**CSC 545/645 Computer Speech, Music and Images**

**Exercise No. 4, Week 7, due Sunday, Feb 28, 2021**

**Filtering images in the spatial domain**

**Goals**

1. Filter images using kernels
2. Experiment with blurring and sharpening filters

**Procedure**

Write a Processing program to perform spatial filtering on an image. Try a low pass box filter and a Laplacian high pass filter. You can decide whether you want to convert the image to grayscale before filtering; these operations should perform well, though, on color images.

Skeleton code is provided in the Exercise download; this code includes kernels for the filters mentioned above. There is an image in the data folder; feel free to add others.

Your goal is to apply the mask to every 3 x 3 matrix of pixels, modifying the target pixel in the center. In order to do this, you will probably use a nested loop to iterate over the target pixels; inside that nested loop you will have a nested loop to iterate over the kernel, acting on the target pixel. Handle the image boundary by leaving a row on top and bottom and a column on left and right unfiltered.

These kernels are both 3 x 3 but kernels can be other sizes. You might want to get your code working for 3 x 3, then modify it so it can handle kernels of any size (you can assume that the kernel sizes will be odd in both x and y dimensions). Try a 5 x 5 or 7 x 7 low pass filter; you can also extend the high pass filter—just make sure the total adds to one and that you’re differencing pixels.

If you have time, modify your program so you can see what happens if you first low pass, then high pass an image, or perform multiple low pass or high pass operations.

**Deliverables**

Submit your .pde file on Blackboard by the due date