Principle of Biological Vision

Programming Assignment 1

Modeling Early Vision

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a. Code Link

https://colab.research.google.com/drive/1THupwrcce8zOCjhCiqOSXR8oUHObsU2L?usp=sharing

b. Results and my findings

i. Result for step 1

Original Grayscale Kitchen image

Original Grayscale Ruin image

DOG (1,3) Kitchen Grayscale image

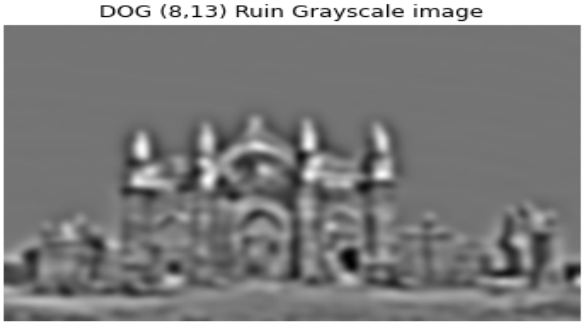
DOG (1,3) Ruin Grayscale image

DOG (3,8) Kitchen Grayscale image

DOG (3,8) Ruin Grayscale image

DOG (8,13) Kitchen Grayscale image

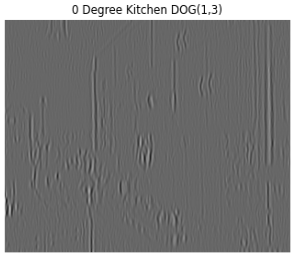
DOG (8,13) Ruin Grayscale image

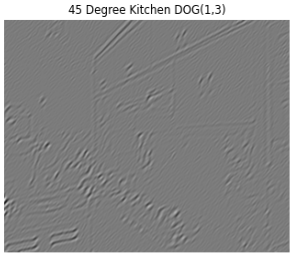


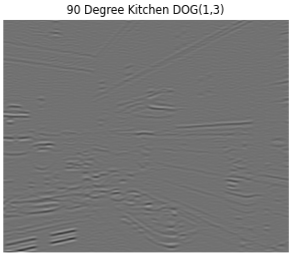
ii. Findings for step 1

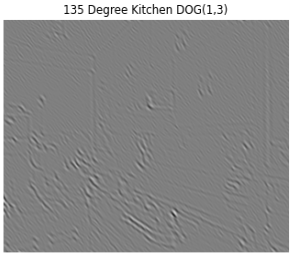
1. As the difference between the standard deviation increases more then the edges become more blur.
2. Further, the value of standard deviation goes higher beyond 10 for both low and high values again the edges become more blur.
3. If low sigma and high sigma value is kept between 1 and 10 then we can see the edges image properly and also the difference between the high sigma and low sigma improve the clarity of the edges.

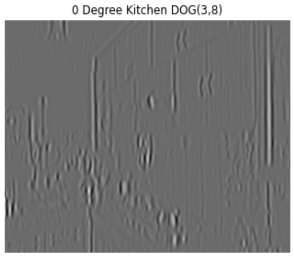
iii. Result for step 2

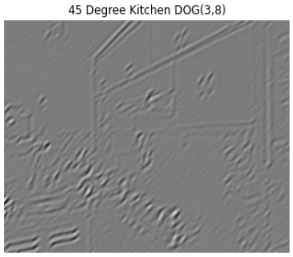


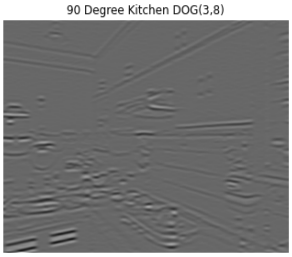


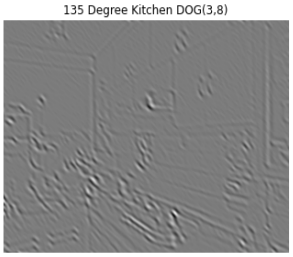


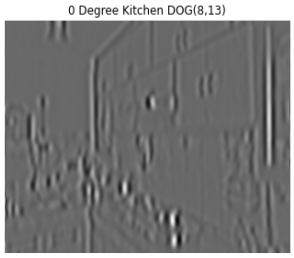


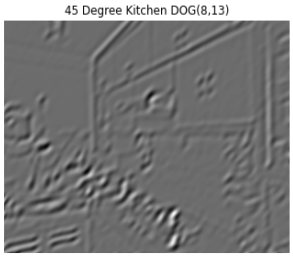


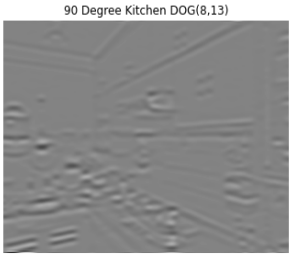


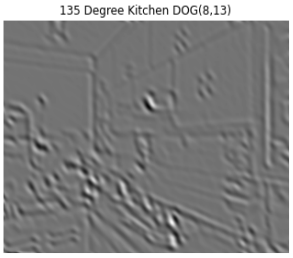


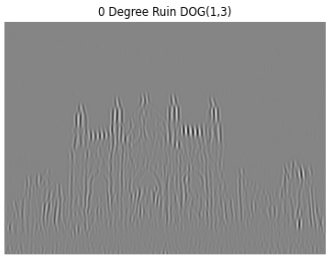


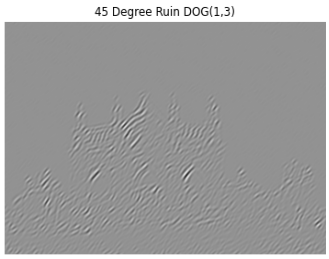


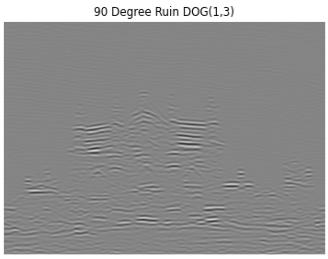


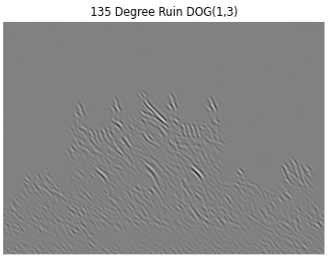


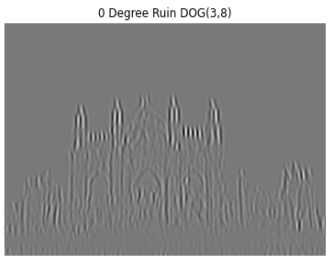


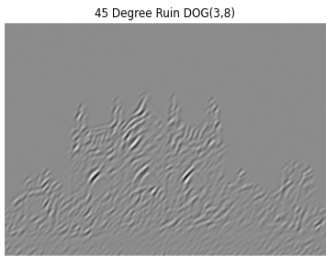


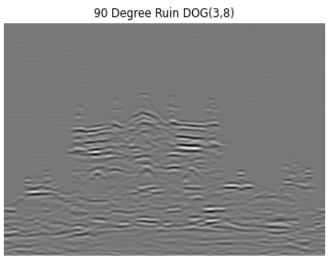


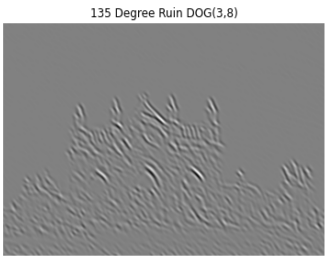


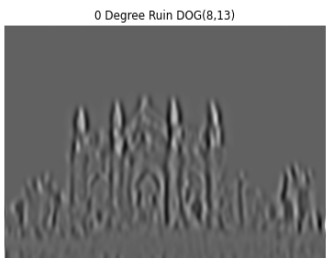


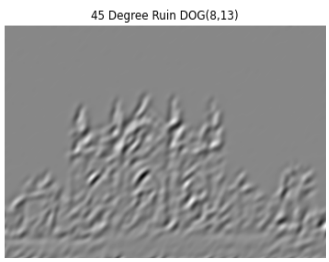


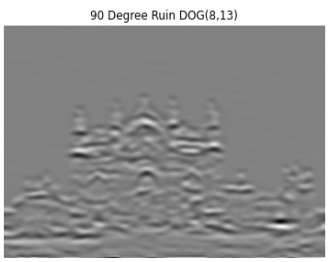


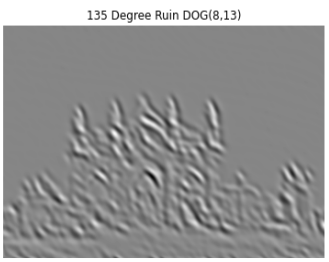








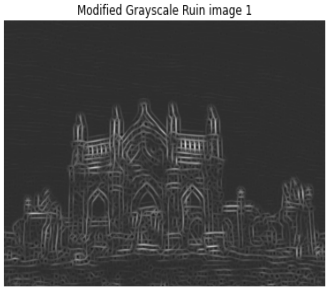


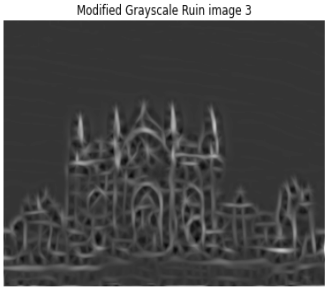


iv. Findings for step 2

1. For the DoG value of 1,3 of sigma, the edges came to be more but thin (not visible clearly) for all 0, 45, 90, 135
2. For the DoG value of 1,3 of sigma, the edges came to be medium with medium thickness (clearly visible) for all 0, 45, 90, 135
3. For the DoG value of 8,13 of sigma, the edges came to be less but thick (clearly visible) for all 0, 45, 90, 135

v. Result for step 3





vi. Findings for step 3

1. Getting the maximum signal value of the edge-oriented images and normalizing them with the average of other images make the image boundary clear and the blurred image outline is easily visible. This seems to happen because we are choosing the maximum value when the intensity is changing in the image, i.e: boundaries at 0, 45, 90, 135 degrees.
2. It is seen in both the image that with low_sigma=1 and high_sigma=3 the final image had many thin edges(Modified Grayscale Ruin Image 1 and Modified Grayscale Kitchen Image 1)
3. It is seen in both the image that with low_sigma=3 and high_sigma=8 the final image had a medium number of edges with medium thickness (Modified Grayscale Ruin Image 2 and Modified Grayscale Kitchen Image 2)
4. It is seen in both the image that with low_sigma=8 and high_sigma=13 the final image had fewer edges but where very thick (Modified Grayscale Ruin Image 3 and Modified Grayscale Kitchen Image 3)