Matlab Exercise 2a - (To be handed in on December 13, 2010)

Properties of the Fourier Transform - Practical Example in Imaging

First, read-in two images that can be found in the Matlab environment. The images are: 'saturn.png' and 'cameraman.tif'. Convert the saturn image to greyscale, and then convert both of them to double precision.

Next, apply a 2D Fourier transform to both of them. After that, take the Fourier transform of the saturn image and replace its phase with the phase of the cameraman image. Likewise, take the Fourier transfrom of the cameraman image, and replace its phase with the phase of the saturn image.

Apply the inverse 2D Fourier transform to both outputs from the previous step to get back to the image domain.

Plot the two images you read in the start together with the outputs of this procedure. What do you see? What does this imply about the Fourier transform components and the information content in the image?

You can make use of the following code, if you are stuck:

```
S=imread('saturn.png');
C=imread('cameraman.tif');

S=rgb2gray(S);

siC=size(C);
S=imresize(S,[siC(1) siC(2)]);

fftC=fft2(C);
fftS=fft2(S);
fftCAmp=abs(fftC);
fftCPha=angle(fftC);
fftSAmp=abs(fftS);
fftSPha=angle(fftS);
fftAmpSPhaC=fftSAmp.*exp(i.*fftCPha);
fftAmpCPhaS=fftCAmp.*exp(i.*fftSPha);
ampSPhaC=ifft2(fftAmpSPhaC);
ampCPhaS=ifft2(fftAmpCPhaS);

imshow(C,[]), figure, imshow(S,[]), figure, imshow(ampCPhaS,[]),figure,
imshow(ampSPhaC,[]);
```