

Input image	Overlapping window size	Overlapping %	Standard Deviation
Img 1	100x100	80	72.1488
	75x75	60	78.3502
	50x50	30	86.5797
	25x25	10	102.2426
Img 2	100x100	70	41.7968
	75x75	60	48.4482
	50x50	30	57.2406
	25x25	10	66.4157

### Conclusion

The proposed method can be used for finding ROI of diseased leaf by using overlapping window technique. From experimental results it is seen that, the ROI depends on various window size and overlapping percentage. Also it depends on the input image which we have taken.

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