Rehana Mahfuz
BME 595 HW 01

Part A:

Output images are labelled as out_<small/big>_k<x>.png. If the stride is not 1, the stride is also specified.

Output of Task 1 is out_<small/big>_k1.png

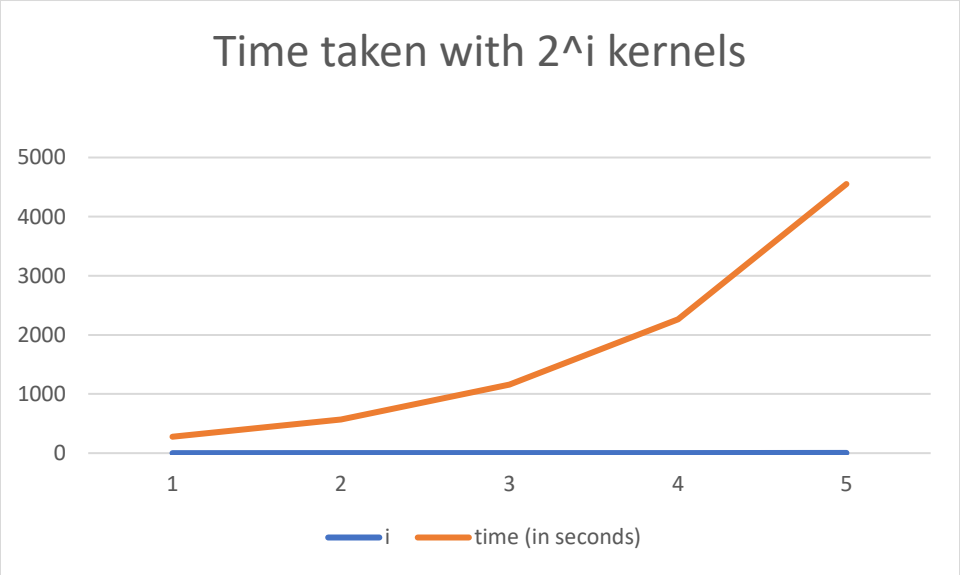
Outputs of Task 2 are out_<small/big>_k4.png and out_<small/big>_k5.png

Outputs of Task 3 are out_<small/big>_k1_stride2.png, out_<small/big>_k2_stride2.png and out_<small/big>_k3_stride2.png

Note: Task 2 with the big image is taking more than 2.5 hours to run, which is why I haven't been able to get anything with the big image yet, except the first task. So for the sake of completeness, I have performed Tasks 2 and 3 with another image named little, which is 300x168 pixels

Part B:

I plotted the time taken for convolution with 2^I kernels as a function of i. For i = 5, it took about 75 minutes, which is larger than the limit of an hour, which is why I did not try with greater i.



Note: the graph generating software (Excel) shifted the range of time from 0-4 to 1-5.

Part C:

To count the number of operations, for a dot product x1y1 + x2y2 + ... + xnyn, I counted number of operations to be n multiplications plus (n-1) additions. I was confused if I need to also count the operations used to add the pixels of the channels. When I asked on Piazza, I was told by other students that operations used foe averaging of the channels also need to be counted. So for adding up the pixels of the three channels, I added (number of pixels in a channel*2) to the total number of operations, since two additions are being done per pixel.

For kernel_size = 9, the program was taking more than an hour to run, so I terminated it.

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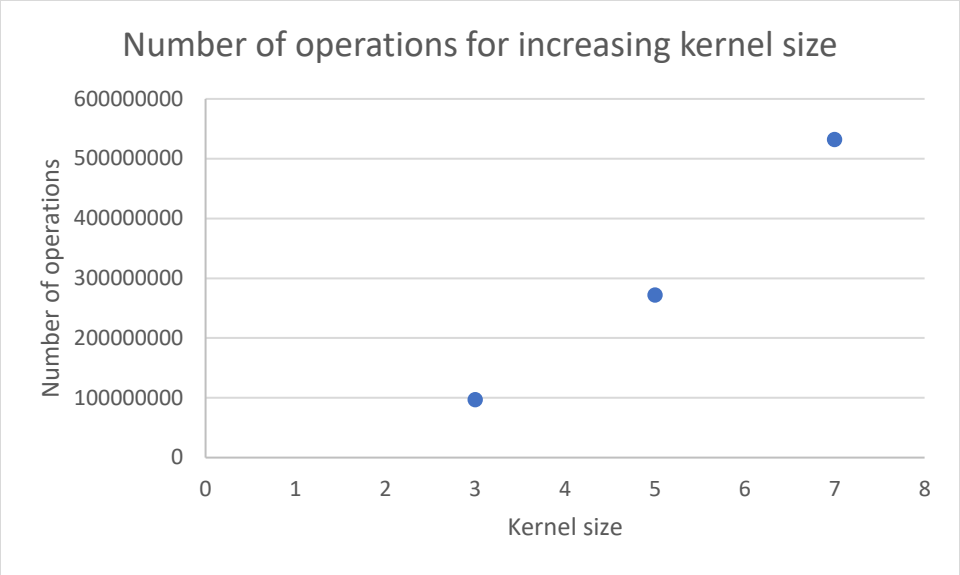
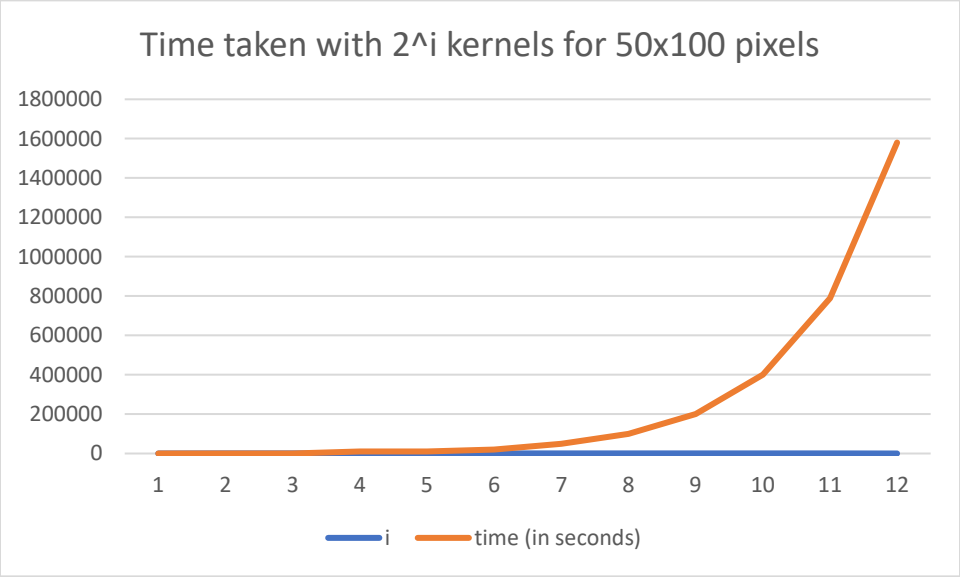


Part D:

I allocated memory on the heap for the image and the kernel, and also freed it at the end of my c_conv function. However, when I try with a large image such as 1280x720, I get a segmentation fault (core dumped). So I tried with two images of smaller sizes: 50x100 pixels, and 60x110 pixels



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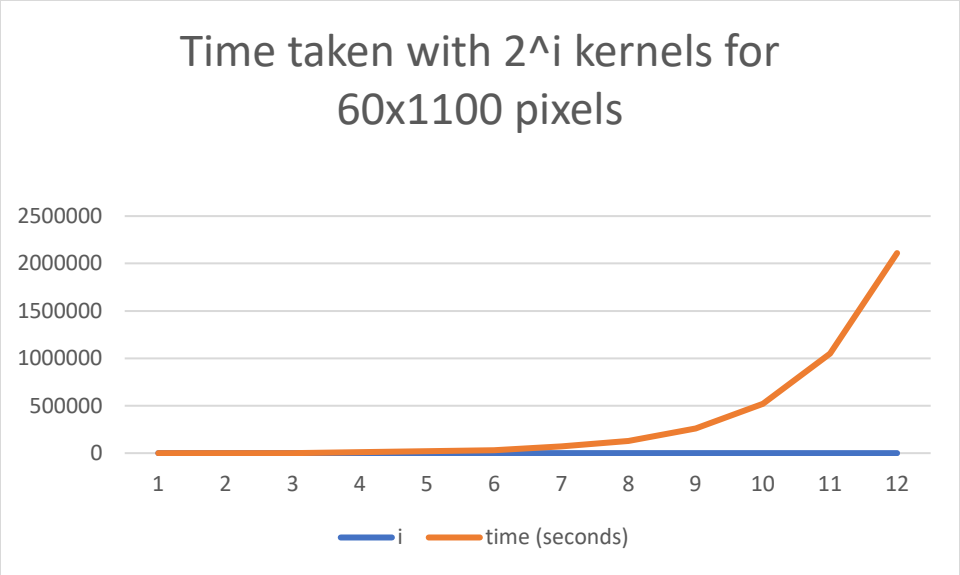

Note: the graph generating software (Excel) shifted the range of time from 0-11 to 1-12.