SEPTEMBER 1, 2020

CONVOLUTION, SEPARABLE FILTERS & SLIDING WINDOWS

ECE 6310, HW01

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C48290423

Part1:

Show similarity between the images.

Ans:

Three files were written using the three different methods of implementation.

- "C48290423_smoothen.c" is the code which implements the basic 2D convolution kernel and outputs the image "smoothed.ppm".
- "C48290423_smoothen_seperable.c" implements the separable filter and outputs the image "smoothed_sep.ppm".
- "C48290423_smoothen_sliding.c" implements the sliding window and separable filter, and outputs the image "smoothed_sliding.ppm".

To compare the files, the command "cmp -l [FILE 1] [FILE 2]" was used. This compares the two given files and prints out the values of the differing bytes, if any exist. Otherwise, it does not output anything.

The following image shows the images being compared with each other and no output being printed, indicating that all the images are same.

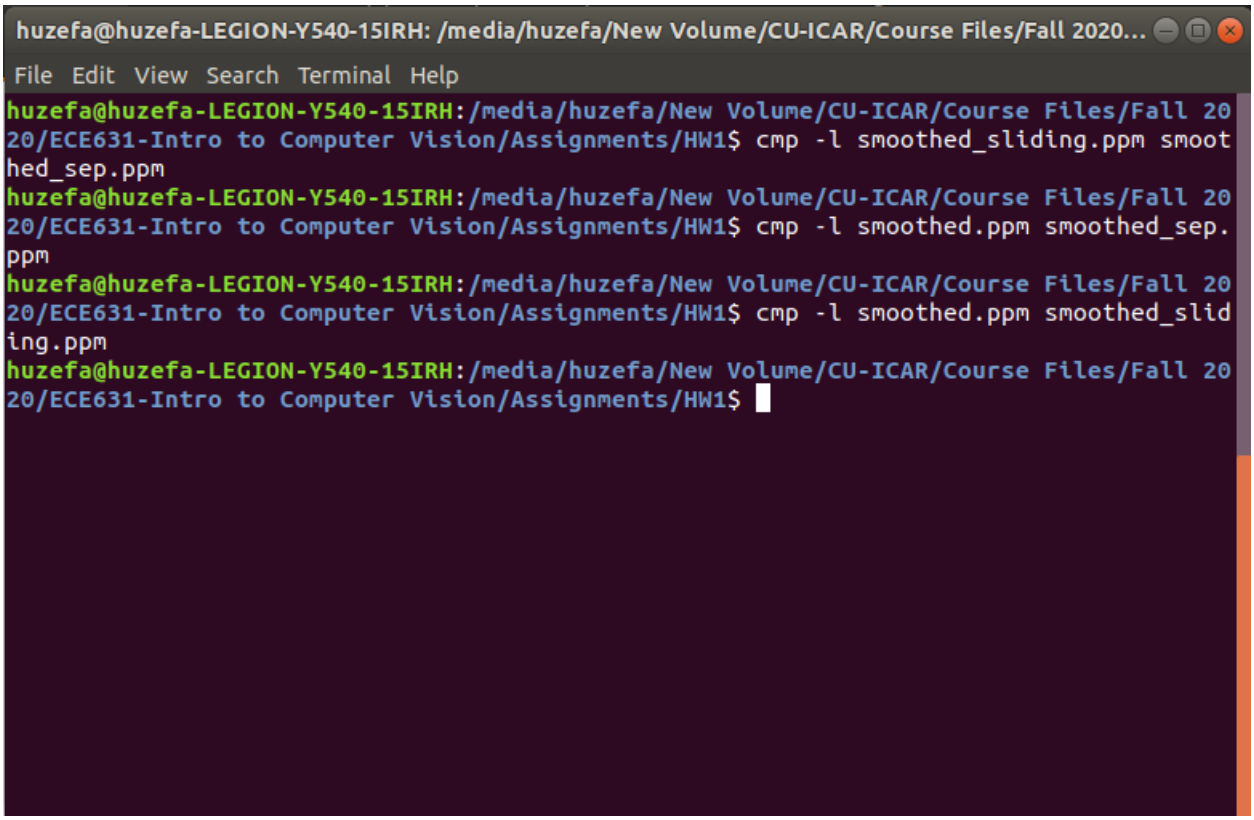

Figure 1. Similarity of images

Part2:

Summarize and compare the amount of time each version of the filter takes.

Ans:

An average of 10 runs was taken and the results were tabulated. The time noted is in milliseconds.

Filter Time	2D Convolution (ms)	Separable Filter (ms)	Sliding window + Separable Filter (ms)
	22.9387	10.9712	4.9871
	22.9801	10.9357	4.9441
	23.9373	11.9685	4.9413
	23.93	11.9995	5.9017
	22.9168	13.0152	4.9861
	22.9833	13.5522	5.984
	22.9376	11.9296	6.9796
	23.0156	10.9704	4.9865
	22.9835	12.009	4.9861
	25.8858	11.4623	4.9869
Average	**23.45087**	**11.92792**	**5.36834**

As can be seen, the sliding window combined with separable filter takes just **5.37 milliseconds** to smoothen out the image. This is due to the lesser time complexity of the fewer nests of the for loop as well as lesser amount of arithmetic calculations of the sliding window.