**Computer Vision HW1 Report**

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**Part 1.**

* **Visualize the DoG images of 1.png.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | DoG Image (threshold = 5) |  | DoG Image (threshold = 5) |
| DoG1-1.png |  | DoG2-1.png |  |
| DoG1-2.png |  | DoG2-2.png |  |
| DoG1-3.png |  | DoG2-3.png |  |
| DoG1-4.png |  | DoG2-4.png |  |

* **Use three thresholds (1,2,3) on 2.png and describe the difference.**

|  |  |
| --- | --- |
| Threshold | Image with detected keypoints on 2.png |
| 2 |  |
| 5 |  |
| 7 |  |

(describe the difference)

The higher the threshold is, the fewer qualified keypoints on 2.png are. That is, keypoints in the image of the higher threshold are more important.

**Part 2.**

* **Report the cost for each filtered image.**

|  |  |
| --- | --- |
| Gray Scale Setting | Cost (1.png) |
| cv2.COLOR\_BGR2GRAY | 1207799 |
| R\*0.0+G\*0.0+B\*1.0 | 1439568 |
| R\*0.0+G\*1.0+B\*0.0 | 1305961 |
| R\*0.1+G\*0.0+B\*0.9 | 1393620 |
| R\*0.1+G\*0.4+B\*0.5 | 1279697 |
| R\*0.8+G\*0.2+B\*0.0 | 1127913 |

|  |  |
| --- | --- |
| Gray Scale Setting | Cost (2.png) |
| cv2.COLOR\_BGR2GRAY | 183850 |
| R\*0.1+G\*0.0+B\*0.9 | 77884 |
| R\*0.2+G\*0.0+B\*0.8 | 86023 |
| R\*0.2+G\*0.8+B\*0.0 | 188019 |
| R\*0.4+G\*0.0+B\*0.6 | 128341 |
| R\*1.0+G\*0.0+B\*0.0 | 110862 |

* **Show original RGB image / two filtered RGB images and two grayscale images with highest and lowest cost.**

|  |  |  |
| --- | --- | --- |
| Original RGB image (1.png) | Filtered RGB image and Grayscale image of  Highest cost | Filtered RGB image and Grayscale image of  Lowest cost |
|  |  |  |
|  |  |  |

(Describe the difference between those two grayscale images)

The grayscale image of the highest cost is darker than that of the lowest cost overall. Additionally, the brightness of the leaf in the former is similar to its background. That is, its setting doesn’t keep the high contrast so the cost is high. On the other hand, the setting in the latter can keep more contrast between the leaf and the background so the cost is low.

|  |  |  |
| --- | --- | --- |
| Original RGB image (2.png) | Filtered RGB image and Grayscale image of  Highest cost | Filtered RGB image and Grayscale image of  Lowest cost |
|  |  |  |
|  |  |  |

(Describe the difference between those two grayscale images)

The grayscale image of the highest cost doesn’t show the good contrast of each part in the original image. Compared with the original image, the brightness of purple and orange in the grayscale image of the highest cost are almost the same so the cost is high. However, the brightness of each color in the grayscale image of the low cost has high contrast to each other so the cost is low.

* **Describe how to speed up the implementation of bilateral filter.**

1. Pre-compute the spatial kernel while the variable is constructed.
2. Use NumPy’s vectorized operations to compute the range kernel and the sum of the weight instead of pure for loop.