EE5175:IMAGE SIGNAL PROCESSING

LAB-9

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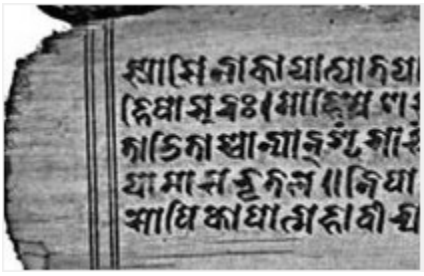
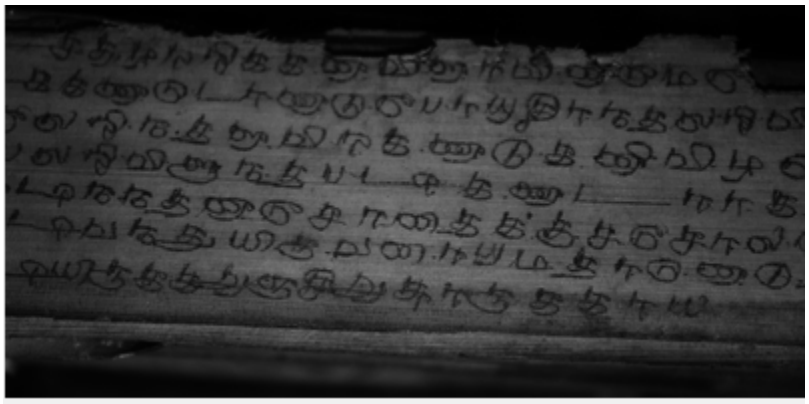
EE20S049

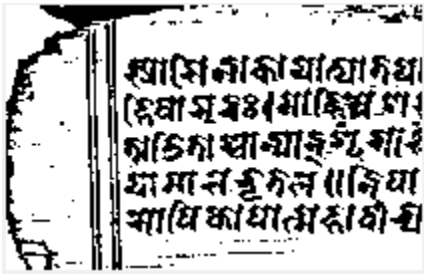
1. Calculate the global threshold value of the given images palmleaf1.pgm and palmleaf2.pgm using Otsu's thresholding algorithm, and display the thresholded binary images. Comment on your observations.

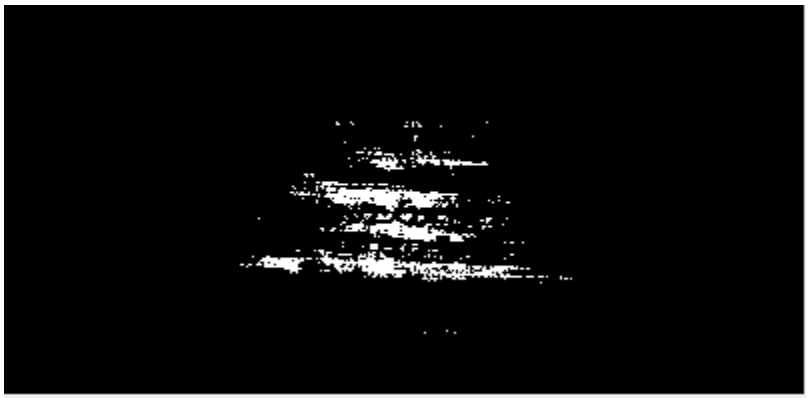
Inputs:





Output:





Global Threshold value for Palmleaf1 :105.

Global Threshold value for Palmleaf2 :101.5 .

Observation: Otsu thresholding works well on images that contain objects with uniform intensity values on a contrasting background. However, it fails if there is a low contrast between the object and the background with non uniform intensity values.

2. In all the following questions, perform K-means clustering on the two input images (car.ppm and flower.png) for K = 3 clusters. Use only Euclidean distance as the distance measure for all iterations. Basic data units to be clustered are vectors containing pixel data, i.e., [r g b]. Perform 5 iterations of the algorithm. To visualize the output of k-means clustering, replace each pixels in the input image with the cluster center it belongs to and display the resulting image.

(a) Perform K-means clustering with initial cluster means as follows:

- **c init 1 - [255 0 0]**
- **c init 2 - [0 0 0]**
- **c init 3 - [255 255 255]**

Inputs:

Outputs:

(b) Perform K-means clustering on both images using random initialization of cluster means. Generate 3 random vectors of size 1 × 3 that are sampled from uniform distribution in [0 255] and use them as the cluster centers to begin the K-means with. Perform K-means clustering using N such initializations. The cost corresponding to the output of k-means clustering can be computed as

$$C = \sum_{i=1}^{P} dist(p_i, c_k)$$

where dist measures the Euclidean distance between a pixel color value pi and its cluster center ck, and P refers to the total number of pixels in the image. Use N=30 (which means that you will repeat K-means clustering with 30 different random initializations), and find the cost corresponding to the output in each case. Among the 30 values that you got after repeatedly running the K-means, find the output corresponding to the lowest and highest value of C.

Output corresponding to the lowest value of C:

Output corresponding to the Highest value of C:

Observations: The output corresponding to the lowest of C properly segmented the image into 3 segments whereas the output corresponding to the highest of C segmented the image into background and foreground only.