Segmentation and Classification: Separation ofWorm Image from Leaf

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*Abstract:*Transition region-based approaches are hybrid segmentation techniques well known for its simplicity and effectiveness. The segmentation effectiveness depends on robust extraction of transition regions. This paper proposes a transition region extraction method for image segmentation. The image is converted into wavelet domain by applying discrete wavelet transform. Standard deviation filtering and thresholding operations are applied to the image for extracting the transition region feature matrix. This feature matrix is used to find corresponding prominent wavelet coefficients. Inverse wavelet transform is applied to the coefficients to get the edge image with more than one-pixel width.Transition regions are got when global thresholding is applied. Morphological thinning and region filling are used to dilate thick edges and fill the holes. Using object regions,the objects are extracted and thus segmented. Using the trained convolution network these segmented images are classified. Then when we also perform a performance analysis for the segmentation performed. This is helpful for farmers in remote areas to detect the type of bug and take necessary actions and get better yield of crops

IndexTerms **- Transition region-based approach, Segmentation, CNN, performance.**

I. INTRODUCTION

Segmentation is the process where image segregated to segments and thus separates the objects from the background. This process of segmentation considers many features like color, intensity, texture etc. There are many methods of segmentation some of them are machine learning approaches, Graph-cut methods, Active Contour and Transition Region Based Approaches. In this paper we use the recent hybrid method of transition region extraction.Extracting the image of the worm from the leaf using transition region extraction method of segmentation we feed the output to a convolution neural network layer.

CNN's are a system having hardware and software which is used highly today in image processing. CNN's use artificial intelligence that use deep learning in turn to perform the image classification. CNN's are based on the concept of the neurons working in a human brain. A neural network has multiple input , output and hidden layers. Thus, it is called as deep learning concept. is also called a multilayer perceptron's.Each hidden layer is fully connected to the previous layers. Thus, pre-trained convolution neural network is used to train the network with imagesof worms and then used to perform classification.The output of segmentation is fed to the convolution neural network which performs a classification.

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II. LITERATUREREVIEW

In Local entropy-based transition region extraction and thresholding we determine the transition region using the Local entropy (LE) based method. The entropy of a neighborhood (gray level changes) is considered to determine the transition region. Entropy is calculated as $E=-\sum Pi\log Pi$ where Pi is the probability of gray level intensity appeared in the image. This method effectively reduces the effects of noise.It has a limitation that in the event of frequent changes in gray level in a local area; it increases the local entropy. [1]

In modified local entropy-based transition region extraction and thresholding.Determination of transition region is done using both frequency and degree of gray level changes. Thus, it improves the extraction of transition region. This method is more efficient than local entropy method. These techniques are ineffective when the foreground and background are of varying intensities. [2]

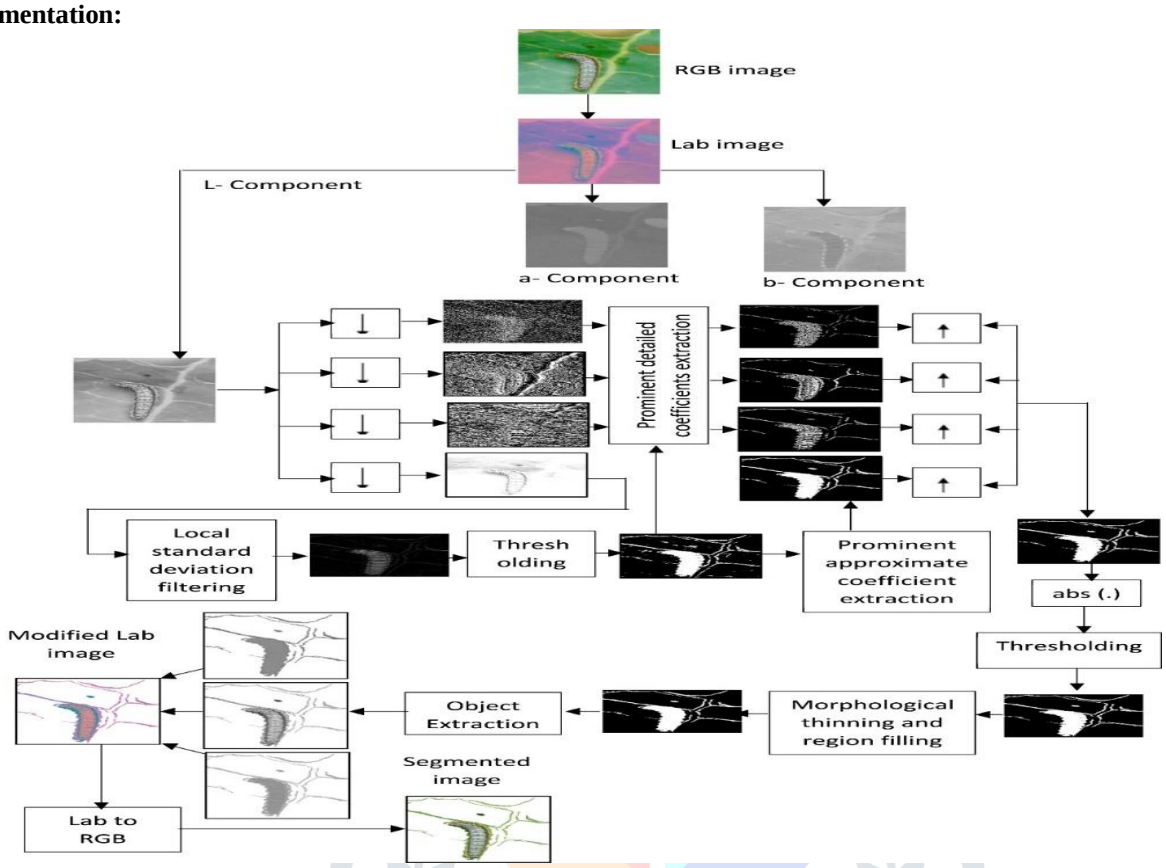
In Robust single-object image segmentation (RIB) based on salient transition region. Transition region with the largest pixel number is chosen. Region growing is a simple region-based image segmentation method. This approach to segmentation examines neighboring pixels of initial seed points and determines whether the pixel neighbors should be added to the region. The process is iterated on, in the same manner as general data clustering algorithms. This achives better segmentation accuracy and robustness. It is also simple and efficient. The drawback of this is that this only applies to images that contain a single object. [3]

In 2-D Gabor filter-based transition region extraction and morphological operation for image segmentation we perform image segmentation using the 2-D Gabor filter. In the method 2-D Gabor filters are applied on the original image to get a Gabor feature image. The Gabor feature image has object regions with enhanced boundaries. This is

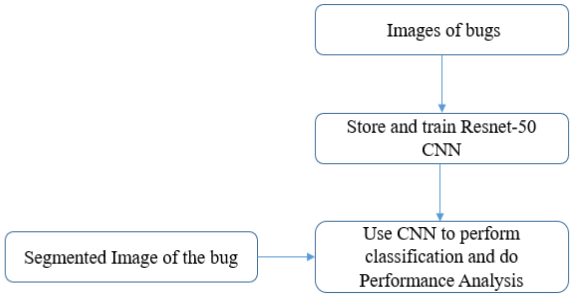
processed to get segmentation. This yields superior performance for image segmentation containing single and multiple objects. But this method is unable to perform well when the image contains textured background. [4]

III. PROPOSED SYSTEM:

Segmentation:



Classification:



Pre-processing: RGB image RGB (red, green, and blue) color image is converted into the Lab color space image. Here it has 3-axis color system with dimension L for lightness and a and b for the color dimensions. The Lab color space is the most exact means of representing color and is device independent.

Haarwavelet transform: performs the 2-D Haar discrete wavelet transform (DWT) of the matrix haar function returns cell arrays of matrices containing the horizontal, vertical, and diagonal detail coefficients by level.

Feature Extraction Process:

Local Standard Deviation filtering:

The standard deviation is a measure that is used to quantify the amount of variation or dispersion of a set of data values. The value of each output pixel is the standard deviation of the 3-by-3 neighborhood around the corresponding input pixel.

Thresholding:

When Gray scale image is converted into Binary Image, it uses a threshold.Thresholding is the simplest method of image segmentation. The simplest thresholding methods replace each pixel in an image with a black pixel if the image intensity is less than some fixed constant T or a white pixel if the image intensity is greater than that constant.

IDWT:

Inverse discrete wavelet transforms (IDWT) of input or reconstruct signals from sub bands with smaller bandwidths and slower sample rates

Otsu's Thresholding:

The algorithm assumes that the image contains two classes of pixels following bi-modal histogram (foreground pixels and background pixels), it then calculates the optimum threshold separating the two classes so that their combined spread (intra-class variance) is minimal, or equivalently (because the sum of pairwise squared distances is constant), so that their inter-class variance is maximal.

Morphological Operations:

The most basic morphological operations are dilation and erosion. Dilation adds pixels to the boundary of objects in an image. Erosion removes pixels from object boundaries. The fill functions perform a flood-fill operation on binary and grayscale images.

Classification using CNN:

1. Load Images of each category into named folders.
2. Equalize the number of images in each category.
3. Load the pretrained network Resnet50.
4. Split the data as Training data and Testing data (70% and 30%)
5. Pre-process images for resnet-50 (224*224*3)
6. Extract features from the full connected layer (fc1000) for the training, testing data .(usingactivations function)
7. Extract the labels and use the features extracted from training images as predictor variables and fit a multiclass SVM. (fitcecocfunction).
8. Evaluate the model using the test images and predict the class of the image.

IV. RESULTS

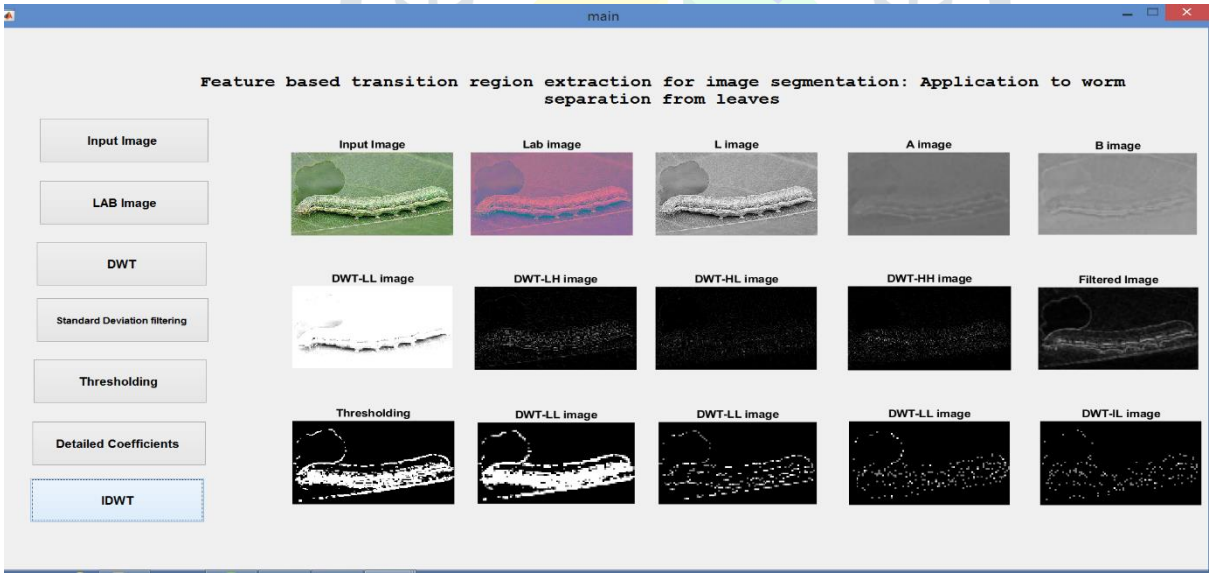


Fig 1: Preprocessing

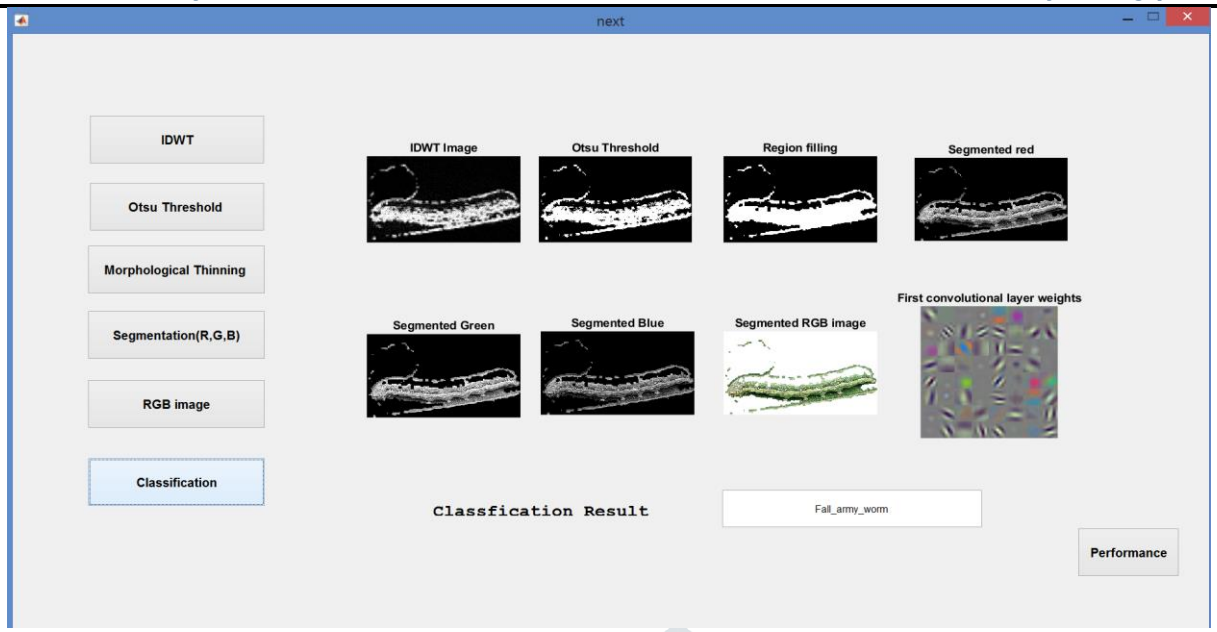


Fig 2: Segmentation and Classification

V. CONCLUSION

In this paper a new method of transition region extraction is presented. It uses the wavelet transformation for feature extraction. This method can be used for multiple images and for textured images also for extraction of transition region. After segmentation using convolution neural networks a classification of the type of the worm is done. This application thus works as a friend of the farmer helping him to find the different types of bugs. It especially helps farmers in remote areas to take necessary actions for the different types of worms.

V1.REFERENCES

[1]C, Sang N, Zhang T. Local entropy-based transition region extraction and thresholding. Pattern Recogn Lett 2003; 24:2935e41. https://doi.org/10.1016/S0167-8655(03)00154-5.

[2]Li Z, Zhang D, Xu Y, Liu C. Modified local entropy-based transition region extraction and thresholding. Appl Soft Comput J 2011;11: 5630e8. https://doi.org/10.1016/j.asoc.2011.04.001.

[3]Li Z, Liu G, Zhang D, Xu Y. Robust single-object image segmentation based on salient transition region. Pattern Recogn 2016; 52:317e31. https://doi.org/10.1016/j.patcog.2015.10.009.

[4]Parida P, Bhoi N. 2-D Gabor filter-based transition region extraction and morphological operation for image segmentation. ComputElectrEng 2017; 62:119e34. https://doi.org/10.1016/j.compeleceng.2016.10.019.

[5] Otsu N. A threshold selection method from gray level histograms. IEEE Trans Syst Man Cybern 1979;9:62e6. https://doi.org/10.1109/ TSMC.1979.4310076.

[6]Parida P, Bhoi N. Wavelet based transition region extraction for image segmentation. Future Comput Inf J 2017;2:68e78. https://doi.org/10.1016/j.fcij.2017.10.005.

[7]Sankur B. Survey over image thresholding techniques and quantitative performance evaluation. J Electron Imag 2004;13:146. https://doi.org/ 10.1117/1.1631315.