

DMET 901 – Computer Vision

Assignment #2

(Due on Saturday, November 30 at mid-night)

(This assignment can be done in teams of maximum 2 students – Please include a text files with your names and IDs in the submission)

Problem 1

Implement a function to compute the Laplacian of Gaussian (LoG) kernel given the value of sigma (σ). First, you are asked to compute the size of the kernel as per the following equation:

$$s = 2 \times [3 \times \sigma] + 1$$

Given the size of the kernel ($s \times s$), implement a function to compute the values inside as per the following function ([0,0] is the middle cell):

$$LoG(x, y) = \frac{-1}{\pi\sigma^4} \left(1 - \frac{x^2 + y^2}{2\sigma^2} \right) e^{-\frac{x^2 + y^2}{2\sigma^2}}$$

Finally, implement a function, given an image, a value for sigma and the threshold for the Prewitt edge magnitude comparison; apply the LoG edge detection on that image according to the steps given in Lecture 5.pdf Slide 17. Apply your function to the image “cameraman.tif”.

Deliverables:

- Your code.
- The output edge image for $\sigma = 2$, $\sigma = 3$ and $\sigma = 4$. Name the edge images “LoG_2.jpg”, “Log_3.jpg” and “Log_4.jpg”. The threshold for all cases should be set to 0.1.

Problem 2

Implement a function to sharpen a gray-scale image as per the discussion provided in the tutorial. As a possible kernel for edge detection, consider the kernel provided below. Apply your function to the image “cameraman.tif”.

$$M = \begin{bmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{bmatrix}$$

Deliverables:

- Your code.
- The sharpened output image. Name the image “Sharpened.jpg”