Homework #2 – Intensity Transformations

Assigned: 15.03.2017 Due: 31.03.2017

1. Objective

This homework is mainly about intensity transformations in spatial domain and histogram processing. You will gain experience with Image Processing Toolbox and learn how to implement histogram processing methods.

2. Specification

Task 1 – Bit plane slicing

In this part, you will implement bit plane slicing (See Lecture4 slides) in Matlab. Your code should generate 2 figures.

- The first figure will display the bit planes of an 8-bit grayscale image as in Figure 1.
- Then you will perform several reconstructions from different combinations of bit planes (Figure 2).

Task 2 – Histogram Processing with Image Processing Toolbox

Using Image Processing Toolbox functions (*imhist* and *histeq*) apply histogram equalization method and generate the images in Figure 3. Generate these figures for each sample image in the provided dataset. Then write a short report including these outputs and discussions about the results.

Task 3 – Implementing Histogram Equalization

In this part, you will implement histogram equalization method **without using Image Processing Toolbox** functions. Use the same layout in Figure 3 as the output of your code.

- Write a Matlab function for computing the histogram of an image.
- Implement the histogram equalization technique discussed in Section 3.3.1 and Lecture5 slides.
- Check your results against Image Processing Toolbox results. (Note that equalized histograms and transformation functions may not be exactly same. But they should look very similar.)

Notes:

- **DO NOT** use *imhist* and *histeq* functions in Task 3. All must be your own implementations.
- Use subplot function to generate a similar layout to the figures in this document. Include the titles clearly.
- Use the sample images provided with this assignment for Task 2.
- For both tasks, you can assume that the images are 8-bit grayscale images.

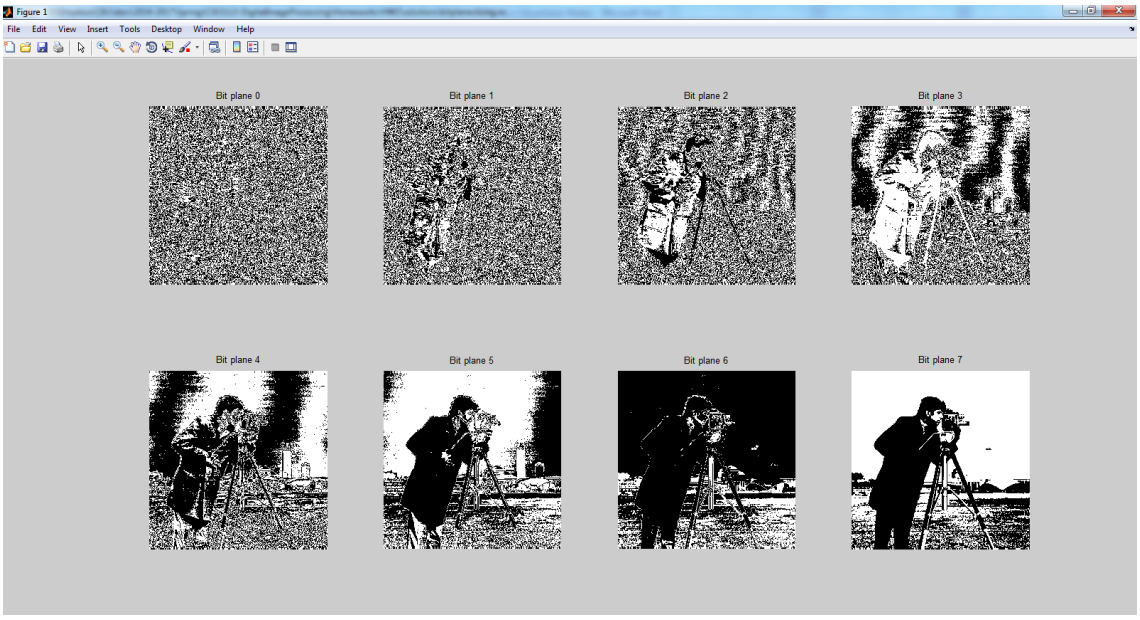

Figure 1: Bit plane slicing.

Figure 2: Reconstructions from bit planes. (Left to right: Reconstructed using bit planes 6 and 7. Reconstructed using bit planes 5, 6, and 7. Reconstructed using bit planes 4, 5, 6, and 7. Reconstructed using all bit planes. Original image.)

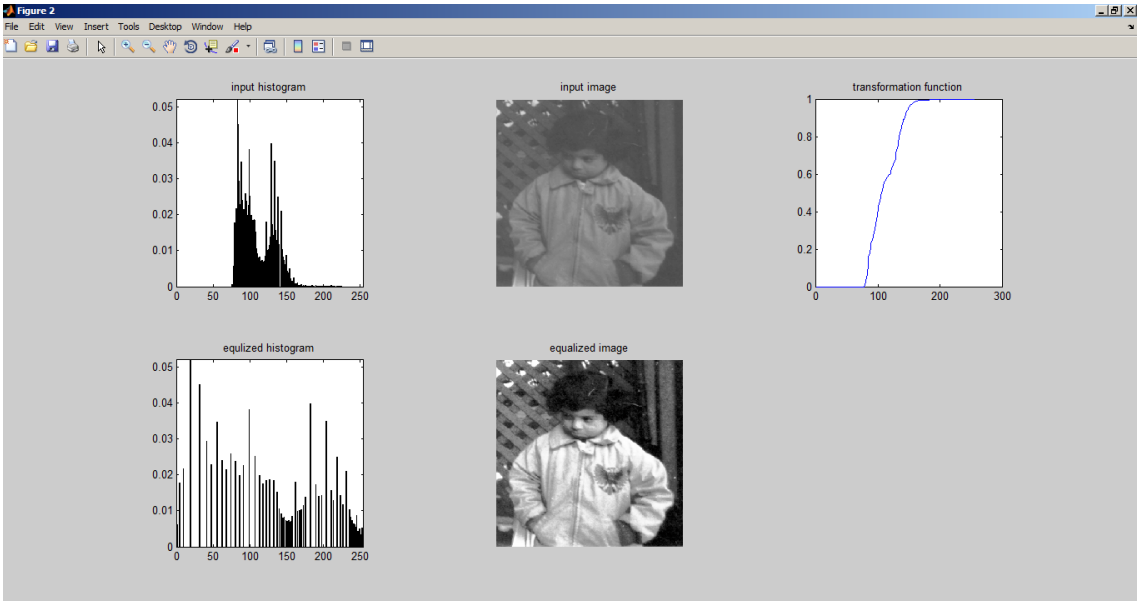

Figure 3: Histogram Equalization results using Image Processing Toolbox.

3. Submission

- This homework can be done individually or in pairs.
- You should submit your Matlab source codes in different files called **HW2_Task1.m, HW2_Task2.m,** and **HW2_Task3.m** respectively. If you defined any additional functions, also include those files. At the beginning of your .m files, write your name, surname, and student ID as a comment.
- For Task 2, you should also submit a report in pdf format, including resulting figures and discussions about the results.
- Place all your files in a zip archive with name **HW1_Surname1_Name1.zip** and submit through the Moodle submission module.
- If you have further questions, you can send me an e-mail or come to my office.

4. Late Submission Policy

Deadline for homework submissions is **23:59 pm** at the specified date. For each additional day, **25% cut-off** will be applied.

Assist. Prof. Dr.
Zeynep ÇİPİLOĞLU YILDIZ