COMPUTER VISION ENCS5343.

ASSIGNMENT#1.

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SECTION 2.

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Quetsion#1

1-)

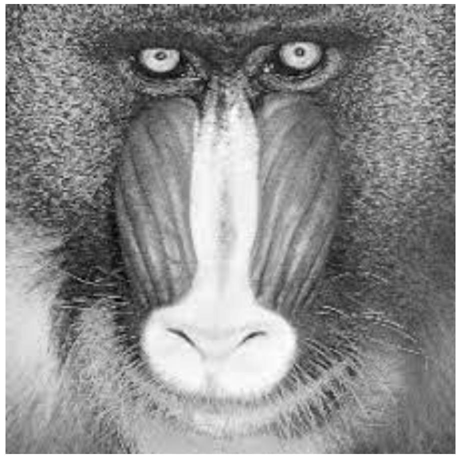

Fig 1: Q1 image.

2-)

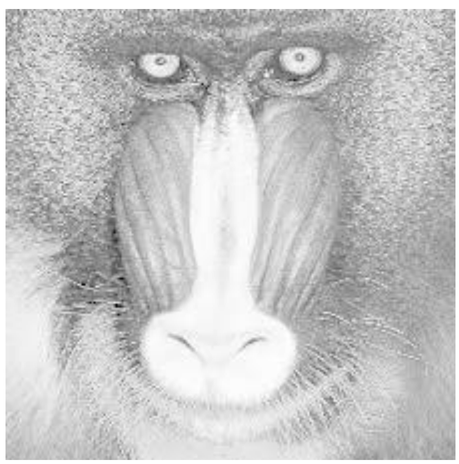

Fig 2: Q1 power law transformation with gamma=0.4.

3-)

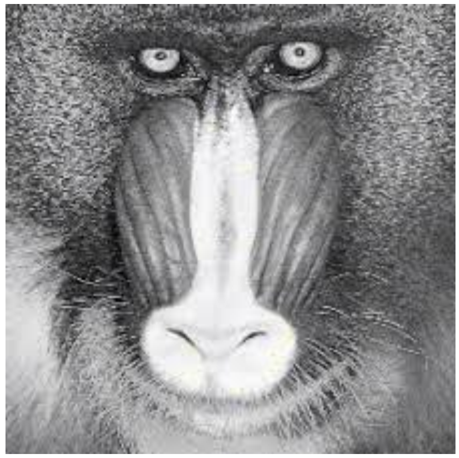

Fig 3: Q1 zero-mean Gaussian noise (with variance =40 gray-levels).

4-)

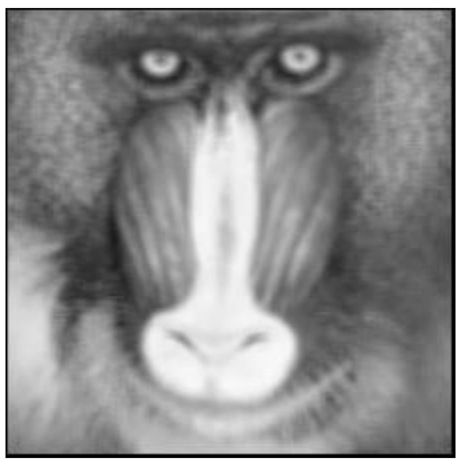

Fig 4: Q1 zero-mean Gaussian noise mean filter (5x5).

As we see when applying the mean filter, it smooths the image to get rid of noise, but it blurs the edges.

5-)

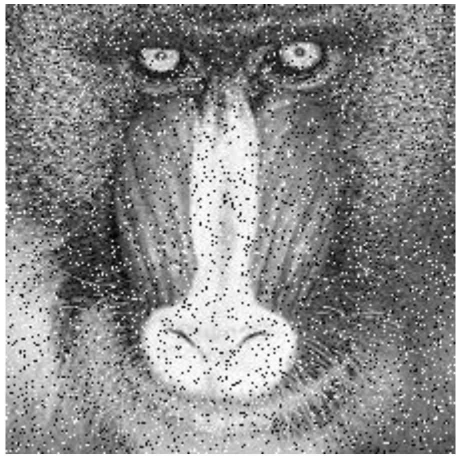

Fig 5: Q1 salt and pepper noise (noise-density=0.1).

Now we will apply median filter 7x7.

Fig 6: Q1 salt and pepper noise median filter.

6-)

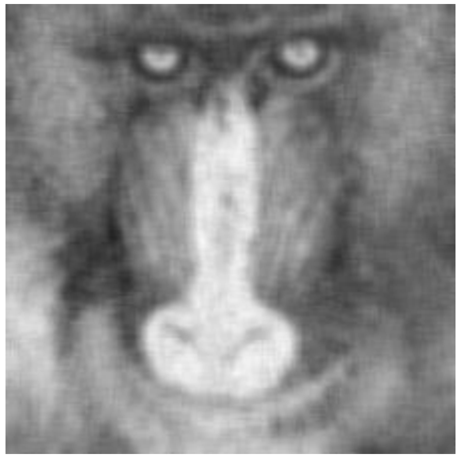

Fig 7: Q1 salt and pepper noise mean filter 7x7.

As we see, when applying the two filter on the noisy image, the two get rid of the noise, but the median was better, because the gray level color in median image is better than mean, and mor accurate.

7-)

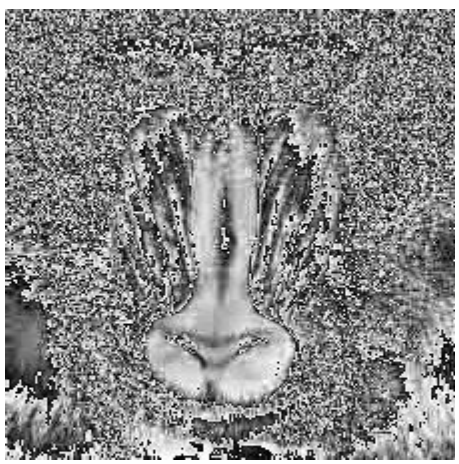

Fig 8: Q1 Sobel filter.

Quetsion#2

1-)

Fig 9: Q2 house1.

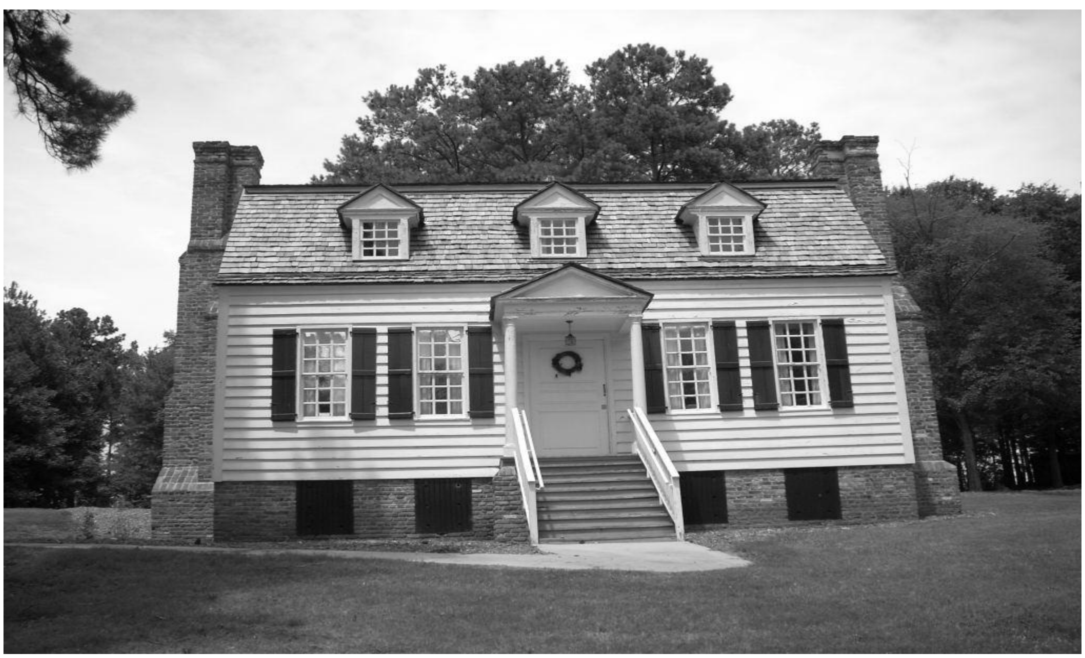

Fig 10: Q2 house2.

Fig 11: Q2 house1 Averaging Kernel (3×3).

Fig 12: Q2 house1 Averaging Kernel (5×5).

Fig 13: Q2 house2 Averaging Kernel (3×3).

Fig 14: Q2 house2 Averaging Kernel (5×5).

As we see the more the filter size increase, the more the image get blur.

2-)

Fig 15: Q2 house1 Gaussian Kernel (σ = 1).

Fig 16: Q2 house1 Gaussian Kernel (σ = 2).

Fig 17: Q2 house1 Gaussian Kernel (σ = 3).

Fig 18: Q2 house2 Gaussian Kernel (σ = 1).

Fig 19: Q2 house2 Gaussian Kernel (σ = 2).

Fig 20: Q2 house2 Gaussian Kernel (σ = 3).

As we see: the effect of σ on Gaussian kernel size the Gaussian kernel grows in size as σ increases. More neighboring pixels are taken into account when applying the filter when σ is larger because this widens the distribution. This may cause the final image to have more blur.

Effect on blurring: A blur that is more intense is produced by a higher σ value. This is because pixels that are farther from the center are given more weight in the Gaussian kernel due to its wider weight distribution. As a result, photos filtered using larger σ values will look hazier.

3-)

Fig 21: Q2 house1 Sobel Edge Operator.

Fig 22: Q2 house2 Sobel Edge Operator.

4-)

Fig 23: Q2 house1 Prewitt Edge Operator.

Fig 24: Q2 house2 Prewitt Edge Operator.

As we see, the results from Sobel is different from Prewitt.

Quetsion#3

Fig 25: Q3 Noisy image 1.

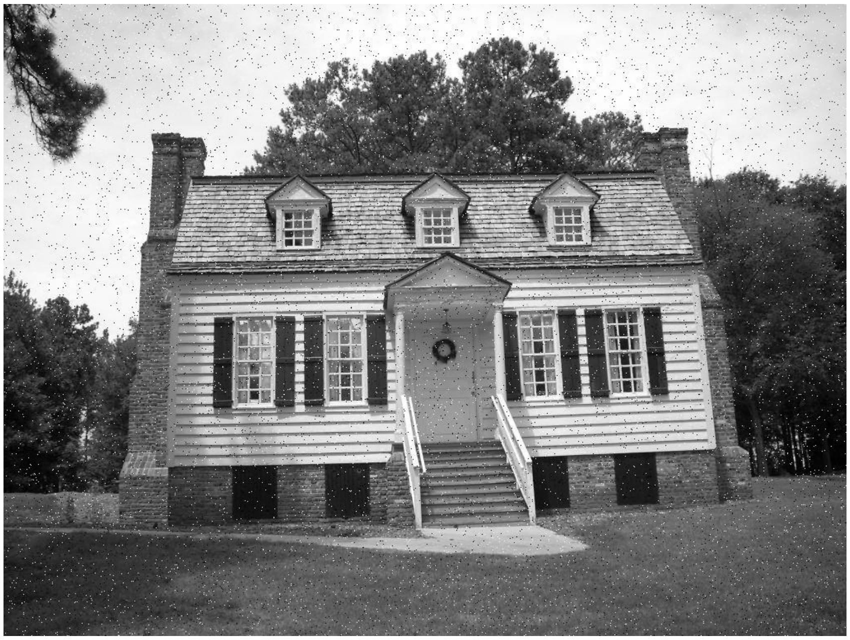

Fig 26: Q3 Noisy image 2.

Fig 27: Q3 Noisy image 1 with mean filter(5x5).

Fig 28: Q3 Noisy image 2 with mean filter(5x5).

Fig 29: Q3 Noisy image 1 with median filter(5x5).

Fig 30: Q3 Noisy image 2 with median filter(5x5).

As we see, the median filter is superior to the averaging filter as it better handles outliers, preserving image details and edges effectively. By using the median value from neighboring pixels, it's less affected by extreme values, making it great for reducing impulse noise without distorting the image. Unlike averaging filters that compute means and are sensitive to outliers, leading to potential blurring and loss of detail, the median filter's nonlinear approach maintains image integrity by preserving critical features while effectively reducing noise. This quality makes it a preferred choice when noise reduction is essential without sacrificing image clarity.

Quetsion#4

1-)

Fig 31: Q4 image.

Fig 32: Q4 image gradient magnitude with Stretch (between 0 to 255).

2-)

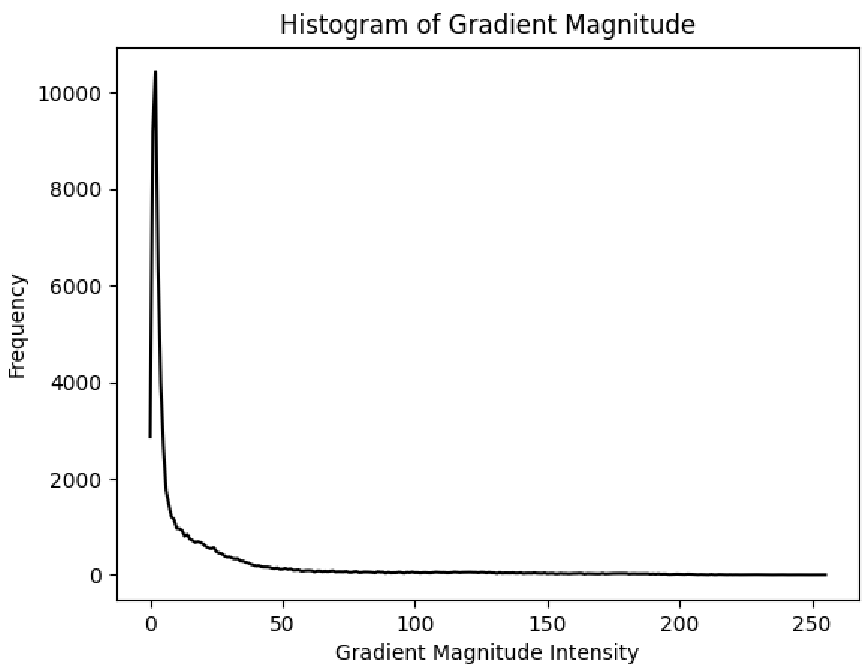

Fig 33: Q4 image gradient magnitude histogram.

3-)

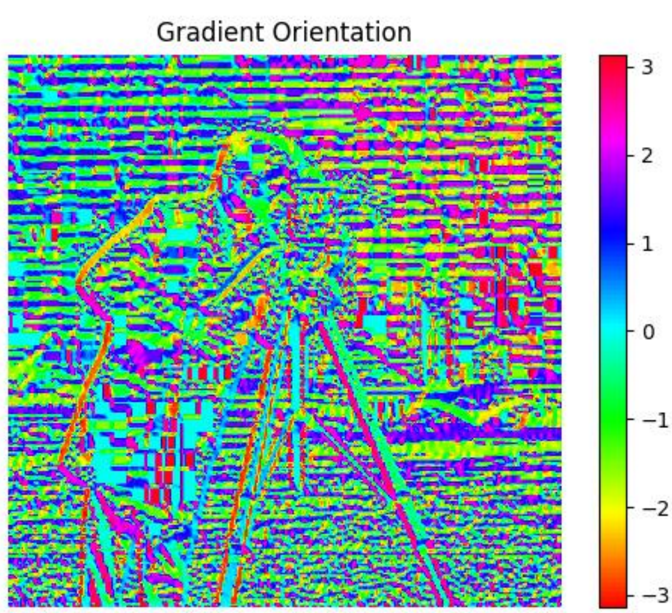

Fig 34: Q4 image gradient orientation.

4-)

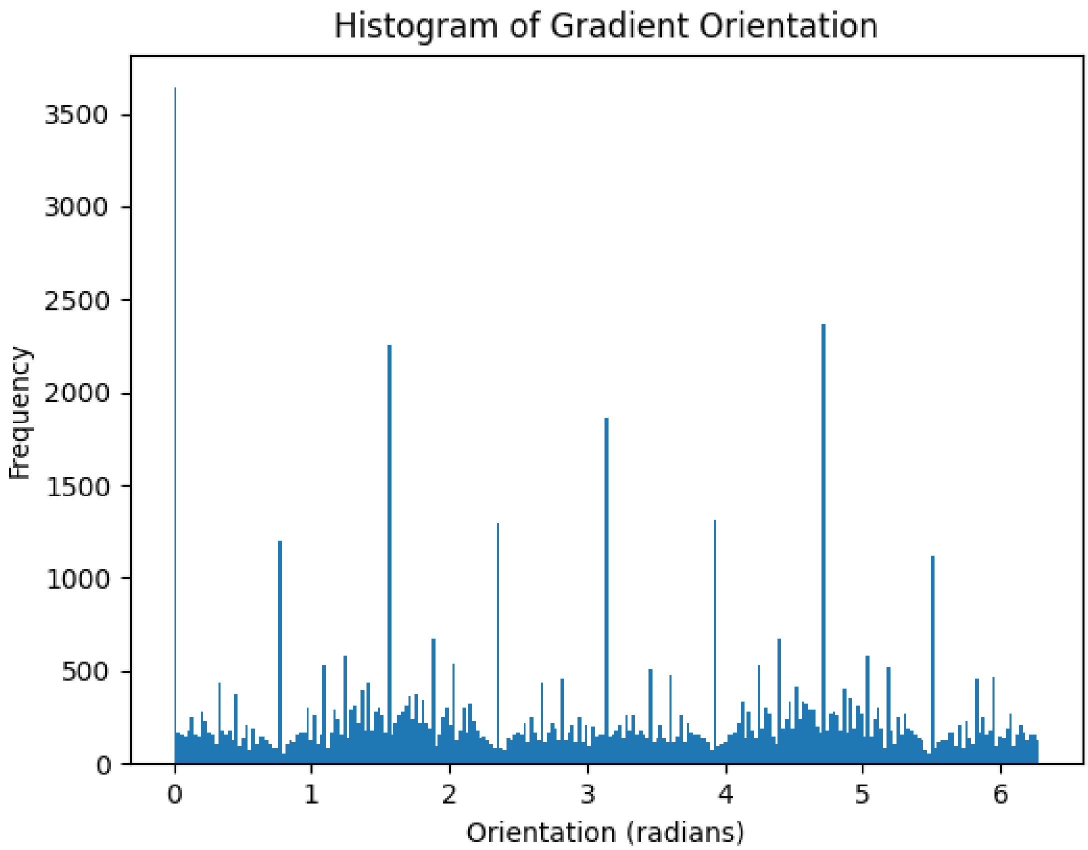

Fig 35: Q4 image gradient orientation histogram (angle between 0 and 2*pi).

Quetsion#5

Fig 36: Q5 walk 1 image.

Fig 37: Q5 walk 2 image.

Fig 38: Q5 walk 1 image gray scale.

Fig 39: Q5 walk 2 image gray scale.

Fig 40: Q5 walk 1 – walk 2 image gray scale.

As we see, the resulting image show the differences in intensity between the two grayscale images. Darker regions represent areas where walk_2.jpg had higher intensity values than walk_1.jpg, and lighter regions represent areas where walk_1.jpg had higher intensity values than walk_2.jpg.

Quetsion#6

Fig 41: Q6 image.

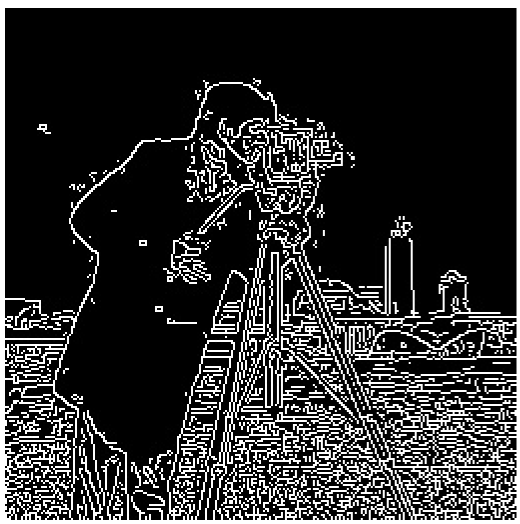

Fig 42: Q6 image Canny edge detector (Threshold: (L=25, H=50) size=3).

Fig 43: Q6 image Canny edge detector (Threshold: (L=50, H=100) size=3).

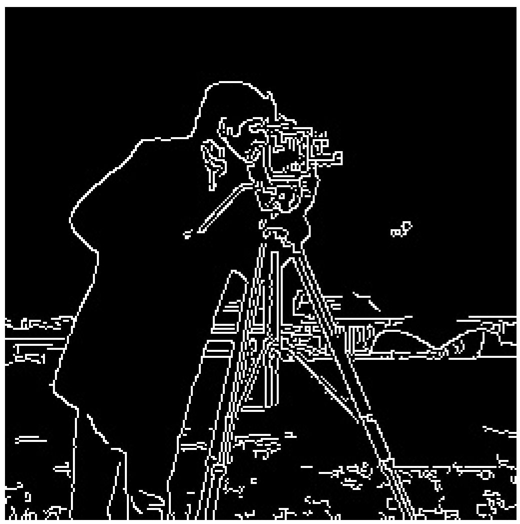

Fig 44: Q6 image Canny edge detector (Threshold: (L=100, H=200) size=3).

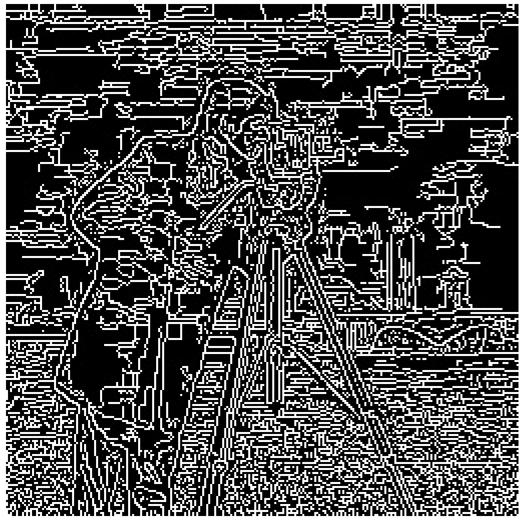

Fig 45: Q6 image Canny edge detector (Threshold: (L=1, H=25) size=3).

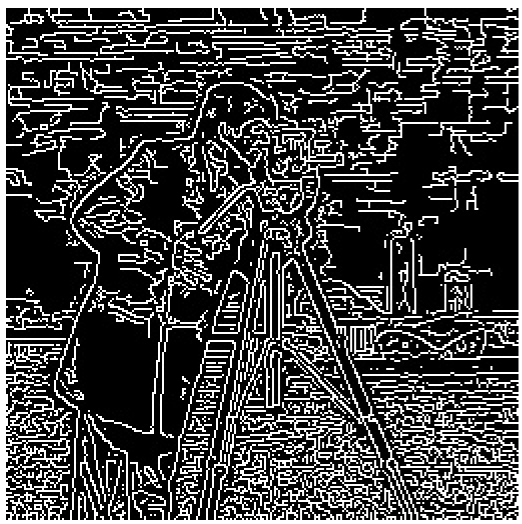

Fig 46: Q6 image Canny edge detector (Threshold: (L=100, H=200) size=5).

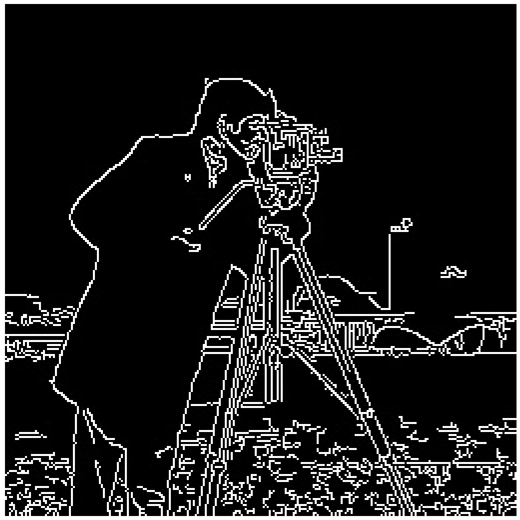

Fig 47: Q6 image Canny edge detector (Threshold: (L=100, H=200) size=3) L2gradient=False.

As we see, the best one was fig44, which mean a bigger threshold and little kernel size with L2gradient=True is better for this situation.