

## Homework 6 MATLAB part

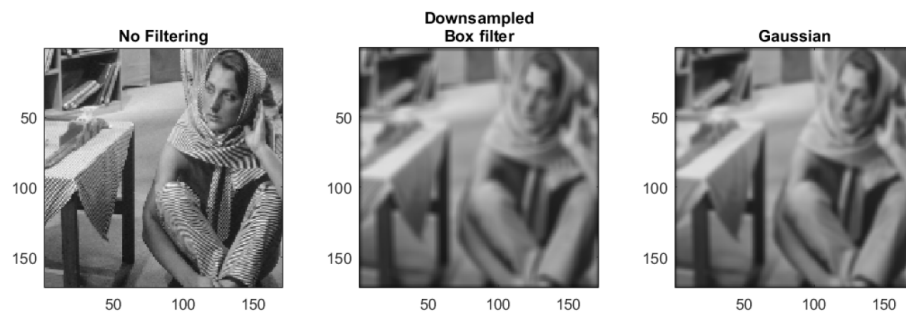
No Written portion. MATLAB portion due on Gauchospace at Monday November 13th, 9 pm.

1. **[5 pts]** In this part, we are going to implement three different downsampling methods and observe the aliasing effect. The built-in *imresize*, *conv2*, and *fspecial* are not allowed to use in this part. There is only one function you have to implement: **myDownSampling**. This function takes the input image, downsampling rate and the anti-aliasing method string. You will be implementing nearest neighbor downsampling with different aliasing cases. Three different downsampling methods you will implement are *No anti aliasing*, *box filter*, and *Gaussian*. For *box filter*, and *Gaussian* methods, you need to convolve the image with their respective filters to filter out the high frequency components in the image that will cause the aliasing and then do the downsampling.

Here are the specifications for the kernels in *box filter*, and *Gaussian* methods.

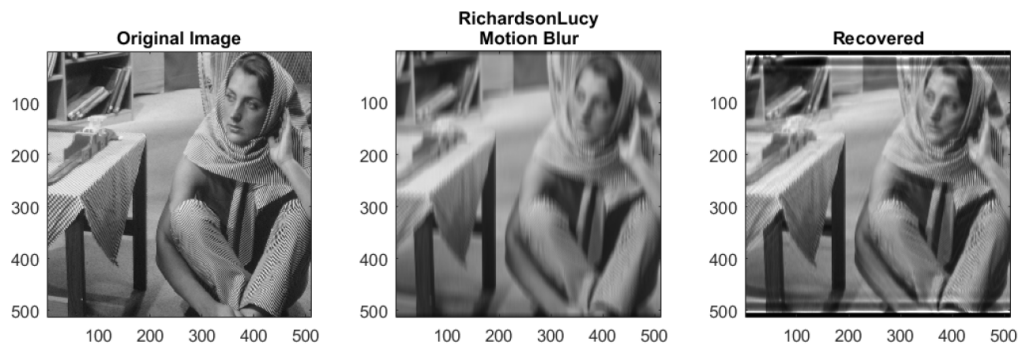
- (a) *Box filter*: Kernel size is 17 and each element has value  $1/17^2$ .
- (b) *Gaussian*: Kernel size is 17 and sigma equals to 5.

After your code is done, you will see the output images like this:



Since the barbara image has lots of high frequency components, the aliasing effect in *nearest neighbor* donwsampling is very obvious. In the output videos, we can notice that the Gaussian filter does better in anti-aliasing downsampling.

2. **[15 pts]** In this part, we are going to implement Richardson Lucy algorithm to recover an image which is blurred by a known point spread function. You can refer to **Wikipedia** for the implementation details. You are not allowed to use built-in **deconvlucy** function. There is only one function you need to implement: **myRichardsonLucy.m**, which takes **the blurred image, the known point spread function, and the number of iterations as inputs**. Your results should look like this:



You can also change the number of iterations to see how it affects the result.

For submitting your code, please upload one zipped file that includes 5 files: **HW5\_main.m**, **display3images.m**, **myDownSampling.m**, **myRichardLucy.m** and **barbara\_512.png**. Name your zip file in this format: <Perm number>\_<First name>\_<Last name>\_HW6. Good luck!