University of Tehran

School of Electrical and Computer Engineering

Digital Image Processing

Instructor: Hamid Soltanian-Zadeh

Assignment 9

Chapter 11 – Representation and Description

Due Date: 6th of Khordad 1401

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Problem 1

a. Develop a program that implements the boundary following algorithm described in Section 11.1.1 of the textbook and apply it to *"Mapleleaf.tif"*.

b. Develop a program to obtain the chain code of the following boundary (you can subsample the boundary image and then apply your program to obtain the chain code).

c. Implement the Fourier descriptor scheme described in Section 11.2.3 and apply it to the boundary from part a. Reconstruct the boundary using 1000, 100, 50, and 10 points. Compare reconstructed boundaries with the original one.

d. Reduce the number of descriptors to the minimum required to keep the maple leaf image recognizable and show the result.

Note: In this problem, you **are not allowed** to use built-in functions for boundary following and chain code.

Problem 2

a. Implement the skeletonization algorithm described in Section 11.1.7 of the textbook.

b. Open the image *"river.tif"* and segment the river from this image. Then, apply your algorithm to skeletonize the river.

Problem 3

Automatically detect the objects in *"shape.png"* and then specify its polygonal type based on its signature described in Section 11.1.5.

Descriptive Assignments

Please solve the following questions from the 11th chapter of the textbook.

1, 3, 10, 11, 17, 19, 26.

Notes:

1. Put written codes for each problem in one m-file, and for each section, intercept them by %%.

2. Analytical problems can be solved on papers, and there is no need to type the answers. The only thing that matters is the quality of your pictures. Scanning your answer sheets is recommended. If you are using your smartphones, you may use apps such as CamScanner or Google Drive Application.

3. Simulation problems need report as well as source code and results. This report must be prepared as a standard scientific report.

4. Your report is particularly important in the correction process. Please mention all the notes and assumptions you made for solving problems in your report.

5. You have to prepare your final report, including the analytical problems answer sheets and your simulation report in a single pdf file.

6. Finalized report and your source codes must be uploaded to the course page as a ".zip" or ".rar" file with the file name format as:

Fullname_StudentNumber_HW#.rar

7. Plagiarisms will be strictly penalized.

8. You may ask your questions from the corresponding TA of each assignment.