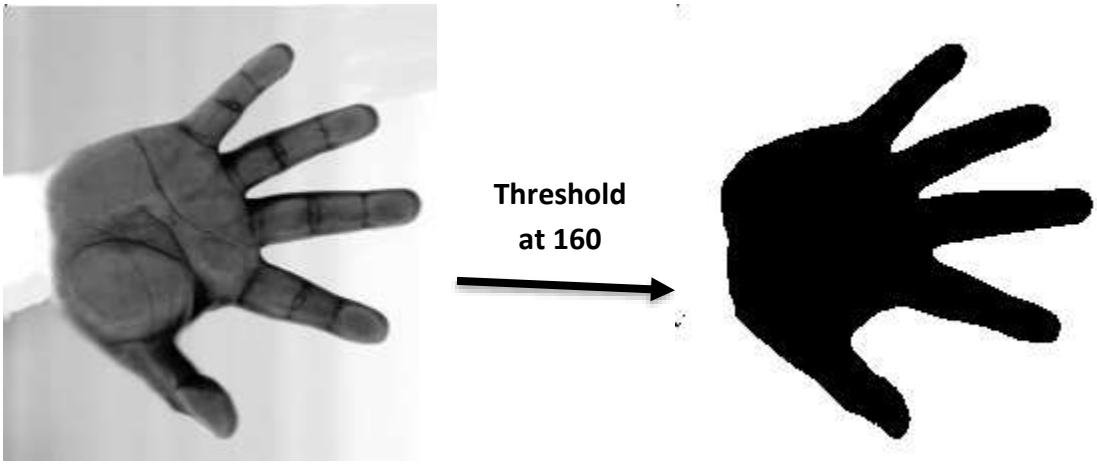
LAB # 08: Image Segmentation

Lab Objective:

The objective of this lab is to apply differential spatial filters to segment an image.

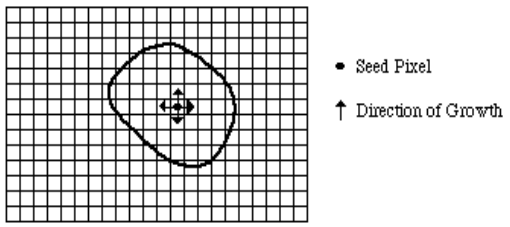
Lab Description:

Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images. For example in the image shown below threshold is applied around the gray value 160 and we have easily extracted the hand out of the image.

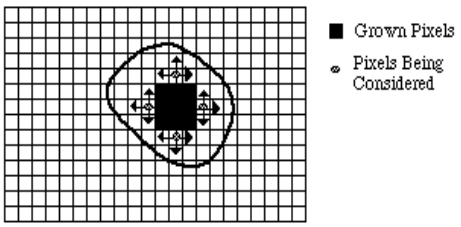


Adaptive thresholding: In some cases a simple threshold doesn't work. An alternative approach is local threshold which is to statistically examine the intensity values of the local neighborhood of each pixel and threshold on the bases of local mean, median or mode etc.

Region Growing is also another kind of region-based segmentation method. For region growing, a "seed" point is selected. Whenever this seed is encountered in an image, its surrounding neighboring pixels are checked and a decision is made whether a neighboring pixel should be added to the region or not following a selection criterion. One criterion that can be used is that only that pixel is kept from the neighbors that has the same intensity value as the pixel itself.



(a) Start of Growing a Region



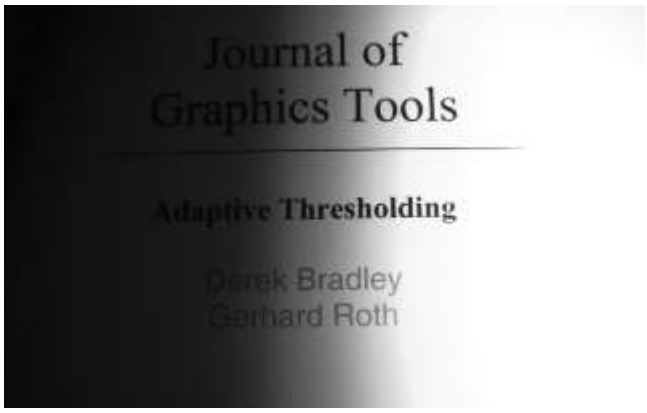
(b) Growing Process After a Few Iterations

Several complete passes of the image are needed in order for region growing to completely work.

Lab Task:

Lab Task 1:

Write a program that threshold the provided image using global mean and median.

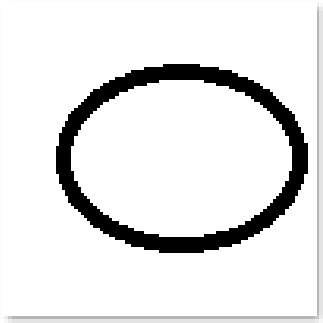


Lab Task 2:

Now threshold the image by taking threshold value mean of 3x3 block locally.

Lab Task 3:

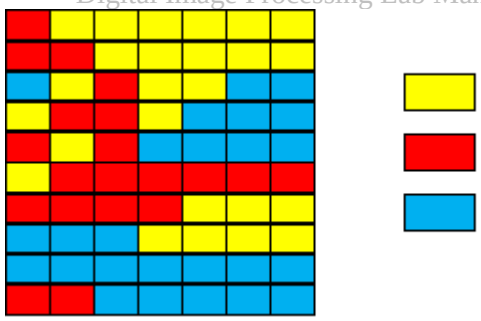
Write a program that take image of the circle as input and applies region growing on it. Take center of the image as seed point. Display the resultant image.



Home Task

K means clustering is the most basic and widely used clustering technique for data grouping, in machine learning and in colored image segmentation. The algorithm for K-means clustering is as following

1. Chose the number (K) of clusters and randomly select the centroids of each cluster.
2. For each data point:
    - ❑ Calculate the distance from the data point to each cluster.
    - ❑ Assign the data point to the closest cluster.
3. Recompute the centroid of each cluster.
4. Repeat steps 2 and 3 until there is no further change in the assignment of data points (or in the centroids).



The above image has been segmented using the labels “yellow”, “red” and “blue”. For a grayscale image, these will be intensity values in grayscale.

Write a function that takes an image (Fig01.tif) and a set of values (64,128,196) as input and segments the images based on those values using K-mean clustering. Display the resulting image.