

Due: 25 March 2003

EE 701 ROBOT VISION

HOMEWORK # 1

- 1) **Segmentation of gray-level images:** Using the 3 aerial images, stored under <http://www.eee.metu.edu.tr/~alatan/Courses/HWData> with the filenames `one.bmp`, `two.bmp` and `three.bmp`, respectively,
 - a. Plot the corresponding gray-level histograms for all 3 images,
 - b. Determine the threshold levels manually (via *trial and error*) for each histogram, so that *sea regions* are segmented from background in these images.
 - c. Find an automatic thresholding method among all the algorithms in software OTIMEC, yielding the “best” segmentation performance compared to manual thresholding (the software and the corresponding manuscript are both available at the same URL address). Explain the best method by using block diagrams and comment on its performance, comparing with other methods. Show the resulting images for all parts (Indicate your measure for choosing the best method).
- 2) **Binary regions and their properties:** Find
 - a. Area, perimeter and compactness of “sea regions” for all 3 images whose masks are obtained by manual segmentation and automatic thresholding (via the best method) [Note: the image boundaries should be assumed as region boundaries].
 - b. Orientations of 5 “holes” (e.g. ships) in one `.bmp`, separately.
- 3) **Edge Detection:** Find the output images for the 3 images above after calculating the magnitude of Sobel and Laplacian of Gaussian (LoG) operators. Compare their edge detection performances, especially at the boundaries between sea and the coast. [Write your own code for both operators].

Note: The answers must be sent to the e-mail address alatan@eee.metu.edu.tr via e-mail with the subject line **RV:HW1** as an attached electronic document (as Word document, PS or PDF). The source codes (C, C++, Pascal, Basic or MATLAB codes) which are used to obtain these results must also be attached to the same e-mail.