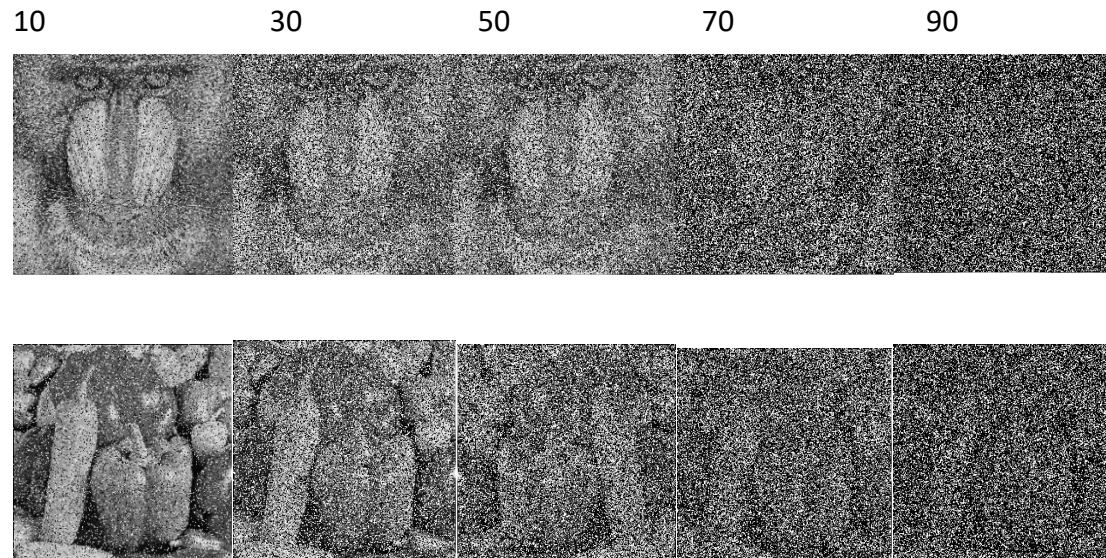1.

a) Please write a program to add 10%, 30%, 50%, 70%, and 90% salt-and-pepper noise to 'baboon.bmp' and 'peppers.bmp.'

b) Please Write a program that performs two-dimensional 5x5 mean filtering to clean up the 10%~90% noisy images you generated. As the table below shows, you need to exclude the noise pixels before applying mean filtering and report PSNR before and after denoising.

PSNR	Before Denoising					After Denoising				
	10	30	50	70	90	10	30	50	70	90
Baboon	15.7	10.8	8.6	7.1	6.1	14.3	10.4	8.3	7.0	6.9
Peppers	15.4	10.6	8.3	6.9	5.8	14.7	10.3	8.1	6.7	5.8

c) Following the previous question, please use two-dimensional 5x5 Gaussian filtering (zero-mean Gaussian distribution with a standard deviation of 2) and report the PSNR results.

PSNR	Before Denoising					After Denoising				
	10	30	50	70	90	10	30	50	70	90
Baboon	15.7	10.8	8.6	7.1	6.1	19.9	18.9	17.6	16.5	15.5
Peppers	15.4	10.6	8.3	6.9	5.8	22.6	20.0	17.7	15.7	14.2

d) Following the previous questions, please implement the "Modified Decision-based Unsymmetrical Trimmed Median Filter" with an adaptive kernel size.

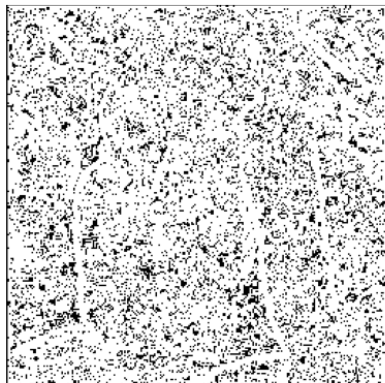| PSNR	Before Denoising					After Denoising				
	10	30	50	70	90	10	30	50	70	90
Baboon	15.7	10.8	8.6	7.1	6.1	20.7	19.6	18.4	17.2	13.0
Peppers	15.4	10.6	8.3	6.9	5.8	28.5	25.2	22.1	19.9	13.1

2.

a) Please implement Sobel filtering to find the edge map for **'pepper.bmp'** and **'pepper_0.04.bmp'**,
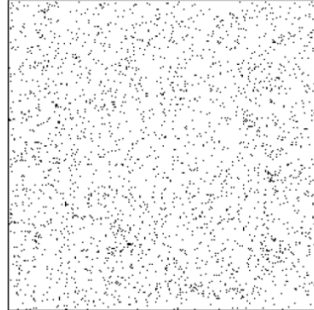
(15%) Following the previous question, please apply Gaussian filtering (zero-mean and standard deviation of 1) to smooth the images ('pepper.bmp' and 'pepper_0.04.bmp') first, apply the Lapcian operator to the images, and report the results.

Sober:

Lapcian