

# Assignment, Week 8 -Segmentation

## Signal and Image Processing 2014

1. Give 3 reasons why simple intensity-based segmentation (i.e. global thresholding of image intensity) is problematic.
2. Explain why region-based and edge-based segmentation are likely to perform better than intensity-based (global threshold) segmentation. In what situations would their performance worsen?
3. Compare the benefits and downsides of region-growing vs quadtree-decomposition for selecting homogenous areas of an image, assuming that they both use the same image feature for determining homogeneity.
4. Using the Matlab test image “concordaerial.png”, perform edge detection using the Sobel filter, LoG and Canny approaches (use the “edge” function, and automatic/default threshold selection). Which do you think performs best?

Now add salt-and-pepper noise, at 4 different levels, to the test image and repeat. Comment on how the performance of each method is affected. Show the images (or zoomed areas thereof) to illustrate your points.

Now filter the noisy images in order to try and remove the noise before you do the edge detection. Try both a median filter, and a Gaussian smoothing. Vary the filter parameters for each to best match the noise level. Are you able to recover the performance of the edge detection? Which edge-detection method shows the best improvement? What is your ranking of best:worst edge-detection performance, and has it changed due to the noise and filtering? Show the (zoomed) images to illustrate your points. Remember to report the parameters of the filters applied.

5. Using the Jon’s “snake.m” Matlab function, try to segment the canoe (and its occupants!) within the Matlab test image “canoe.tif”. (Define a mask image that specifies your starting contour, so that you can re-use the same initial conditions each time. Choose a simple polygon shape that encompasses all the parts that you wish to segment). To start with, just use the image intensities as the input.

Now try to improve the segmentation by giving the snake function a different input. Think about what features define the outline of the target object, then try to generate a metric (an “image” of values based upon statistics or features of the original image) that will enhance them. For example, what are the differences between the target region and the background regions. (Colour, texture, edge density?). For example, you might want to look at the texture properties in local neighbourhoods. Or the edge densities. Or colour. Or combinations of them.

Show ALL your steps, with intermediate results, and explain any parameter choices that you make. Show the final segmentation.