# Digital Image Processing Assignment 1

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1 Problem 1: Pointillism

1.1 Histogram Matching

Here, we attempt to transform a grayscale image such that its histogram matches with that of another grayscale image. The script is provided along with this report saved the name 'hist_match.m'. This involves finding the normalised cumulative sum of both the input images initially. The obtained results are as follows:
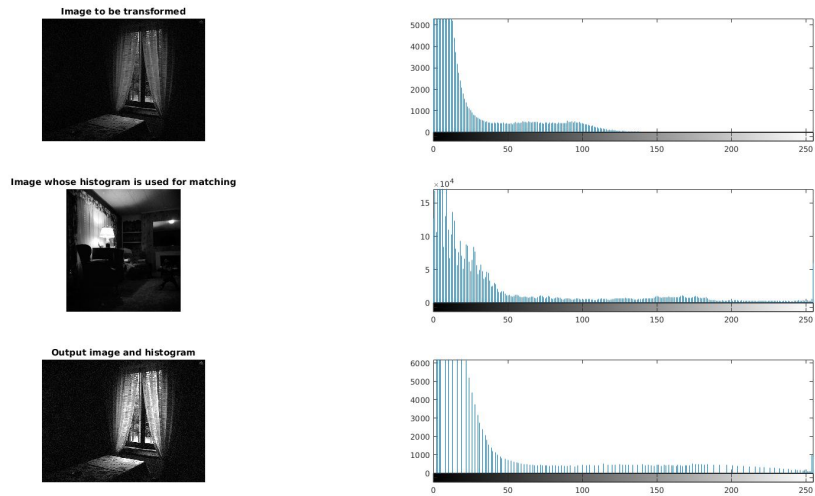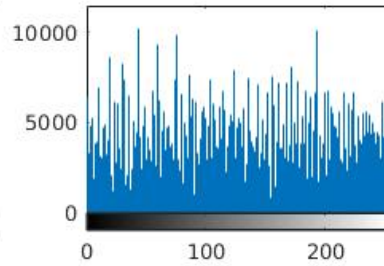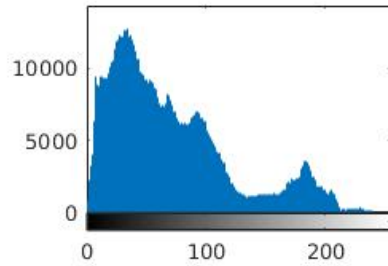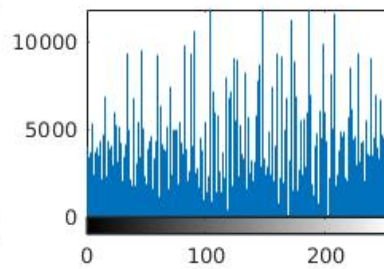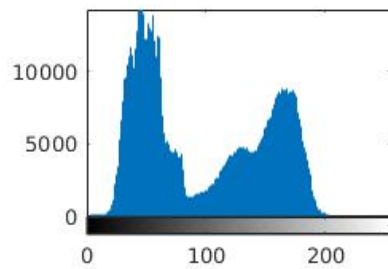

1.2 Local Histogram Equalisation

The script file for this has been saved as 'hist_equal.m'. Here, we attempt to make the hiostogram of the input image uniform throughout while making

sure the basic information of the image is intact. We obtain the output as:

2 Problem 2: Spatial Filtering

2.1 Gaussian Filtering

The script file for this has been saved as 'guassian.m'. Here, we simply convolve the input image with the guassian matrix of the form:

$$G(x, y) = (1/2\pi\sigma^2)e^{-(x^2+y^2)/2\sigma^2}$$

Tking $\sigma = 2$, the required 3X3, 5X5 and 8X8 guassian filters are created and convolved with the input image to obtain the following result:

Original input image

After applying 3X3 filter

After applying 5X5 filter

After applying 8X8 filter

2.2 Median Filtering

The script file for this has been saved as 'med.m'. Here, we replace the intensity value of a pixel by with the median of the neighbouring values. We do this for a window of sizes 3X3, 5X5 and 8X8 to obtain the following result:

Input image

After using 3X3 window

After using 5X5 window

After using 8X8 window

Input image

After using 3X3 window

After using 5X5 window

After using 8X8 window

2.3 High-Boost Filtering

The script file for this has been saved as 'high_boost.m'. Here, the edge matrix is obtained for an image by subracting its smoothened (using guassian

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filter) version from itself. This matrix is then multiplied with a product factor and added to the image matrix itself to obtain an image with more definite edges. The output obtained for various sizes of guassian filter used are as follows:

Input image

Using 3X3 guassian filter

Using 5X5 guassian filter

Using 8X8 guassian filter

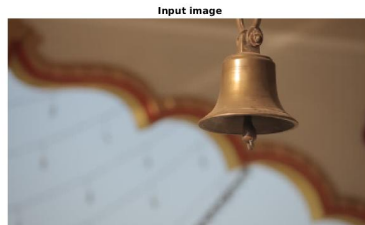Input image   Using 3X3 guassian filter

Using 5X5 guassian filter   Using 8X8 guassian filter

2.4   Bilateral Filtering

The script file for this has been saved as 'bilateral.m'. Here, we replace a pixel with a weighted average of the neighbouring pixels. This procedure has been carried out for windows of size 3, 5 and 8. We obtain the output for each window as:
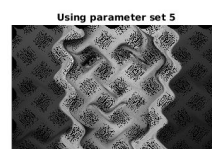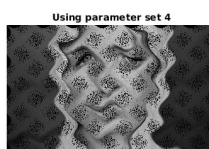

Input image   Using 1 sized window

Using 2 sized window   Using 3 sized window

Input image

Using 1 sized window

Using 2 sized window

Using 3 sized window

3 Problem 3: Geometric Transformations

3.1 Ripple Transform

The script file for this has been saved as 'rip_tr.m'. Here, we transform the image by arranging the pixels based on trajectories of sine waves. The behaviour of the waves depends on the fundamental period and amplitude. 5 different sets of these parameters leads to 5 different output images. The required gif's are attached along with this pdf as 'sameraman.gif', 'portraits.gif' and 'portraits2.gif'. We obtain the output for each set of parametrs used as:

input image

Using parameter set 1

Using parameter set 2

Using parameter set 3

Using parameter set 4

Using parameter set 5

input image

Using parameter set 1

Using parameter set 2

Using parameter set 3

Using parameter set 4

Using parameter set 5

input image   Using parameter set 1   Using parameter set 2

Using parameter set 3   Using parameter set 4   Using parameter set 5
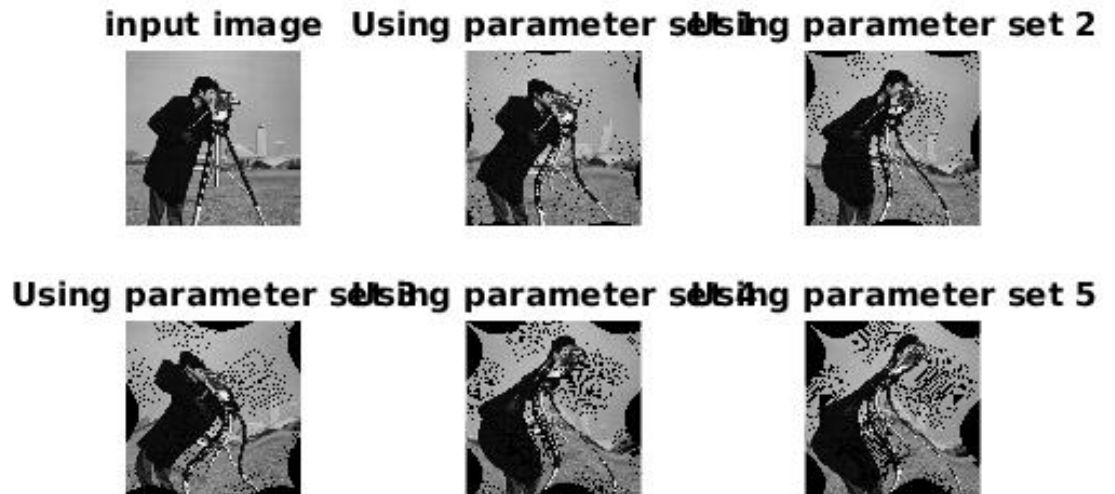
3.2 Spherical Transform

The script file for this has been saved as 'sph_tr.m'. Here, the image is transformed in such a way so that a magnifying effect is observed in a specific region. The same formulas have been used which were given in the lecture slides. The required gif's are attached along with this pdf as 'sameraman_2.gif', 'portraits_2.gif' and 'portraits2_2.gif'. We obtain the output for each set of parametrs used as:

Input image

Using parameter set 1

Using parameter set 2

Using parameter set 3

Using parameter set 4

Using parameter set 5

Input image

Using parameter set 1

Using parameter set 2

Using parameter set 3

Using parameter set 4

Using parameter set 5

Input image   Using parameter set 1   Using parameter set 2

Using parameter set 3   Using parameter set 4   Using parameter set 5

4 Problem 4: Homography Estimation