Report Template for EN2401 Image and Video

Processing

EN2401 Image and Video Processing, Project X

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Summary

Write a short summary of your report. Write approximately 150 words about

the problem that you are considering, your solution, obtained results and the

the conclusion. For example, this template provides instructions for writing the

project reports for the EN2400 Image Processing course. Read it thoroughly as

it is expected that the instructions are followed.

1 Introduction

Give an introduction to the problem considered. The introduction should be

written such that it can be understood by an engineer whose area of expertise

is not image processing. Motivate the problem by using references to work by

other authors [1], as well as interesting applications.

Deﬁne the mathematical notation used in the report and state the problem

using this notation. Make sure that any assumptions you are using are explicit.

It is often convenient to be able to refer to equations by numbers. An example

equation is the additive noise degradation model for images

g(x, y) = f (x, y) + η(x, y). (1)

2 System Description

Give a description of the system that is implemented for ﬁnding a solution to the

problem stated in Section 1. Any derivations that are useful for understanding

the solution are presented here. Describe and motivate implemented algorithms.

We will be presenting examples on image typically used by Image processing community – Lena. The original picture can be seen on Figure 1.

Figure 1 – Lena

Goal of the first task was to plot histogram of the original image with 8-bit resolution (Figure 1.1), then simulate low contrast image by reducing dynamic range of the image to only a part of the spectrum. The simulated image, along with its histogram can be seen on Figure 1.2.

Implementation of histogram equalization algorithm is presented in appendix A. (I think we are supposed to include some code)

* Why is hitogram not flat after the equilization?

Altoughy the perfect histogram equalization should theoretically be a flat response over all intensities – this is not case in practice. Doing so in practice would mean losing information (maybe you can explain this better?) – hence what is typically done is that hisogram values are not changed, but rather they are streched to cover the whole range of colors. In grayscale case, this would mean stretching histogram to fill range of [0, 255]. A seen on figure 1.X.

The second task was to investigate, and implement and compare image-denoising filters for different kinds of noise in the images. We used Low Pass Filter (LPF) as a spatial smoothing filter, and median filter as an order-statistics filter.

TODO Show examples and expain them. (Figure 1.3, Figure 1.4)

* Explain the difference between the mean filter and the median filter and their denoising effects on different noise types.

With salt & pepper noise in the image - denosing by applying mean filter does not help much, the median filter is much better option since it will discriminate extreme values, hence black/white pixels (noise pixels) are more likely to replaced. Downside of this is that if most of the pixels where filter is ran are black/white, it will introduce image artifacts.

Blur however cannot be compensated by applying order-statistics filter, but rather by applying low-pass filter such as simple averaging filter. Hence we can use the low-pass filter for debluring images.

Third task was an introduction to frequency domain filtering, we were given a blurred image, generated using following degradation model:

g(x, y) = h(x, y) ∗ f (x, y) + η(x, y)

explain stuff

In Appendix A, we attached our implementation of Weiner filter.

3 Results

To conﬁrm your ﬁndings and the performance of your algorithms, present sim-

ulation results in this section. All results should be explained in the text. Plot

your results in ﬁgures such as Figure 1, which shows the histogram of (1) for a

given image f (x, y) and η(x, y) = 0.

Sometimes images give a better understanding of the obtained results. Fig-

ure 2 gives a better description of f (x, y) than Figure 1 for certain purposes.

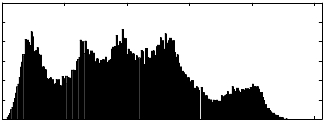
However, make sure that you have a good motivation for the inclusion of any

graphics. They should all aid the reader in understanding your report.

1

3000

h(r)



2500

2000

1500

1000

500

0

Histogram

0             50           100           150           200           250

r

Figure 1: Make sure to name the axis. In this ﬁgure the gray level is denoted r

and h(r) is the number of pixels with gray level r.

Lena

Figure 2: Each ﬁgure should be well explained in the caption, as well as in the

text.

4 Conclusions

Present your conclusions in this section. Remember that conclusions are not

just another summary. Your report, excluding references and appendix, should

ﬁt in 4-5 A4-pages. Therefore, make sure to write concisely and to the point,

describing everything of importance. Writing a report takes time, which is

why you should start early. If you have any questions about the assignment

ask the teaching assistants in time. Name your report pdf-ﬁle in the format

20YYpX\_author1\_author2.pdf, where author1 and author2 are surnames of

the authors.

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Appendix

Who Did What

Describe in detail how the project work was divided between the authors. This

template was written by Ermin Kozica in LTEX 2ε. A good introduction to

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LTEX 2εis available at [2]. You can write your report in other programs as well.

MatLab code

Include the well documented MatLab code that you have used.

function h = histogram(f)

% A function that calculates the histogram of matrix f.

N = numel(f); % The number of elements in f

h = ...

References

[1] Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, Pren-

tice Hall, 2nd ed., 2002

[2] Tobias Oetiker et al., The Not So Short Introduction to LTEX 2ε, Available:

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http://tobi.oetiker.ch/lshort/lshort.pdf, Last accessed: March 17, 2009

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