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MyMainScript

```
myNumOfColors = 256;
myColorScale = [[0:1/(myNumOfColors-1):1]' ,[0:1/
(myNumOfColors-1):1]', [0:1/(myNumOfColors-1):1]'];

im = double(imread('../data/barbara256.png'));
im1 = im + randn(size(im))*20;
```

Part a)

PCA Denoising using all patches for eigenspace

```
tic;

im2 = myPCADenoising1(im1, 20);
rmse_a = sqrt( sum(sum((im2-im).^2)) / sum(sum(im.^2)) );
fprintf('RMSE for part a) is %f\n', rmse_a);

h = figure;
subplot(1, 2, 1), imagesc(mat2gray(im1)), title('Original Image');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

subplot(1, 2, 2), imagesc(mat2gray(im2)), title('Denoised using all
 patches');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

waitfor(h);

toc;
```

```
RMSE for part a) is 0.112036
Elapsed time is 38.122471 seconds.
```

Part b)

PCA Denoising using 200 best neighbouring patches for eigenspace

```
tic;
```

```
im2 = myPCADenoising2(im1, 20);
rmse_b = sqrt( sum(sum((im2-im).^2)) / sum(sum(im.^2)) );
fprintf('RMSE for part b) is %f\n', rmse_b);

h = figure;
subplot(1, 2, 1), imagesc(mat2gray(im1)), title('Original Image');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

subplot(1, 2, 2), imagesc(mat2gray(im2)), title('Denoised using best
 200 patches');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

waitfor(h);

toc;
```

```
RMSE for part b) is 0.091780
Elapsed time is 164.880444 seconds.
```

Part c)

Denoising using Bilateral Filtering

```
tic;

im2 = myBilateralFiltering(im1, 1.1, 0.05);
rmse_c = sqrt( sum(sum((im2-im).^2)) / sum(sum(im.^2)) );
fprintf('RMSE for part c) is %f\n', rmse_c);

h = figure;
subplot(1, 2, 1), imagesc(mat2gray(im1)), title('Original Image');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

subplot(1, 2, 2), imagesc(mat2gray(im2)), title('Denoised using
 bilateral filter');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

waitfor(h);

toc;
```

```
RMSE for part c) is 0.147315
Elapsed time is 22.705487 seconds.
```

Part d)

Removing Poisson Noise for im

```
tic;
```

```
im1 = poissrnd(im);
im2 = myPCADenoising2(sqrt(im1), 0.5);
im3 = im2.^2;
rmse_d = sqrt( sum(sum((im3-im).^2)) / sum(sum(im.^2)) );
fprintf('RMSE for part d) is %f\n', rmse_d);

h = figure;
subplot(1, 2, 1), imagesc(mat2gray(im1)), title('Original Image');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

subplot(1, 2, 2), imagesc(mat2gray(im3)), title('Removing Poisson
 Noise');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

waitfor(h);

toc;
```

```
RMSE for part d) is 0.037535
Elapsed time is 170.789775 seconds.
```

Part e)

Removing Poisson Noise for low exposure image

```
tic;

im_low = im/20;
im1 = poissrnd(im_low);
im2 = myPCADenoising2(sqrt(im1), 0.5);
im3 = im2.^2;
rmse_e = sqrt( sum(sum((im3-im_low).^2)) / sum(sum(im_low.^2)) );
fprintf('RMSE for part e) is %f\n', rmse_e);

h = figure;
subplot(1, 2, 1), imagesc(mat2gray(im1)), title('Low-exposure Image');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

subplot(1, 2, 2), imagesc(mat2gray(im3)), title('Removing Poisson
 Noise for low exposure image');
daspect([1 1 1]);
colormap(myColorScale); axis tight; colorbar;

waitfor(h);

toc;
```

```
RMSE for part e) is 0.110380
Elapsed time is 182.155738 seconds.
```

Published with MATLAB® R2018a