



ITMO UNIVERSITY

Detection, localization, segmentation

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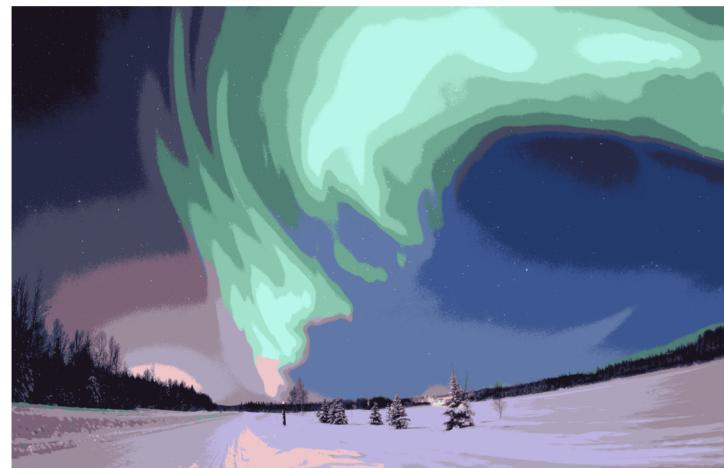
Thresholding segmentation

- ✓ The simplest method of image segmentation
- ✓ The key of this method is to select the threshold value

Ex: Otsu's method

Clustering segmentation

- ✓ Pick K cluster centers, either randomly or based on some heuristic method, for example K-means++
- ✓ Assign each pixel in the image to the cluster that minimizes the distance between the pixel and the cluster center
- ✓ Re-compute the cluster centers by averaging all of the pixels in the cluster
- ✓ Repeat steps 2 and 3 until convergence is attained



Edge based segmentation

- ✓ To segment an object from an image however, one needs closed region boundaries. The desired edges are the boundaries between such objects or spatial-taxons

Ex: Canny detector

- ✓ Apply Gaussian filter to smooth the image in order to remove the noise
- ✓ Find the intensity gradients of the image
- ✓ Apply non-maximum suppression to get rid of spurious response to edge detection
- ✓ Apply double threshold to determine potential edges
- ✓ Track edge by hysteresis: Finalize the detection of edges by suppressing all the other edges that are weak and not connected to strong edges

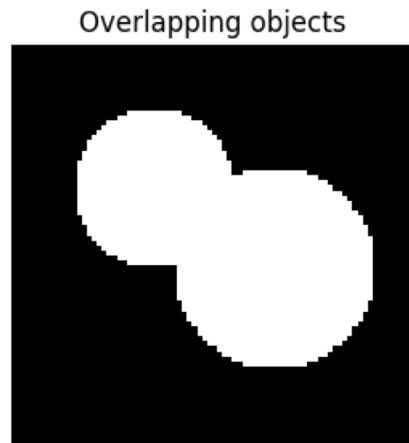
Edge based segmentation



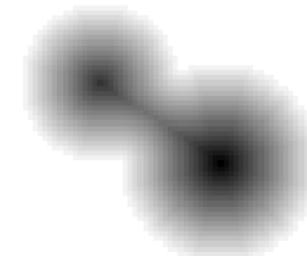
Region based segmentation

- ✓ The common procedure is to compare one pixel with its neighbors

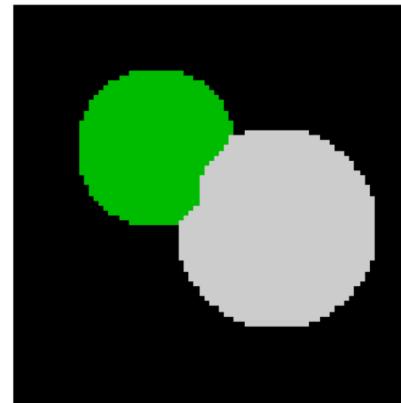
Ex: watershed segmentation



Distances



Separated objects



Materials

Presentation was prepared using:

1. [http://on-demand.gptechconf.com/gtcdc/2017/presentation/dc7217-abel-brown-deep-learning-object-detection-and-segmentation.pdf](http://ondemand.gptechconf.com/gtcdc/2017/presentation/dc7217-abel-brown-deep-learning-object-detection-and-segmentation.pdf)
2. <http://www.cs.toronto.edu/~jepson/csc2503/segmentation.pdf>
3. <http://scikit-image.org>
4. https://medium.com/@jonathan_hui/what-do-we-learn-from-region-based-object-detectors-faster-r-cnn-r-fcn-fpn-7e354377a7c9

Task

1. Choose the implementation of SegNet or any segmentation network or write your own <https://github.com/mrgloom/awesome-semantic-segmentation>
2. Train SegNet on CamVid dataset. Classes are:
 3. Sky = [128,128,128]
 - Building = [128,0,0]
 - Pole = [192,192,128]
 - Road_marking = [255,69,0]
 - Road = [128,64,128]
 - Pavement = [60,40,222]
 - Tree = [128,128,0]
 - SignSymbol = [192,128,128]
 - Fence = [64,64,128]
 - Car = [64,0,128]
 - Pedestrian = [64,64,0]
 - Bicyclist = [0,128,192]
 - Unlabelled = [0,0,0]
4. data_shape = 360*480

**Thanks for attention!
Questions?**