Homework #2

(Deadline: 11:59 pm on 5/13)

Submit a zip file that contains a report, all the codes, and all the image files.
Attach all the results and codes to your report.
Do NOT use MATLAB functions except basic operators such as "for", "while", "size", "zeros", "median", "round", "floor", "ceil", "+", "-", "/", and "*".
Implement element-wise operations using for-loop.

1. Gaussian Filtering (Ch. 2.4.2: 영역 연산)
   - Implement a function that processes Gaussian filtering on an image using a Gaussian filter.
   - The function has two inputs (im, σ) and one output (result).
   - σ: standard deviation of Gaussian filter
   - The size of filter: $(2 \times \lceil 2\sigma \rceil + 1$ by $2 \times \lceil 2\sigma \rceil + 1)$
   - $G(y,x) = \frac{1}{2\pi\sigma^2} e^{-\frac{y^2+x^2}{2\sigma^2}}$, then normalize it.
   - e.g.) 5x5 size & σ=1

0.003	0.013	0.022	0.013	0.003
0.013	0.059	0.097	0.059	0.013
0.022	0.097	0.159	0.097	0.022
0.013	0.059	0.097	0.059	0.013
0.003	0.013	0.022	0.013	0.003

   - For boundary region, if a pixel is out of image, assume the pixel has the same intensity with the closest pixel.
   - Below is the main function, and you need to implement the function "gaussianFiltering".
   - Explain Gaussian filtering, your code, and your result.
   - Show results when $\sigma = 1$, $\sigma = 2$, and $\sigma = 3$.
   - Discuss the effects of varying "σ" on your report.

```
im = imread('Lenna_salt_pepper.png');
im = im2double(im);
sigma = 1;

result = gaussianFiltering(im, sigma);

imwrite(result, 'result_GaussianFilter.png');
```

2. Median Filtering (Ch. 2.4.2: 영역 연산)
   - Implement a function that processes median filtering on an image.
   - The function has two inputs (im, filterSize) and one output (result).
   - For boundary region, if a pixel is out of image, assume the pixel has the same intensity with the closest pixel.
   - Below is the main function, and you need to implement the function "medianFiltering".
   - Explain salt-and-pepper noise, median filtering, your code, and your result.
   - Show results when filterSize = [3,3], filterSize = [5,5], and filterSize = [7,7];

- Discuss the effects of varying “filterSize” on your report.

```
im = imread('Lenna_salt_pepper.png');
filterSize = [3,3];

result = medianFiltering(im, filterSize);

imwrite(result, 'result_medianFilter.png');
```