```matlab
%Pratap Luitel
%ENGS 111, HW2 Part C
%This script plots multiple versions of an image, 'WallPaper-1.tif'
%by applying the unsharp mask from the function enhance by varying the
%associated paramerters k1,k2,r0 and n.


filename='WallPaper-1.tiff';
imIn=imread(filename);
imIn=rgb2gray(imIn); %intensity image
imIn=im2double(imIn);%image type double
k1=1;
k2=[0,1,5];
ro=[1,5,10];
n=[1,5,10];


index=1;
for i = 1:3
    for j=1:3
        for k=1:3
            imOut=enhance(imIn,[k1,k2(k),ro(j),n(i)]);

            %converting numeric vals to string for title
            k2Str=num2str(k2(k));
            roStr=num2str(ro(j));
            nStr=num2str(n(i));
            figure(i)

            subplot(3,3,index);
            %positionVector=[left, bottom, width, height]
            %subplot('Position',positionVector)
            imshow(imOut);
            title(['k1=1 k2=' k2Str ' r0=' roStr ' n=' nStr])
            index=index+1;
            if mod(index,9)==1
                index=1;
            end

        end
    end
end
    %plotting half of original and half of output image based on the
    %parameters selected from visual analayis of plotting multiple images
    %in the script above.
    figure
    [nRow,nCol]=size(imIn);
    subplot(131)
    imOut=enhance(imIn,[1,2,5,5]);
    imOut(1:nRow/2,1:nCol)=imIn(1:nRow/2,1:nCol);
    imshow(imOut);
    title('k1=1, k2=1, ro=5, n=5')
```

```
subplot(132)
imOut=enhance(imIn,[1,4,5,5]);
imOut(1:nRow/2,1:nCol)=imIn(1:nRow/2,1:nCol);
imshow(imOut);
title('k1=1, k2=5, ro=5, n=5')


subplot(133)
imOut=enhance(imIn,[1,10,5,5]);
imOut(1:nRow/2,1:nCol)=imIn(1:nRow/2,1:nCol);
imshow(imOut);
title('k1=1, k2=10, ro=5, n=5')

fprintf('To implement the unsharp mask, I implemented the \n');
fprintf('butterworth High Pass Filter. The filter is a function of\n');
fprintf('the radius from the center of the image, ro and n. \n')
fprintf('\n');

fprintf('First I explored the output by passing in multiple variables\n');
fprintf('After visually accessing the output images, I chose some \n');
fprintf('variables that I thought were producing better results \n');
fprintf('Using those values, I have plotted 3 images with original \n');
fprintf('enhanced image stacked together.\n');
```

To implement the unsharp mask, I implemented the butterworth High Pass Filter. The filter is a function of the radius from the center of the image, ro and n.

First I explored the output by passing in multiple variables After visually accessing the output images, I chose some variables that I thought were producing better results Using those values, I have plotted 3 images with original enhanced image stacked together.

k1=1 k2=0 r0=1 n=1   k1=1 k2=1 r0=1 n=1   k1=1 k2=5 r0=1 n=1

k1=1 k2=0 r0=5 n=1   k1=1 k2=1 r0=5 n=1   k1=1 k2=5 r0=5 n=1

k1=1 k2=0 r0=10 n=1   k1=1 k2=1 r0=10 n=1   k1=1 k2=5 r0=10 n=1

k1=1 k2=0 r0=1 n=5   k1=1 k2=1 r0=1 n=5   k1=1 k2=5 r0=1 n=5
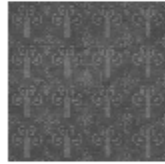
k1=1 k2=0 r0=5 n=5   k1=1 k2=1 r0=5 n=5   k1=1 k2=5 r0=5 n=5
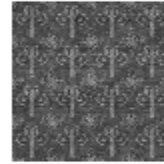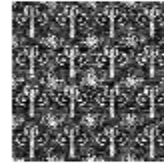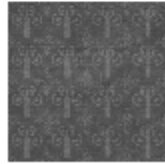
k1=1 k2=0 r0=10 n=5   k1=1 k2=1 r0=10 n=5   k1=1 k2=5 r0=10 n=5
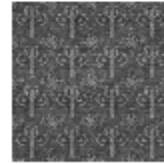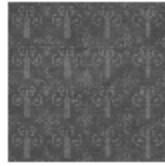
k1=1 k2=0 r0=1 n=10 k1=1 k2=1 r0=1 n=10 k1=1 k2=5 r0=1 n=10

k1=1 k2=0 r0=5 n=10 k1=1 k2=1 r0=5 n=10 k1=1 k2=5 r0=5 n=10

k1=1 k2=0 r0=10 n=10 k1=1 k2=1 r0=10 n=10 k1=1 k2=5 r0=10 n=10
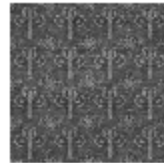
k1=1, k2=1, ro=5, n=5 k1=1, k2=5, ro=5, n=5 k1=1, k2=10, ro=5, n=5

Published with MATLAB® R2014a