Bauhaus-Universität Weimar

Assignment 1

Topics:

- Image Enhancement
- Derivation of a binary mask by thresholding
- Refinement of the mask by using morphological operators

You may use own photos (images with bad or low contrast; not too complex image content, i.e., background and foreground are easy to separate) or the provided image (sat_image.jpg). In case you use sat_image.jpg, we are interested in extracting water surfaces.

A) Write a function to **enhance the contrast** of an image

   If your input image is colored (rgb), compute a grayscale image and use it for all subsequent steps (`imread, mean, rgb2gray`).

   a. Visualize the initial image and the corresponding histogram (`imshow`, `imhist`)
   b. Shortly describe the characteristics of the histogram (comments in code)
   c. Enhance the image using *contrast stretching* (use self-written code: `min, max`)
   d. Shortly describe the differences to the initial histogram (comments in code)
   e. Visualize the resulting enhanced image

B) Write a function for **thresholding** the enhanced image of step A (binarization)

   a. Convert the enhanced image to a binary mask, where 0 = background and 1 = searched regions, i.e., water in sat_image.jpg (`graythresh, im2bw, <, >`)
   b. Visualize the resulting mask
   c. Make some tests with different thresholds and describe the difficulties you had to find an appropriate threshold (code comments)

C) Write a function for **morphological filtering** of the obtained mask of step B

   a. **Successively** morphological opening and closing on the mask (`imopen, imclose`)
   b. Visualize the result of a
   c. **Implement** a function for erosion *or* dilation (`for, .*, sum`)
   d. Compare the results of your function with the results of the MATLAB function (e.g. sum up the pixel differences). Are there differences in the results? Why? (code comments)
   e. Visualize an overlay of the enhanced image and the final mask

D) Write a main function which sequentially conducts steps A-C

E) Are the results satisfactory? What are the limitations of this approach for separating background and foreground (code comments)?

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