

ECE 457/557 Digital Image Processing
Fall 2018
Project #2
Due Tuesday 25 September 2018
(Literature due 18 Sept)

Histogram Explorations

Take the Lena and Crowd images from Homework 1. Make a histogram of the gray levels in the original image and each of the subsampled and intensity quantized images. Compare the histograms.

Point Operation Explorations

For this part of the project you will work with the image called `pout.png` to explore how point operations affect an image. This image is available in Matlab through

```
>> load imdemos pout
```

If you are not using Matlab, a copy is available in Blackboard.

Part 1.

Get a histogram of the gray levels in `pout`

Part 2.

Do point operations on the image to

- a) shift the colors so the image is brighter (linear op)
- b) shift the colors so the image is darker (linear op)
- c) stretch the colors linearly so there is more contrast (linear op)
- d) equalize the colors (histogram equalization)

Histogram equalization should be done with code written by you, not by built-in code. You may use built-in code only to verify your results, although slight differences are possible.

For each of these you should show (1) a plot of the transformation function, $s=T(r)$, relating the input gray levels to the output gray, (2) the resulting image (3) the corresponding histogram and levels. Comment on what each transformation does mathematically and visually.

While only 4 transformations are explicitly specified, full credit is also based on the depth of your exploration beyond the 4 specified and the insight in your comments. Histograms and transformation plots should be included for all reported images. Pay attention to your writing style and formatting. Submit your code electronically with your report.

ECE 557: Find and read an article on an application that uses contrast enhancement. Prepare a 3 paragraph written summary and prepare to discuss this in class to introduce the undergraduates and other grad students to the article if they didn't read it. PPT slides are not needed. Submit the citation for the article and either a link to the article or a PDF copy of the article. This is due Sept 18th.

Image subtraction

Five frames from a video sequence are included in this assignment link. (a) Calculate the difference between the first image and each subsequent image. (b) Calculate the difference between each adjacent pair of images. Note that the gray level ranges could now extend from -255 to +255 (notation: $[-255, 255]$). Do a transformation to move them into $[0, 255]$ range by (c) a linear transformation and (d) the absolute value of the intensities. Plot the $s=T(r)$ curves you use. Discuss what the information the image subtraction highlights. How does the alternate display modes affect what your interpret?

Helpful commands: `cumsum()`, `axis`, `axis equal`, `img2 = T(img1+1)`, `hist`, `imhist`;

Student Name: _____

**ECE 457/557 Digital Image Processing
Fall 2013
Project #2
Due Friday 4 October 2013
Grading Rubric**

Point Operations

_____	Discussion of point operations
_____	Histograms shown for all images
_____	Transformation plots shown for all transformations
_____	Investigation of brightening transformation
_____	Investigation of darkening transformation
_____	Investigation of contrast stretching transformation
_____	Investigation of histogram equalization transformation
_____	Well formatted report (intro/body/conclusion, use of sections, figures w/ labels)
_____	Good presentation (sentence structure, flow of thoughts, referencing of figures and equations).
_____	Good grammar,
_____	Suitable depth of investigation
_____	Suitable insight exhibited in comments.
_____	Literature reviewed and properly cited. (ECE 557 only)
_____	Grade