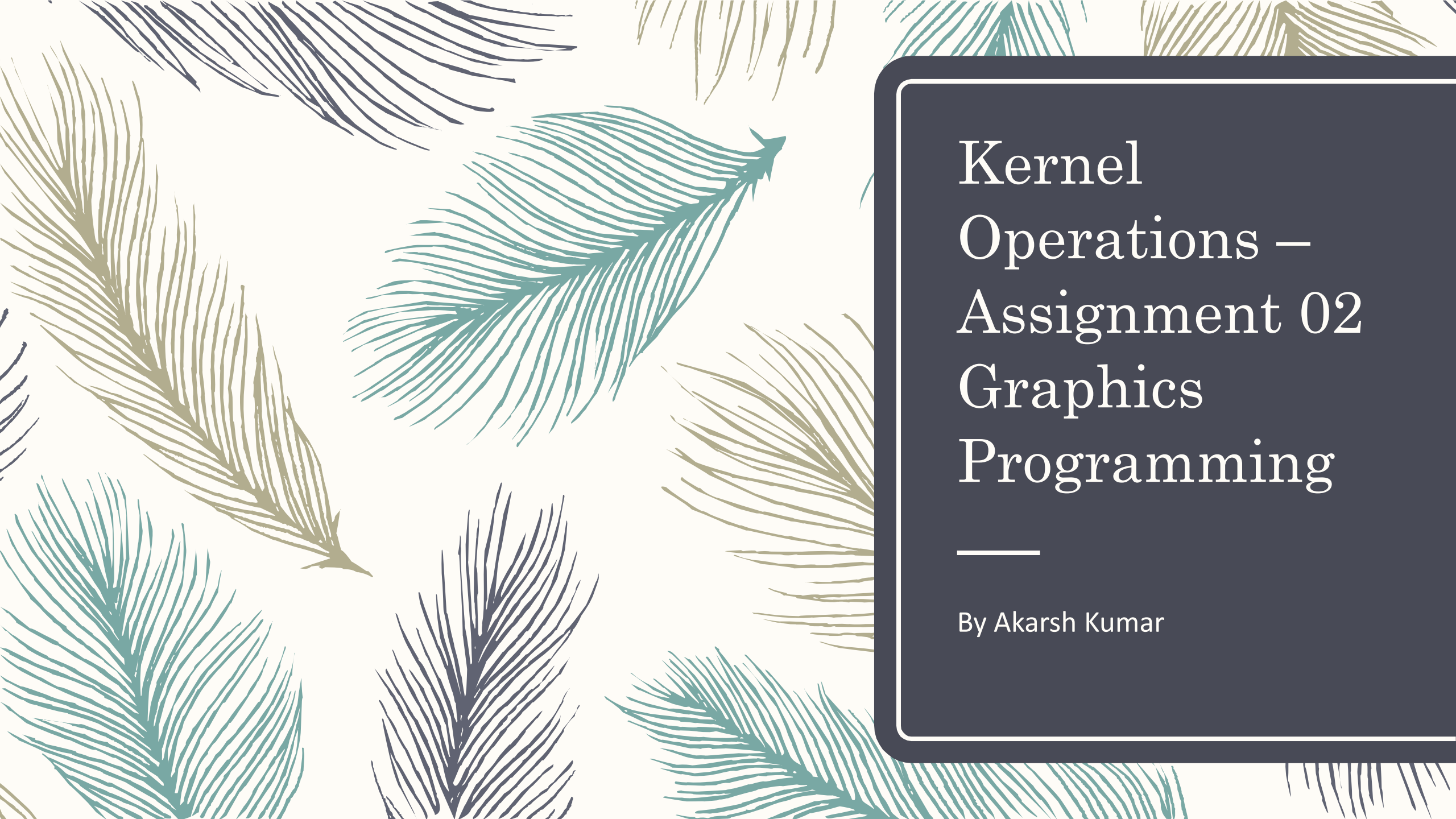


Kernel Operations – Assignment 02 Graphics Programming

By Akarsh Kumar

Images Chosen

Box Blur

- 2D Kernel: $\frac{1}{9}\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}$

pic_1_b.png

1D Blur

- 1D Kernel: $\frac{1}{3}[1 \quad 1 \quad 1]$, $\frac{1}{3}\begin{bmatrix}1\\1\\1\end{bmatrix}$
- 1D horizontal blur (left), both 1D filters applied (right)

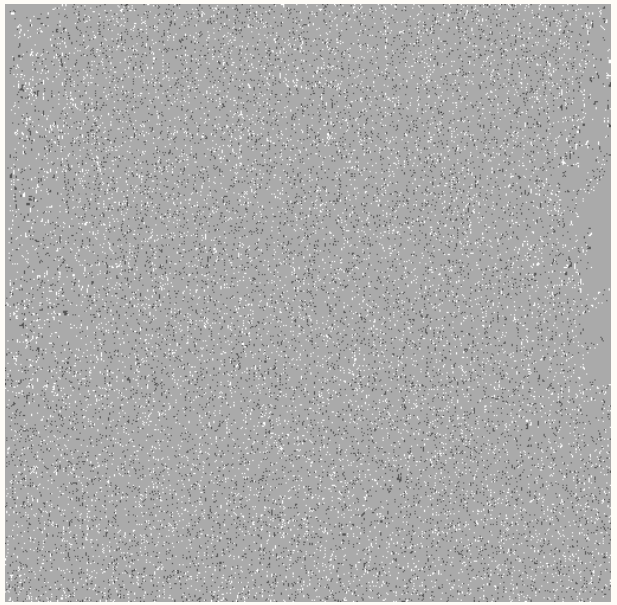
pic_1_d_0.png

pic_1_d_0.png

1D Blur vs Box Blur

- The following is the normalized version of the difference between two 1 dimensional blurs and the single 2 dimensional blur
- Average of absolute value of difference: 10.973
- Normalized difference:

pic_1_e.png



Gaussian Blur

- 2D Kernel: $\frac{1}{16}\begin{bmatrix}1 & 2 & 1\\ 2 & 4 & 2\\ 1 & 2 & 1\end{bmatrix}$

pic_2_b.png

1D Gaussian Blur

- 2D Kernel: $\frac{1}{4}[1 \quad 2 \quad 1], \frac{1}{4}\begin{bmatrix}1\\2\\1\end{bmatrix}$
- 1D horizontal blur (left), both 1D filters applied (right)

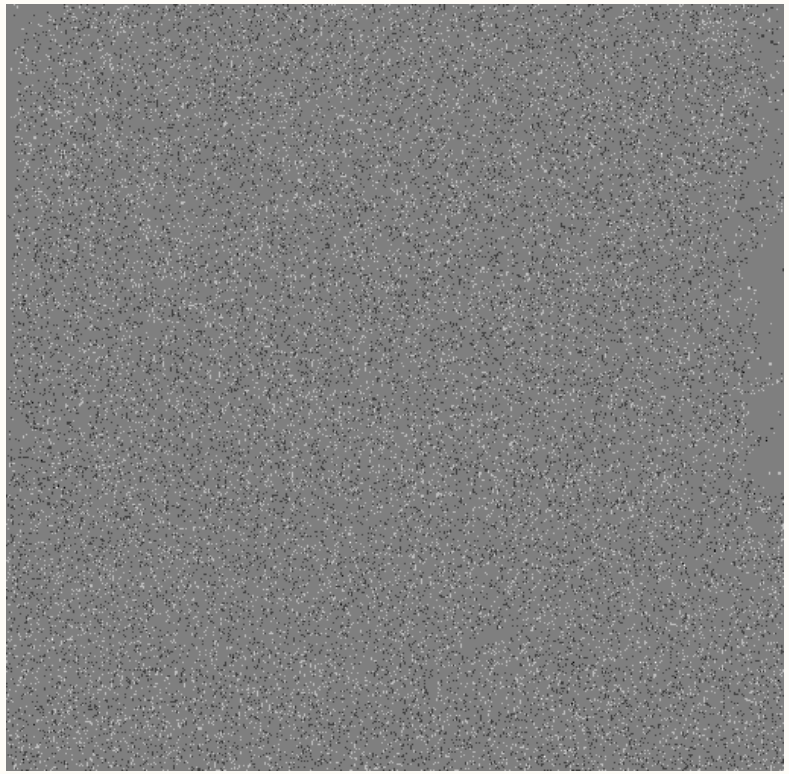
pic_2_d_0.png

pic_2_d_1.png

1D Gaussian vs 2D Gaussian

- Average of absolute value of difference: 16.734
- Normalized difference:

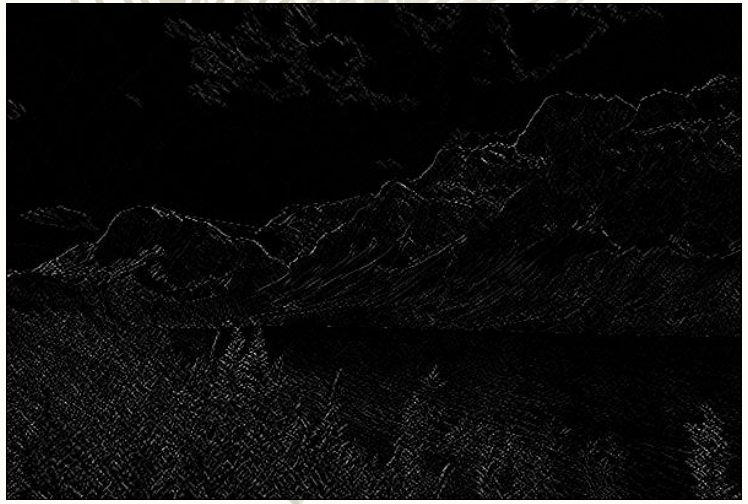
pic_2_e.png



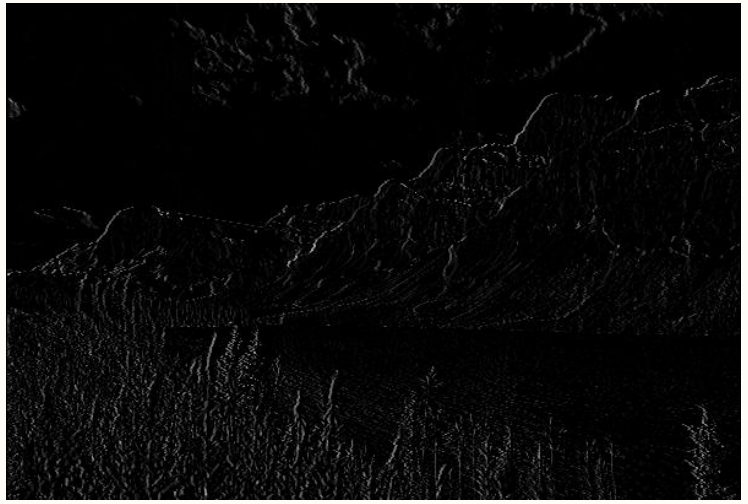
Edge Detection

- Edge Detection Kernel: $\begin{bmatrix} 1 & 0 & -1 \\ 0 & 0 & 0 \\ -1 & 0 & 1 \end{bmatrix} = [1 \quad 0 \quad -1] \times \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$

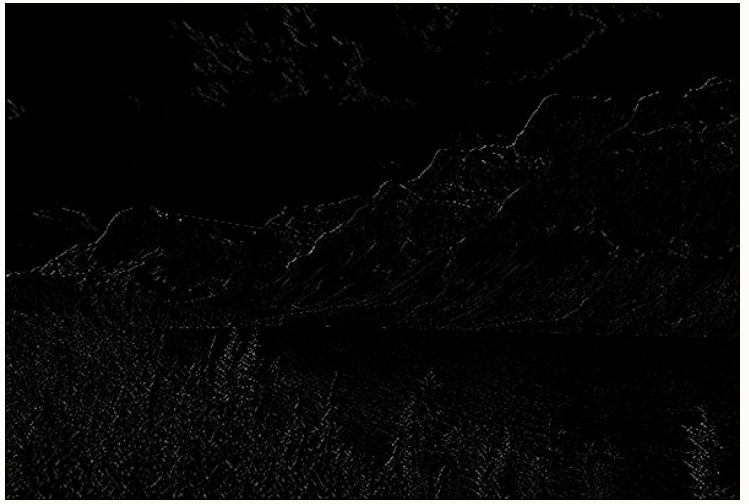
pic_3_b.png



pic_3_d_0.png



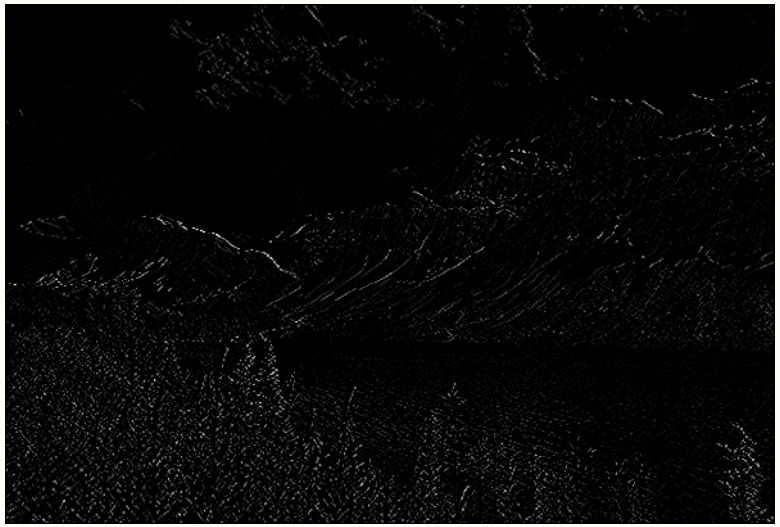
pic_3_d_1.png



Diagonal Edge Detection vs Two 1Dimensional Edge Detection

- Average absolute value of difference: 3.853
- Normalized difference:

pic_3_e.png



Sharpen Image

- Kernel: $\begin{bmatrix} 0 & -1 & 0 \\ -1 & 5 & -1 \\ 0 & -1 & 0 \end{bmatrix}$

pic_4_b.png

Corner Detection

- Corner detection was done by getting a horizontal edge detection (left) and a vertical edge detection (middle) and using a black white filter on those and using that to find common points in both and outlining the corners (right)