Lab4: Image restoration

Student name: **Total mark:** / 6

Student number: **TA signature:**

Instructions

- Print and bring this lab sheet to the lab.
- Prior to the lab, read "**Deblurring Images Using a Wiener Filter**" at MathWorks website: http://www.mathworks.com/help/images/examples/deblurring-images-using-a-wiener-filter.html
- Complete all three parts of the lab below following the instructions.
- Answer all questions using complete sentences in the boxes provided. Answers may be typed or hand-written **legibly**. You may exceed the box size if necessary.
- Before leaving the lab, give the completed lab sheet to the TA.
- If you have any questions, or get stuck please do not hesitate to ask the TA for assistance.

Part I [1 mark]:_____ / 2

Direct inverse (deconvolution) filter for blurred image with no noise.

(1) Download a medical image of your choice. Convert its pixel values to double precision using "im2double". Show the image, f(x,y).

(2) Create a Gaussian averaging mask, h(x,y), using "fspecial". Blur f(x,y) in spatial domain using "imfilter(f, h, 'conv', 'circular')". Show the blurred image, g(x,y).

(3) Restore the original image from g(x,y) by using a direct inverse filter using "deconvwnr(g, h, K)". View the restored image. What does a parameter K represent? What a value of K should be for the direct inverse filter?

(4) Compare the original and restored image and discuss the difference(s).

Part II [1 mark]: _____ / 2

Weiner filter for blurred image with noise.

(5) Add a white Gaussian noise to the blurred image g(x,y) created in Part I, using "imnoise". Show the noisy blurred image.

(6) Apply a direct inverse filter to the noisy blurred image. Show the restored image. Does it work? Why or why not?

(7) Calculate the K value from the SNR of the image. Apply a Wiener filter to the noisy blurred image with this K value. Show the restored image.

(8) Make the K value 100 times bigger or 100 times smaller than the K value calculated in (7). Discuss how the restored image quality is affected by the K value.

K = _____ *from (7)*

Part III [1 mark]: _____ / 2

Wiener filter with K value to minimize the mean square error

(9) Make a Matlab code to iteratively calculate the mean square errors (MSE) e^2 between the original image f(x,y) and restored image. Find the K value with which the MSE is the minimum. Is the K value the same as the one obtained in (7)? Is this what should be expected?

K = _____

(10) Restore the blurred noise image obtained in (5) using this new K value. Compare and discuss the result with the image obtained in (7).