

Assignment 1

October 18, 2016

INSTRUCTIONS

This is the first coursework for course GV12/3072 on Image Processing. The subject of the coursework is simple image segmentation. For a pass mark, you need to get 50 marks. If you only do the CORE section you will get a maximum **grade of 50%**. For full marks you will also need to complete the ADVANCED section.

You should use **Matlab** to complete this assignment.

You must submit two things:

1. A short pdf report on your work. The short report should start with a brief list of what you have attempted and to what extent you have achieved each item. Next, write a short description of the methods you used for each part together with any conclusions you have drawn from your experiments. Please include all the images that you use and also the results of the segmentation algorithm. In some cases you will have to show different results of the algorithm after running it with different parameters.
2. Your matlab code. Please note that we will be running your code to make sure that the results that you show in your report match the results that we get when we run your code. Therefore, please make sure that your code runs with a single click, i.e. we are not required to run many different scripts. Just one script that executes all the sub-parts of the coursework.

Please upload your coursework via Moodle by Friday 28 October 2016, 23:59.

LATE POLICY We will use the following late policy:

Submissions after the deadline but within 24 hours of it will be marked down to 90% of the number of points achieved.

Submissions later than 24 hours, but within 48 hours from the deadline will be marked down to 80% of the number of points achieved.

Submissions later than 48 hours will receive 0%.

1 CORE SECTION

Here is a classic image processing test-image called girlface:



Figure 1.1: Girl face

We would like to separate the skin region from the background of the image and surrounding parts of the head. This is a tough image, so don't expect the result to match what a human would accomplish.

1. Download the image above and plot a histogram of the grey levels it contains. (Try plotting a histogram of another grey scale image and comparing the difference) (5 points)
2. Write a short program to threshold the image and try to identify a good threshold by trial and error. Create a ground truth segmentation. You can do this using Matlab (look up the function *roipoly*), or using other painting tools. (15 points)
3. Use your ground truth segmentation to plot an ROC curve for your thresholding algorithm. What threshold does the ROC curve suggest? You may have to implement an

algorithm to find the point closest to a desired Operating Point. How does it compare to your trial and error estimate? (30 points)

2 ADVANCED SECTION

You should answer both questions.

1. Implement a region growing algorithm and compare its performance at segmenting the face in the image above with the performance of the thresholding algorithm. Show the seeds you chose. (25 points)
2. Implement the mean-shift algorithm and show the results that you achieve for different values of the “radius” parameter. (25 points)