COMPUTER VISION
Assignment 4

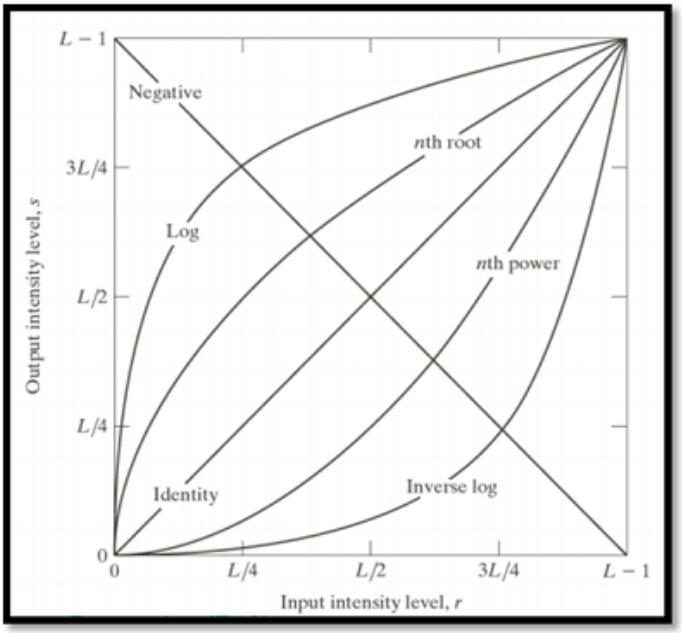
By-
Anuj Singh Negi(19BAI10021)
Elisha Singh(19BAI10043)

After reading the paper on Plant Disease Detection Using Machine Learning, we took a similar image and applied various enhancement, segmentation, feature extraction and classification techniques on it. The results and procedure for the same are displayed below.

ORIGINAL IMAGE

A grayscale (or gray level) image is one in which the only colors are shades of gray. The reason for differentiating such images from any other sort of color image is that less information needs to be provided for each pixel.If the levels are evenly spaced then the difference between successive gray levels is significantly better than the gray level resolving power of the human eye. Grayscale images are entirely sufficient for many tasks and so there is no need to use more complicated and harder-to-process color images.

As a first step, we perform gray level transformation on our original image.
There are 3 types of gray level transformation functions:-
1)Power Law
2)Linear
3)Logarithmic
They map an input gray level intensity r, to an output gray level intensity s, as per our requirement.



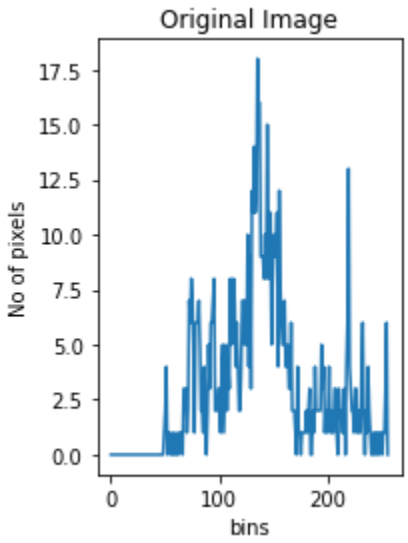
Gray scale transformation is an easy and efficient way to enhance our image before applying other processing techniques to it, in order to get better results.

IMAGE AFTER GRAY LEVEL TRANSFORMATION

After gray level transformation, we perform image enhancement on our image using histogram equalisation.
This technique increases the dynamic range of an image, so that it covers as wide a range of gray levels as possible, hence enhancing the contrast. An ideal histogram is one which is almost flat. A flat histogram means that it covers all the gray levels, and all the gray levels have similar number of pixels. We can do this by adjusting the probability

density function of the original histogram of the image so that the probability spread equally.

ORIGINAL HISTOGRAM



EQUALISED HISTOGRAM

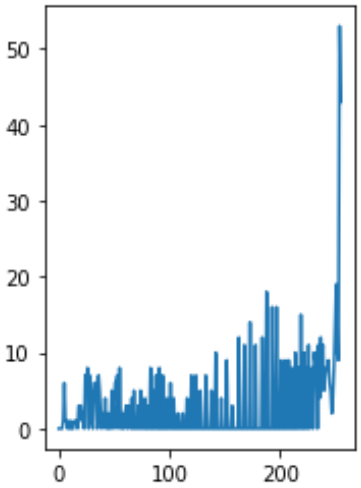


IMAGE AFTER HISTOGRAM EQUALISATION

After enhancing the image, we move on to the segmentation process.Segmentation refers to the subdivision of an image into it's constituent regions or objects. This subdivision process should stop once we have found our object of interest. Segmentation is generally based on two properties of gray level intensities.

1)DISCONTINUITY- segmentation of image based on the abrupt gray level irregularities in an image, like the edges and lines.

2)SIMILARITY- segmentation of image into regions with similar gray levels.

IMAGE AFTER SEGMENTATION PROCESS

After the segmentation process, we move on to feature extraction.

Feature extraction involves reducing the number of resources required to describe a large set of data. Feature extraction techniques are applied to get features that will be useful in classifying and recognition of images. These techniques are helpful in various image processing applications such as character recognition.

The is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images. It uses a filter based on the derivative of a Gaussian, in order to compute the intensity of the gradients.The Gaussian reduces the effect of noise present in the image. Then, potential edges are thinned down to 1-pixel curves by removing non-maximum pixels of the gradient magnitude. Finally, edge pixels are kept or removed using hysteresis thresholding on the gradient magnitude.
The five main steps of Canny Edge Detection algorithm are:

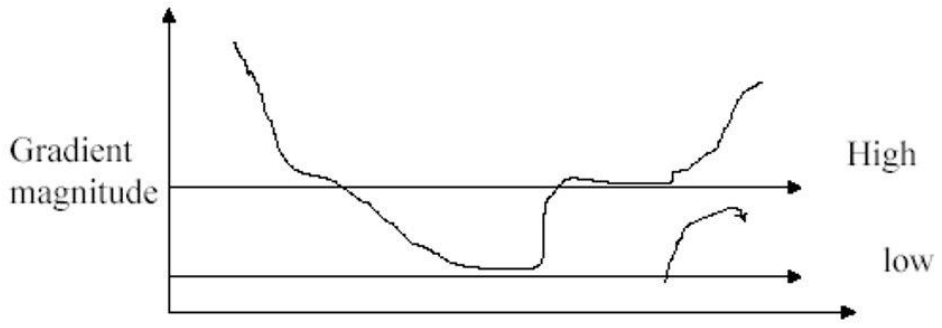
1.Apply Gaussian Filter to smoothen the image in order to remove the noise.

2.Find the intensity gradients of the image (g_x and g_y).

3.Apply non-maximum suppression to suppress the pixels in gradient magnitude image that are not local maximum.

4.Apply double threshold to determine potential edges

5.Hysteresis Thresholding: Finalize the detection of edges by suppressing all the other edges that are weak and not connected to strong edges.



For Hysteresis thresholding

IMAGE AFTER APPLYING CANNY EDGE DETECTION ALGORITHM