ECE 6310: Introduction to Computer Vision - Lab 1 Report
Convolution, separable filters, sliding windows

Objective: To implement three versions of a 7x7 mean filter. The first version should use basic 2D convolution. The second version should use separable filters (1x7 and 7x1). The third version should use separable filters and a sliding window. All three versions of the filter should produce the exact same output.

Time Analysis for 3 versions over 10 runs: (Time in milliseconds)

Run No.	2D convolution	Separable filters	Separable filters + sliding windows
1	64.3294	27.9384	10.2115
2	65.7198	27.8934	11.0867
3	65.3456	28.6193	11.1271
4	66.4815	26.9565	11.0759
5	64.1364	28.8256	10.3951
6	67.3376	27.8928	9.0942
7	66.1044	27.9121	10.1801
8	63.8121	26.6528	9.3383
9	64.4882	26.1608	10.0908
10	65.9161	27.1375	10.2006
Average Time	**65.3671**	**27.5989**	**10.2800**

The first version uses n*n number of pixels in the operation, whereas, in separable filters, only 2*n pixels are used in the operation, here n is 7 for 7*7 mean filter.
The least amount of avg time is observed in the third version, separable filters with sliding window.

Input image: 512*512, 8 bit grayscale ppm image: bridge.ppm

Output image 1 : 512*512, 8 bit grayscale ppm image: **smoothed_by_convolution_1.ppm**
Output image 2 : 512*512, 8 bit grayscale ppm image: **smoothed_by_sep_filters_1.ppm**
Output image 3 : 512*512, 8 bit grayscale ppm image:**smoothed_by_sliding_window_1.ppm**

Smoothed output images for 3 versions were compared using 'diff' on linux platform and returned none, hence, all versions produced the exact same output, as shown below:

```
es/Intro_to_CV/assignments$ gcc -o op_lab1 final_lab1.c
modjoul1@LAPTOP-7FILMC9D:/mnt/c/Users/Netra Inamdar/Documents/fall_19_cours
es/Intro_to_CV/assignments$ ./op_lab1

Total time for 2D convolution:  38142700
Total time for sep filters:      8311500
Total time for sep filters and sliding window:  2566200
modjoul1@LAPTOP-7FILMC9D:/mnt/c/Users/Netra Inamdar/Documents/fall_19_cours
es/Intro_to_CV/assignments$ diff smoothed_by_convolution_1.ppm smoothed_by_
sep_filters_1.ppm
modjoul1@LAPTOP-7FILMC9D:/mnt/c/Users/Netra Inamdar/Documents/fall_19_cours
es/Intro_to_CV/assignments$ diff smoothed_by_sep_filters_1.ppm smoothed_by_
sliding_window_1.ppm
modjoul1@LAPTOP-7FILMC9D:/mnt/c/Users/Netra Inamdar/Documents/fall_19_cours
es/Intro_to_CV/assignments$ diff smoothed_by_convolution_1.ppm smoothed_by_
sliding_window_1.ppm
modjoul1@LAPTOP-7FILMC9D:/mnt/c/Users/Netra Inamdar/Documents/fall_19_cours
es/Intro_to_CV/assignments$
```