INTRODUCTION TO DIGITAL IMAGE PROCESSING

ASSIGNMENT 3

<u>Due date</u>: **Wednesday, November 11, 2020 by 11:55 pm**
<u>Total marks</u>: **5**
<u>Late penalty</u>: **0.5 marks per day overdue. Late assignments will <u>not</u> be accepted after 11:55 pm on Friday, November 13, 2020, and a mark of zero will be given.**

All assignments will be done in **groups** of 3, and the same final mark for the assignment will be given to all group members. You should stick with the same group as for previous assignments.

Instructions for submitting answers are given with each question below. Note that I allow you to keep resubmitting until the deadline. Only the last submission is available to the TAs for marking. I recommend that all group members should agree to a submission before uploading it. Only one person in the group needs to submit on behalf of the entire group.

CONVENTIONS

Fixed-point font (`Courier`) is used to denote MATLAB commands, variables and filenames.

OBJECTIVES

To write your own function for histogram equalization.

PROBLEMS

Write a MATLAB function that implements the histogram equalization algorithm that was described in the lectures. The function header should have the form:

```
function im2 = myequalize_#(im)
```

where `im` is a `uint8` grayscale image (like `pout.tif` in MATLAB), `im2` is the `uint8` output image and # is your group number. For instance, if you are part of AssignmentGroup-1, your function name would be `myequalize_1`. If you are part of AssignmentGroup-17, your function name would be `myequalize_17`. You can use any built-in MATLAB functions in your code <u>except</u> for `histeq`. A mark of zero (0) will be given if you use `histeq`. Note that the output of `histeq` may be different than that of `myequalize_#` since they are using different approaches for histogram equalization, so you cannot use the output of `histeq` to verify if your function is working correctly.

All code and answers requested below must be submitted using OWL. To provide answers via OWL:

1. **One group member should log into OWL and access the course site.**
2. **Select the "Assignments" tool.**
3. **From the page that comes up, select "Assignment 3".**
4. **You will now reach the submission page for Assignment 3. Follow the instructions below for each part to submit answers.**

(a) **[4.5 marks]** Save the function in a file called `myequalize_#.m` where # is your group number. **NOTE: Use the exact filename and function name as specified in these instructions. All letters are in lowercase. Your function should be commented.**

When you are on the submission page in OWL for Assignment 3, scroll to the bottom and attach your M-file. <u>Also, cut and paste this code into the text box.</u>

(b) **[0.5 marks]** Equalize the `uint8` intensity image `pout.tif` using `myequalize_#`. This image is available as part of the MATLAB installation. Using the `subplot` command and the `imshow` command, display the original and equalized images side-by-side in <u>one</u> figure window with the original image on the left side of the equalized image. You will need to use the `help` command to get more information about `subplot`. Once you generate the display, you should save the display by selecting "File" in the figure window and then "Save As…". In the dialog box that comes up, select "TIFF image (*.tif)" as the output type and for "File name", enter "3b_#" without quotes where # is your group number. This will save the figure in the file called "3b_#.tif". **Attach it in OWL as you did the M-file.**

Again, each group should only make one submission. In the text box on the assignment submission page, enter the name and student number of <u>each</u> group member.

MATLAB RESOURCES

All MATLAB guides can be found at:

http://www.mathworks.com/access/helpdesk/help/helpdesk.shtml

which can also be accessed by typing `doc` at the MATLAB prompt. For information on the image processing toolbox, select the link labelled "Image Processing Toolbox".