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# Segmentation Techniques For Guava Leaf Disease Detection And Classification

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**Abstract**
Today image processing enters into the field of human health care and disease analysis. It also dominates its features in the area of agriculture to prevent and cure various diseases. Agriculture is the technique of preparing the soil for the growth of plants and animals. Productivity in the agricultural sector is crucial for economic development. Since plant diseases are common, disease detection in plant leaves is crucial in the agricultural sector. In that region, plants face severe effects if safety precautions are not taken, which affects the quality, quantity, or productivity of the respective products. A critical element in the disease diagnosis process for plant leaf disease is image segmentation. This paper we, proposed an algorithm for image segmentation, a technique used to detect guava plant leaf diseases automatically. It also gives a general review of the many disease classification techniques that can be used to identify plant leaf diseases.

**Keywords:** Image Segmentation, leaf disease identification, SVM, RGB, HSV

## INTRODUCTION

Agriculture productivity has a significant impact on the Indian economy. Therefore, it is essential to recognise plant diseases in the agricultural sector. Use of an automatic disease detection technology is advantageous for spotting a plant disease in its very early stages. India's primary source of income is agriculture. India has a population that is almost entirely dependent on agriculture [1]. Farming is the primary source of income for more over 58 percent of rural residents [2]. Even though technologies in the developing world are constantly evolving, we still practise a few outdated agricultural practises. It takes more time, effort, and money to use the current approaches to identify a plant that has a disease. Guavas can reach a height of 3 to 10 metres and are fast-growing evergreen shrubs or small trees. Its root system is thin. Guava grows suckers from its roots and low, drooping branches from its base. The trunk is 20 cm in diameter with smooth, green to reddish-brown bark that breaks off in little pieces.

The common fruit known as the "poor man's apple" is the guava. Due to the prevalence of several diseases, guava output is declining daily. Algae, fruit rot, and guava wilt are the most prevalent guava illnesses. These illnesses hinder fruit growth, and because of their unworthiness, the fruits cannot be sold. It causes

significant loss to the guava farmers and is a highly severe disease. These diseases cause the fruit to get hard, develop dark spots, have insects lay eggs inside the fruit, become sore, and split. The greatest remedy for leaf disease is provided by employing machine learning approaches to handle these issues.

The major diseases of guava leaves are Guava Wilt, Algal, Fruit rot, etc., Image samples of these diseases are shown in Figure 1.


a) Guava Wilt b) Algal c) Fruit rot

**Figure 1:** Various diseases affecting Guava

**Guava Wilt**

The monsoon season marks the beginning of guava wilt. Foliage turning light yellow and losing its turgidity and epinasty. Some of the twigs eventually dry out after becoming naked and incapable of producing new leaves or blossoms. All the damaged branches' fruit is still stony, hard, and undeveloped.

**Algal**

Early spring flush is when immature guava leaves become infected with algae. On leaves, particularly on the tips, margins, or regions close to the mid vein, tiny, shallow brown velvety lesions first form. As the disease worsens, the lesions grow to a diameter of 2-3 mm.

**Fruit rot**

Fruit rot is a disease that begins at the fruit's calyx disc during the wet season. As the fruit ripens, a whitish cotton-like growth that covers the affected area quickly appears.

## I. RELATED WORKS

[5] suggested a technique for identifying the soybean plant Frog Eye disease. The author claims that the segmentation approach divides the affected area into the infected region and the healthy leaves. Shape, colour, and textures are used in the following to extract the features, which are then extracted using statistical and spectral approaches. For final classification, those features are fed into SVM. [6] tries to distinguish between two distinct diseases in order to determine which plant leaves are afflicted. The RGB to HSV conversion of the image comes first. Techniques for pre-processing images are used to enhance their quality. The characteristics from the sick image were then extracted using the colour co-occurrence approach. Finally, SVM was used to classify the form, colour, and texture retrieved characteristics. An method for disease prediction in different plants from early symptoms was proposed by [8]. In that investigation, the manual segmentation approach had a 63% accuracy rate while automatic detection identification accuracy was 58%. The automatic approach was extremely bad due to the poor capture conditions. In order to maximise accuracy, capturing conditions should be very clear. The researcher was inspired by this study to look into severity measuring. In order to effectively and reliably anticipate the disease, texture information is crucial [9].

## II. METHODOLOGY

The basic steps for performing segmentation techniques are shown in Figure. 2

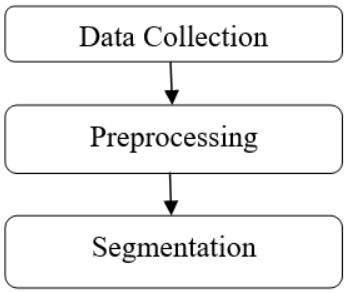


**Figure 2.** Work Flow of proposed method

**Data Collection**

In this process, we have to collect the data for processing. Collect the dataset from Kaggle for processing. We have to collect various kinds of data and split them into training and testing. When an algorithm gets well trained it gives better result.

Split the data into training and testing 80% for training and 20% for testing. We may collect real images in agriculture field from farmers. That helps to get recent images that specify diseases in up to date.

**Preprocessing**

In this process, we have to process the data to avoid inaccurate and unwanted data. Dataset includes all kinds of data. We need to clear them for the next process. It is a technique that is used to convert raw data into clean dataset. Achieve it through with the help of openCV package in python and perform data augmentation for rotated images.

**Segmentation**

A digital image is divided into smaller groups by the process of image segmentation, which makes it simpler and easier to analyse and analyse larger images. There are two forms of image segmentation: region-based and edge-based.

**Region Based Segmentation**

This procedure entails breaking the image up into smaller sections that adhere to a predetermined set of guidelines. This method makes use of an algorithm that separates the image into a number of parts with similar pixel properties. The method searches the image for groups of segments. Small segments may include comparable images from nearby pixels and eventually expand in size. The programme can determine the grayscale from nearby pixels.

- **Region growing**

By incorporating nearby pixels with similar properties, this technique recursively increases segments. For grey areas, it uses the variation in grey levels, and for textured images, it uses the variation in textures.

- **Region splitting**

This approach treats the entire image as a single region. To segment the territory now, it looks for pixels that were previously part of the region and determines whether they meet the predetermined set of requirements. They are combined into one section if they adhere to the same rules.

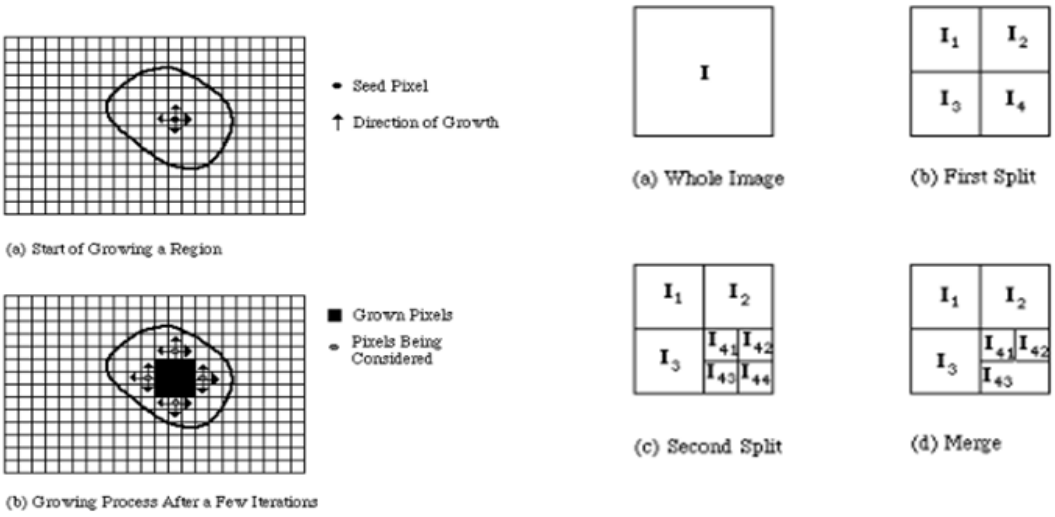


**Figure 3: Region Based Segmentation**

**Edge Based Segmentation**

The boundaries or edges of the images differ noticeably from one another and from the image background in edge-based segmentation. This fact is used to perform edge detection on images with various edge discontinuities and intensities. The image's edges contain a good deal of information. Edge identification and edge connecting are two frequent operations in this technique. The edge is located during edge detection. As the name implies, edge linking entails connecting two edges. Thresholding is a method frequently used to find contours.

**IV. RESULTS**

The collected image is further applied for preprocessing. In this approach, modifying an image by changing its shade or color of the pixel. Additionally, it is applied to improve contrast and brightness.

```
image_name="l1.jfif"
#image_name="l2.jfif"
file_name="/content/drive/MyDrive/guava/"+image_name
im= imread(file_name,as_gray=True)
plt.imshow(im,cmap=plt.cm.gray)
plt.show()
```

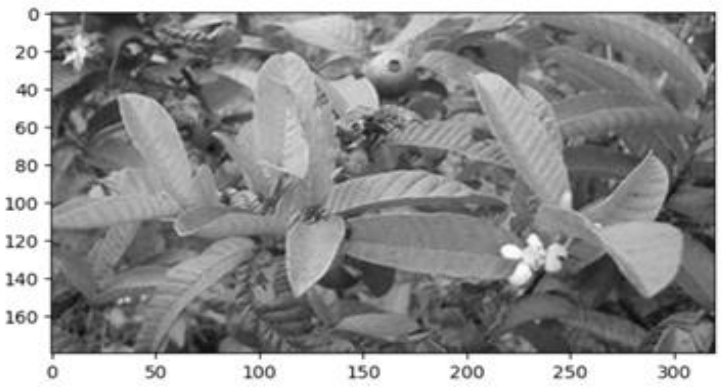


**Figure 4. Image Filtering output**

After preprocessing, the segmentation techniques are applied. Here, region growing segmentation is used to separate the area of the colour image that is affected by the disease.

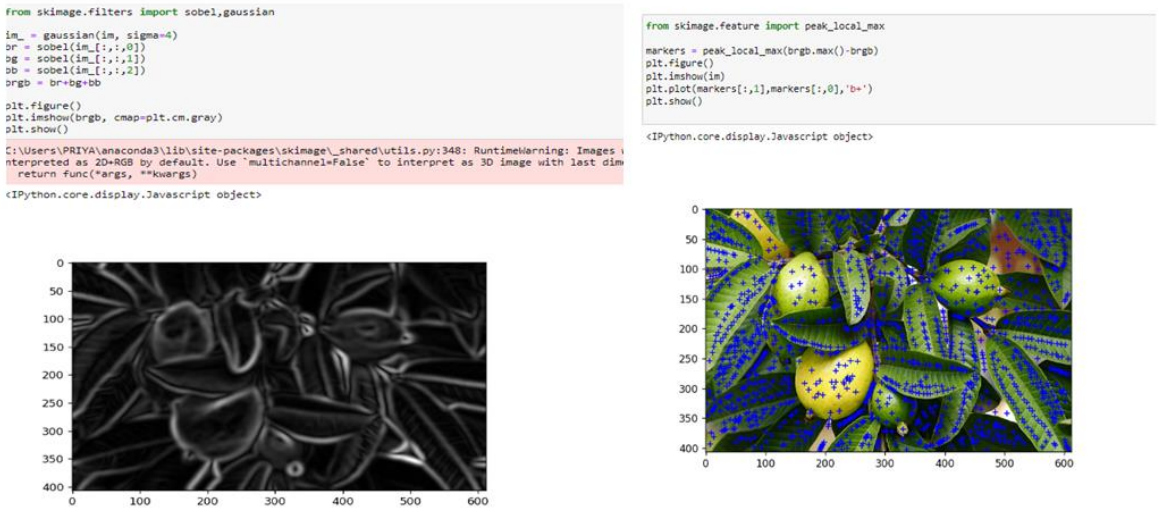


**Figure 5. Region Growing Segmentation**

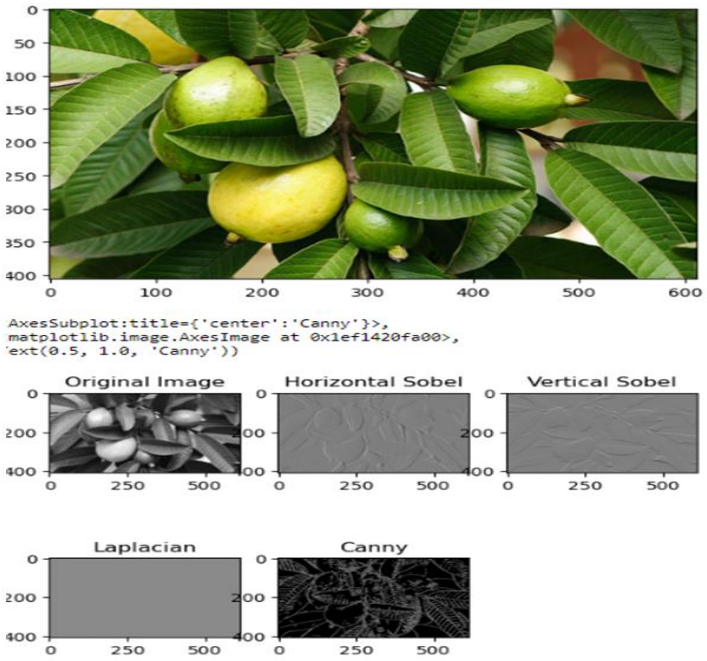


**Figure 6. Edge Based Segmentation**

## V. CONCLUSION

This paper presents the image segmentation techniques used for plant leaf disease detection. Guava plant leaves related disease images were taken for identification. The best results were achieved with very little computing effort, demonstrating the effectiveness of segmenting the leaf diseases. Utilising this technology also has the benefit of allowing for the early or first detection of plant diseases.

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