CAP5415 Computer Vision

Programming Assignment # 1

1. Write a function Convolution(Image I, Kernel H) that has arguments
    a. Image I (Images may be of varying sizes and you may want to give the size as arguments. If you are using MATLAB, you can compute size within the function)
    b. Kernel H (Again, you should allow varying size Kernels)

    The output of function should be the convolution of I with H. Test your function and show results on the following Kernels.

    i. Averaging Kernel (3×3 and 5×5)

    ii. Gaussian Kernel ($\sigma=1,2,3$) Use $(3\sigma+1)\times(3\sigma+1)$ as size of Kernel (You may want to write a separate function to generate Gaussian Kernels for different values of σ)

    iii. Roberts Edge Operators: $\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $\begin{bmatrix} -1 & 1 \\ 1 & -1 \end{bmatrix}$

    iv. Sobel Edge Operators $\begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}$ and $\begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$

    v. Prewitt Edge Operators $\begin{bmatrix} -1 & 1 & 1 \\ -1 & -2 & 1 \\ -1 & 1 & 1 \end{bmatrix}$ and $\begin{bmatrix} 1 & 1 & 1 \\ -1 & -2 & 1 \\ -1 & -1 & 1 \end{bmatrix}$

2. Write a function Reduce(Image I) that has an image as an input and the output should be re-sampled copy of half the width and height of the input image. Use the two 1D gaussian kernels as discussed in class.
3. Write a function Expand(Image I) that has an image as an input and the output is the expanded copy of input image, twice the width and height of original image.
4. Use the Reduce function in (2) to write a function GaussianPyramids(Image I, Levels *n*) that produces *n* levels of gaussian pyramid for image I.
5. Use the above functions to write a function LaplacianPyramids(Image I, Levels *n*) that produces *n* levels of Laplacian pyramid of image I.

Deliverables:

1. Report including Input and Output images (Soft Copy)
2. Code (Soft copy)

Send your assignments by email to rcen@cs.ucf.edu.

Submission Deadline: February 11, 2003 (23:59)