



## CNG 466 – FUNDAMENTAL IMAGE PROCESSING TECHNIQUES

### Assignment 3

#### Image Segmentation and Morphology (Mainly Lectures 7, 9, and 10)

Date handed out: 22 December 2022, Thursday

Date Submission due: 05 January 2023, Thursday 23:00 (Cyprus Time)

**Objectives:** The purpose of this assignment is to familiarize yourselves with color image processing, image segmentation, and morphological image processing techniques. For this assignment, you are given an image of half-cut oranges. Your job is to process the image and identify the number of big and small half-cut oranges in the image.

**Description:** You are required to identify the number of big and small half-cut oranges in the image shown in Fig.1. The size of all big and the size of all small half-cut oranges are exactly the same. In order to count the big and small number of half-cut oranges in the image, you first need to segment half-cut oranges and then count. Your algorithm should not be specific for this image (it should work with a different number of half-cut oranges, different orange colors, oranges at different locations, and oranges at different big/small sizes). For segmentation, you are free to choose any algorithm. However, for counting the small and big half-cut oranges, you are only allowed to design an algorithm based on Morphology. Implement your solution as a MATLAB script named `A3_StudentID.m` which processes the image. After running the script, two figures should be created; Figure 1: Showing all of the steps of your algorithm.

Figure 2: Showing the final segmented image and the number of big and small half-cut oranges.

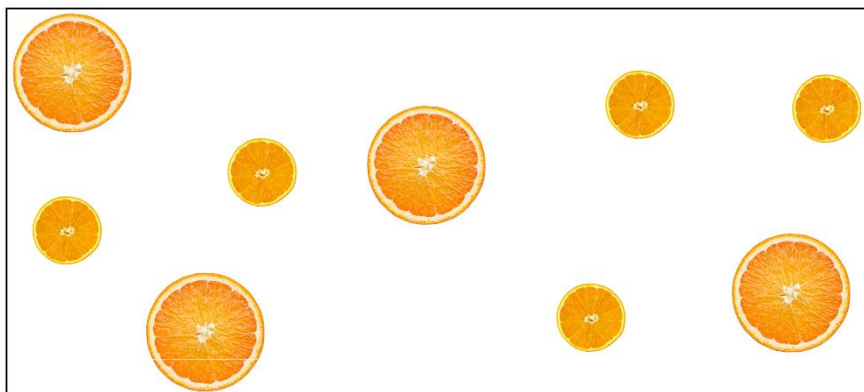


Fig.1: The image of half-cut oranges

You should submit only one m file (as a function) which will work by just calling this function with the input image and producing the two figures mentioned above. This file should also include the following;

- Function for segmentation: input will be the original image and the output will be the segmented image.
- Function for counting: input will be a segmented image and the output will be the number of big and small half-cut oranges.

#### **Grading:**

- (25 pts) Segmentation algorithm (any algorithm can be used)
- (25 pts) Counting algorithm (only morphology MUST be used)
- ( 8 pts) Segmentation accuracy
- ( 8 pts) Counting accuracy
- ( 5 pts) Creating Figure 1
- ( 5 pts) Creating Figure 2
- (10 pts) Explanation of code step by step and reasons for used techniques.
- (14 pts) Accuracy of your software when tested on a different image. (This will be tested by us using an image with a different number of half-cut oranges, different orange colors, oranges at different locations, and oranges at different big/small sizes. If you do not implement your code as a function, the grade of this part will be zero.)

You can test your algorithm using the given test images which include all options mentioned. We will be testing your algorithm separately for each option.

#### **Regulations:**

- 1) **Programming Language:** You must code your program in MATLAB. You are expected to make sure your code runs successfully. If your code is not implemented in MATLAB and/or doesn't compile, your grade will be zero.
- 2) **Implementation:** Check the above grading policy, if you fail to do any of them or do not obey to the stated rules, your grade from that part will be zero.
- 3) **Submission:** Submit one .m file.
- 4) **Late Submission:** Late submission is not allowed; your grade will be zero.
- 5) **Cheating:** Please read carefully the cheating policy from the course syllabus for more details. (Taking a code or a part of a code from any online resource is a cheating case and your grade will be zero.)