

IMAGE SEGMENTATION - I

Objective:

To understand Image segmentation based on region information.

Theory:

Image segmentation refers to the process of partitioning an image into groups of pixels which are homogeneous with respect to some criterion. Different groups must not intersect with each other, and adjacent groups must be heterogeneous. Segmentation algorithms are area oriented instead of pixel-oriented. The result of segmentation is the splitting of the image into connected areas.

Regions in an image are a group of connected pixels with similar properties. In the region approach, each pixel is assigned to a particular object or region.

Region Growing

Region growing is a segmentation approach in which neighbouring pixels are examined and added to a region class if no edges are detected. The process is iterated for each boundary pixel in the region. If adjacent regions are found, a region-merging algorithm is used in which weak edges are dissolved and strong edges are left intact.

Region growing requires a seed to begin with. Ideally, the seed would be a region, but it could be a single pixel. A new segment is grown from the seed by assimilating as many neighbouring pixels as possible that meet the homogeneity criterion. The resultant segment is then removed from the process. A new seed is chosen from the remaining pixels. This continues until all pixels have been allocated to a segment. As pixels are aggregated, the parameters for each segment have to be updated. The resulting segmentation could depend heavily on the initial seed chosen and the order in which neighbouring pixels are examined. The selection of homogeneity criteria in image growing depends not only on the problem under consideration but also on the type of image to be segmented.

MCQ:

1. Which of the following statements are false:
 - (i) Regions growing approach is an example for local segmentation.
 - (ii) The borders of regions found by region growing are perfectly thin and connected.
 - (iii) Image segmentation is used to detect cancerous cells from medical images

(iv) Better segmentation can be expected if we use more than one seed in a region growing technique.

(a) (i)

(b) (i) and (ii)

(c) (i), (ii) and (iii)

(d) none of these.

Exercise: Region Growing

Steps:

1. Load the image 'Exp8 Image1.png'. The image can be found in the zip folder or downloaded from <http://bit.ly/2AvjynN>
2. Convert the image into grayscale image.
3. Implement the region growing algorithm with logical image of region as output and with input parameters :
 - a. input image
 - b. location of seed point and
 - c. The difference between a pixel's intensity value and the region's mean as a threshold.
4. Apply the region growing algorithm on any of the objects in the image.
5. Show the segmented object on the colour image.

Exercise: K-means clustering

6. Apply k-means segmentation to identify the red color circle from the image 'Exp8 Image1.png'.
Hint: Use appropriate color feature vector.