MIDTERM - 03/25

**Image Processing**

**Students:**

1.

2.

**Problem 1**. *Filtering in the frequency domain*

Given a grayscale image, filter this image using an ideal low-pass filter. Vary the cut-off frequency of the ideal low-pass filter and observe the results. What can we see in the output images? Illustrate and try to explain the observed phenomena.

We now replace the ideal low-pass filter with the Butterworth and Gaussian low-pass filters and repeat the above filtering. In these cases, are there any differences in the results compared with those from the ideal low-pass filter? Show the results appropriately to illustrate the comparisons.

*[Code]*

*[Figures/Tables]*

*[Explanation]*

**Problem 2**. Simulate a 2D mosaic image for a color image (as in Alleysson’s paper). Show the magnitude spectrum of this mosaic image. Compare this spectrum with the magnitude spectrum of a natural image. Explain the eventual differences.

*[Code]*

*[Figures/Tables]*

*[Explanation]*

**Problem 3**. *Filtering in the spatial domain.*

We consider the following filters.

Given a grayscale image I, we filter I according the two following methods. “\*” denotes the convolution operation.

**Method 1**:

**Method 2**:

Compare and . Explain this comparison.

Which method should be used? Explain.

*[Code]*

*[Figures/Tables]*

*[Explanation]*