

HOMWORK #2

One dimensional Gaussian is defined as

$$[1] \quad p(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp \left[-\frac{(x - \mu)^2}{2\sigma^2} \right]$$

x is input, mean is μ and variance is σ^2

1) You will implement 1D - Gaussian function.

X values are range of [-100,100] and step size is 1,
Variance σ^2 is in different values which are 0.2, 1.0 and 5.0,
and mean will be 0.

You can use exp function of Matlab for exponential (exp).

Use plot function of Matlab to see the results. Put them into report.

2) Use 3x3, 5x5, 7x7 Gaussian kernel functions given below. You will do normalization on filters dividing by the sum of coefficient. [2] Implement each kernel to the each given image in the zip file. Put the results into report.

$$[2] \quad \begin{array}{ll} \bullet \text{ 3x3} & \bullet \text{ 7x7} \\ \begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix} & \begin{bmatrix} 1 & 1 & 2 & 2 & 2 & 1 & 1 \\ 1 & 2 & 2 & 4 & 2 & 2 & 1 \\ 2 & 2 & 4 & 8 & 4 & 2 & 2 \\ 2 & 4 & 8 & 16 & 8 & 4 & 2 \\ 2 & 2 & 4 & 8 & 4 & 2 & 2 \\ 1 & 2 & 2 & 4 & 2 & 2 & 1 \\ 1 & 1 & 2 & 2 & 2 & 1 & 1 \end{bmatrix} \\ \bullet \text{ 5x5} & \\ \begin{bmatrix} 1 & 1 & 2 & 1 & 1 \\ 1 & 2 & 4 & 2 & 1 \\ 2 & 4 & 8 & 4 & 2 \\ 1 & 2 & 4 & 2 & 1 \\ 1 & 1 & 2 & 1 & 1 \end{bmatrix} & \end{array}$$

3) Use Gaussian kernels given in question#2 as sharpening filter. According to lecture slides,

$$\begin{array}{c} F + \alpha (F - \underbrace{F * H}_{\text{blurred image}}) \\ \uparrow \\ \text{image} \end{array}$$

H will be Gaussian Kernel. Use different α values. Implement each filter to your own face image. Put the results into report.

Besides image reading and writing, do not use any image processing function from MATLAB.

You should comment your code, so that it can be easily understood. Use Matlab. Your code has to be in script file with m extension.

You must explain what you implement in the report. You must show your output images in the related parts of the report.

Cheating and plagiarism on assignments will be punished according to ITU regulation.

[1]Alpaydin, Ethem. Introduction to machine learning. MIT press, 2010.

[2]<http://users.polytech.unice.fr/~lingrand/Ens/up/Lesson6-noise.pdf>