CS 663 : Digital Image Processing
Assignment #2 : Filtering

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Notes to Checker

1. Color Bars have been displayed using the MATLAB script but have not been added to the report since introduction of color bar resizes images which was leading to artifacts

4. The script displays images with the color map off by default. To view the color map please select the color map option in the MATLAB figure viewer

5. All results have been saved into the folder 'images'

Edge-preserving Smoothing was performed using Patch-Based Filtering on the below images

(1) 3/data/barbara.mat
(2) 3/data/grass.png
(3) 3/data/honeyCombReal.png

- The parameters accepted by the function myPatchBasedFiltering() are Patch size, Window Size and the filter parameter h
- The parameter h was tuned to minimize the RMSD between the filtered and the original image

Results

Saved using save as option of MATLAB pop up

1. **Show the original, corrupted, and filtered versions side by side, using the same (gray) colormap.**

The results for the 3 images are stored in the folder images

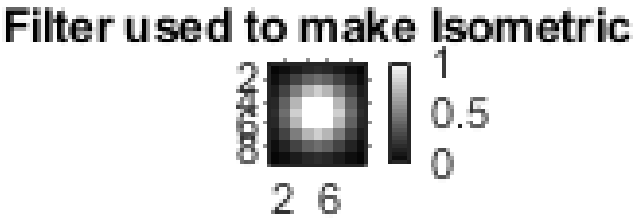
2. **Show the mask used to make patches isotropic, as an image**

The mask was computed as a clipped Gaussian with the clip value set to 75% of peak value. The standard deviation. The mask used to make patches isometric ('Circular') have been saved as .png files. It is in its original size i.e 9x9 pixels

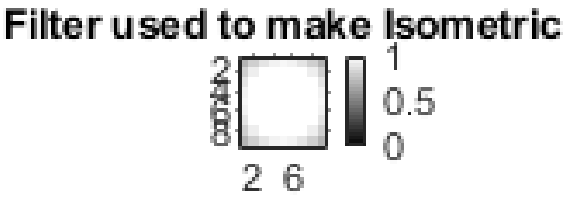
The mask is of size 9x9 pixels. The version shown here is highly zoomed in.

2 values of std. deviation sigma were considered for the Gaussian mask

Sigma = 2



Sigma = 5



The patch for sigma = 5 looked more isometric (on eyeballing) hence 5 was chosen

3. **Report the optimal parameter value found, say sigma_star, along with the optimal RMSD**

Barbara.MAT

Optimal Sigma = 0.5, optimal RMSD = 0.083

Grass.png

Optimal Sigma = 0.01, RMSD = 0.0835

But better looking images were obtained for sigma = 0.05 (for grass) (RMSD = 0.0885)

honeyCombReal.MAT

Optimal Sigma = 0.005, RMSD = 0.0964

4. **Report RMSD values for filtered images obtained with (i) 0:9 sigma and (ii) 1:1 sigma, with all other parameter values unchanged**

To limit the number of lengthy executions Values of sigma above and below optimal are chosen (But not exactly 1.1 and 0.9 times)

Barbara.MAT

Sigma = 0.25, RMSD = 0.097

Sigma = 0.7, RMSD = 0.093

Grass.png

Sigma = 0.005, RMSD = 0.0885

Sigma = 0.02, RMSD = 0.1096

honeyCombReal.MAT

Sigma = 0.01, RMSD = 0.1096

Sigma = 0.02, RMSD = 0.1103

Sigma = 0.001, RMSD = 0.1096