



Image Analysis and Object Recognition

Exercise Sessions

Summer Semester 2024

(Course materials for internal use only!)

Computer Vision in Engineering – Prof. Dr. Rodehorst

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Assignment 1

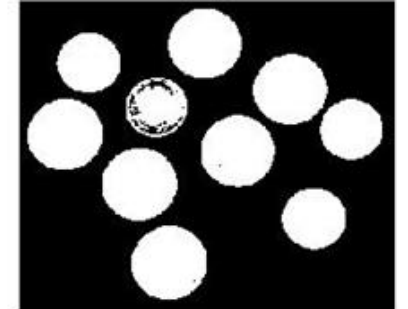
Assignment 1: Overview

Topics:

- Image enhancement
- Thresholding (binarization)
- Morphological operators

Goal:

- Getting familiar with MATLAB / Octave
- Extracting image pixels representing foreground objects



Assignment 1: Overview

Topics:

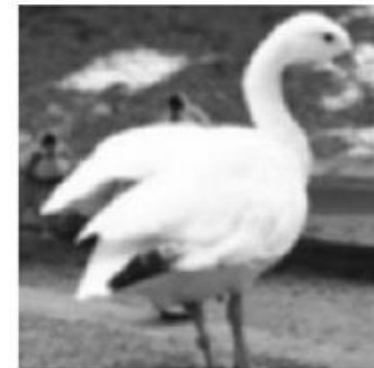
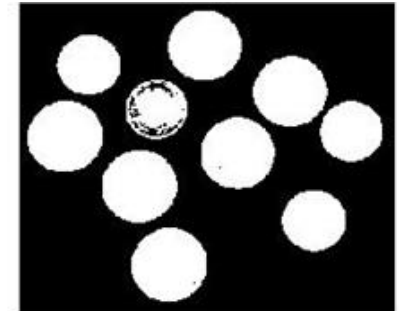
- Image enhancement
- Thresholding (binarization)
- Morphological operators

Goal:

- Getting familiar with MATLAB / Octave
- Extracting image pixels representing foreground objects

Keep in mind:

- This is only a simple method for foreground-background separation.
- Do not expect perfect results!
- Select images with relatively simple content!



Assignment 1: Overview

Input:

- A **starting input image** can be found on Moodle
- In this satellite image, the **water regions** should be treated as **foreground**
- For any additional test images:
 - select a **low-contrast** photograph
 - avoid too complex content
 - decide in advance what should be foreground

Tasks:

- **1**: Enhance image with bad contrast
- **2**: Find and apply a threshold on image values
→ separate background=**0** and foreground=**1**
- **3**: Refine the binary mask using morphological operators
- **4**: Write a main function, which conducts tasks 1 to 3.
Evaluate the results and test your program with new input data.



Provided low-contrast input image

Assignment 1: Task 1

Image Enhancement:

Note: Your input image (`imread`) may consist of multiple channels (`r,g,b`). Therefore, compute **mean** value for each pixel `uint8(mean(image, 3))` and **use the resulting grayscale image**.

- Visualize the initial image and the corresponding histogram
- Shortly describe the characteristics of the histogram
- Enhance the image using *contrast stretching*
- Shortly describe the differences to the initial histogram
- Visualize the resulting enhanced image

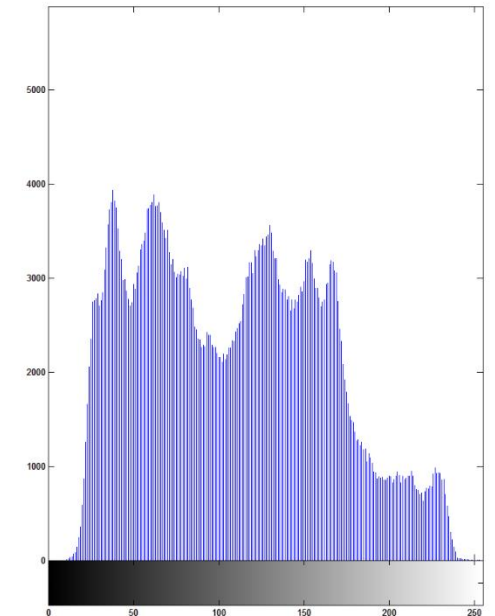
8-bit Image



$$2^8 = 256$$

possible grayscale values

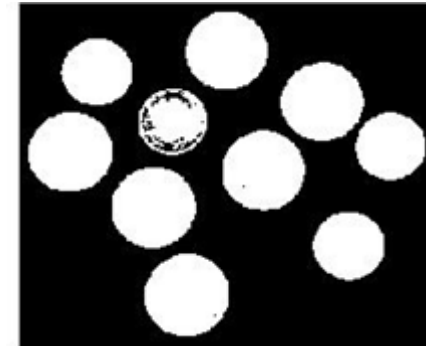
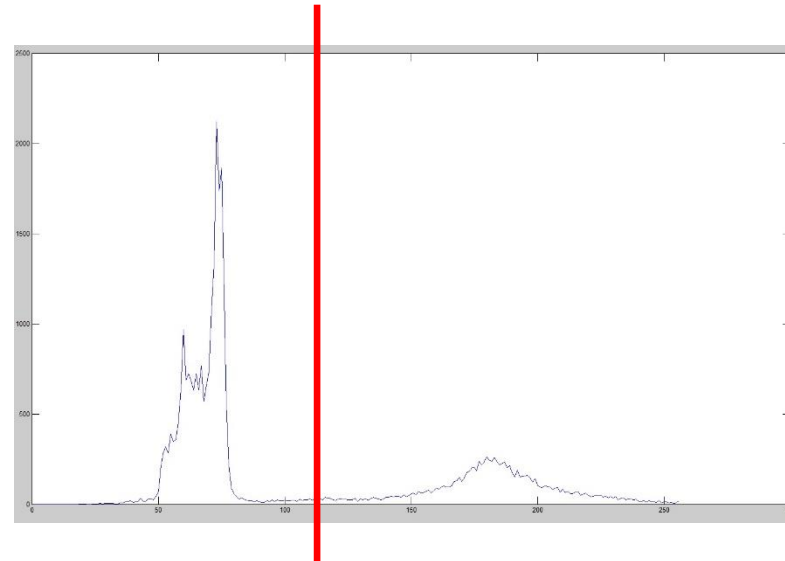
Gray value histogram



Assignment 1: Task 2

Thresholding:

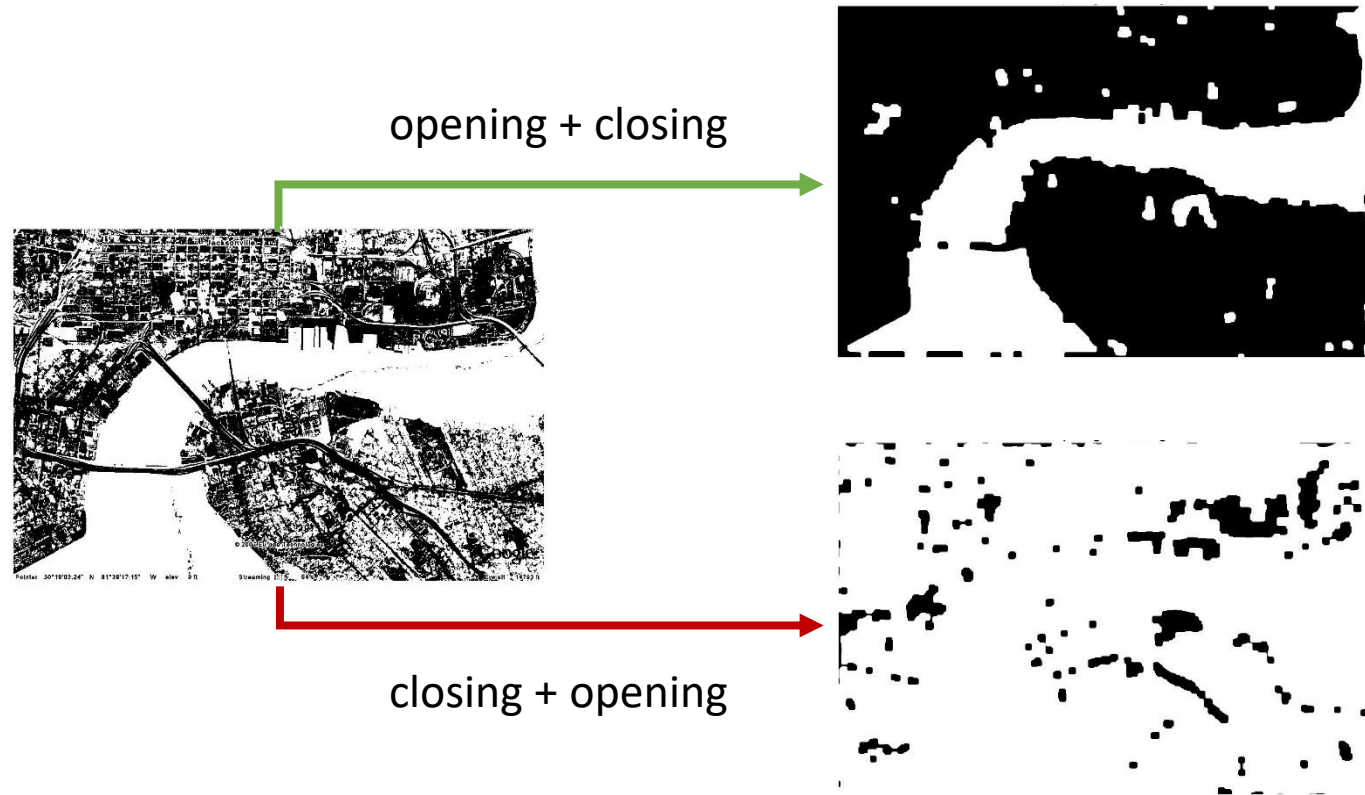
- a. Convert the enhanced image to a binary mask, where 0 = background and 1 = regions of interest
- b. Visualize the resulting binary mask
- c. Make some tests with different threshold values, and describe the difficulties you have in finding an appropriate threshold



Assignment 1: Task 3

Morphological filtering:

- Successively apply **opening** and **closing** on the input image



- Visualize the resulting binary mask
→ function `imshow`
available both for MATLAB and Octave

Assignment 1: Summary

