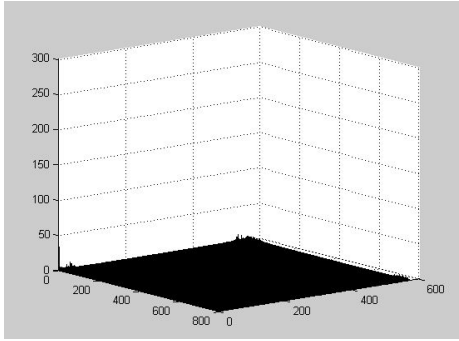


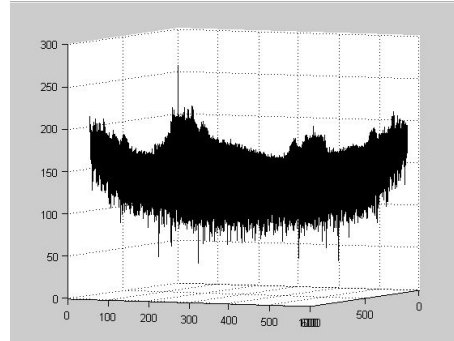
CA4007

Image Processing Assignment 1

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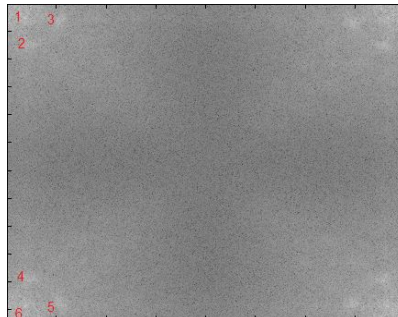
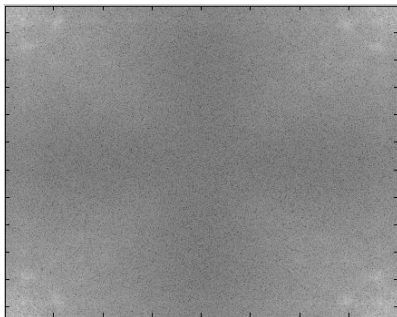


```
surf(256*abs(y)/max(max(abs(y))));
```

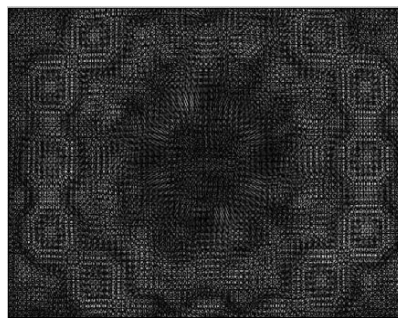


```
surf(256*log(abs(y))/max(max(log(abs(y))));
```

Firstly to see where the majority of the data is contained i looked at a surf plot of the Fourier Transform(FT). From the surf plot we can see that the bulk of the data is contained in the four corners, This becomes even more apparent when we display the log to account for the spike at 1,1 which represents the average brightness of the image.



After displaying the image of the FT the first structure we can see is the 12 spikes located in the corners. numbered them 1-6, as their diagonal counterparts are their symmetrical image i didn't number them.



Applying a mask to the FT as shown we can see that these spikes contain a large proportion of the data describing the overall shape of the image. When we look the each spike individually we can also see some interesting structure.

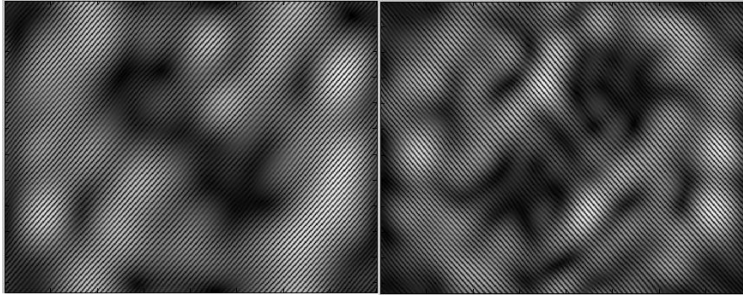


Image of spike 1 and spike 6

Looking at spikes 1 and 6 we can see that they contain zero values traveling in uniform diagonal lines. Along with this we can see the images are actually flipped images of each other as indicated by the change in direction of the lines and also the black center pattern

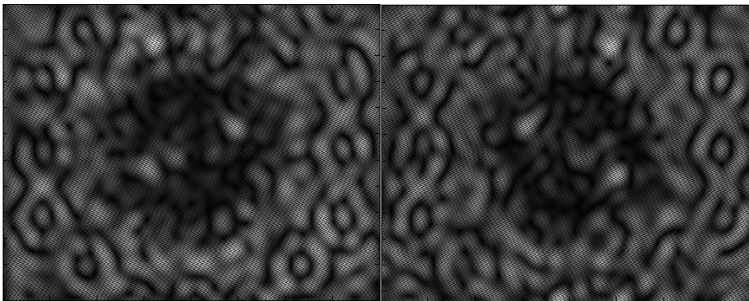


Image of spikes 2 and 4

It is hard to see in this image but looking at spikes 2&4 they have the same structure as 1&6 being that they are flipped images of each other and also contain a pattern of zero values except the pattern is in the shape of a sawtooth pointing in a horizontal direction.

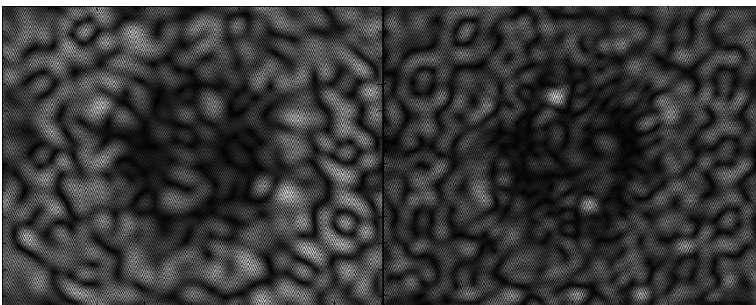
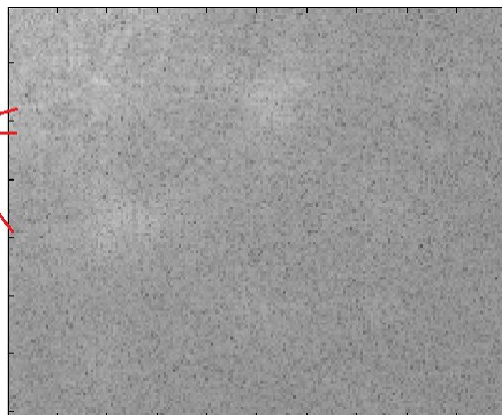


Image of spikes 3 and 5

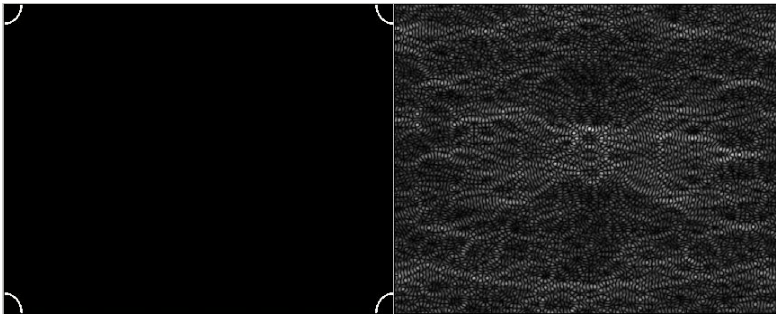
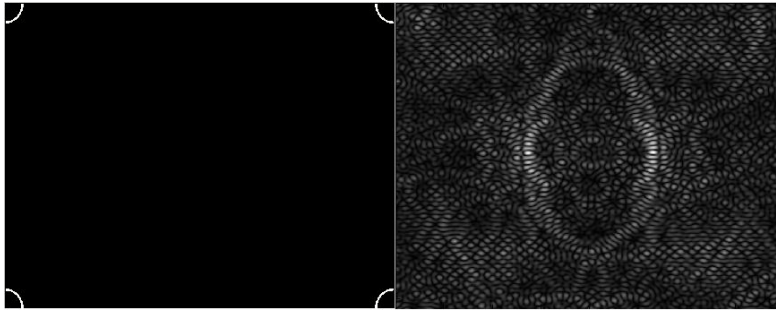
3&5 are again the same, both are flipped images of each other and they contain the sawtooth pattern however they also appear to be the same image as 2&4 but rotated 90 degrees as indicated by the diamond pattern and also how the sawtooth pattern is now facing a horizontal direction

The reason for this is because the spikes are in circular pattern centered at the origin of the FT.

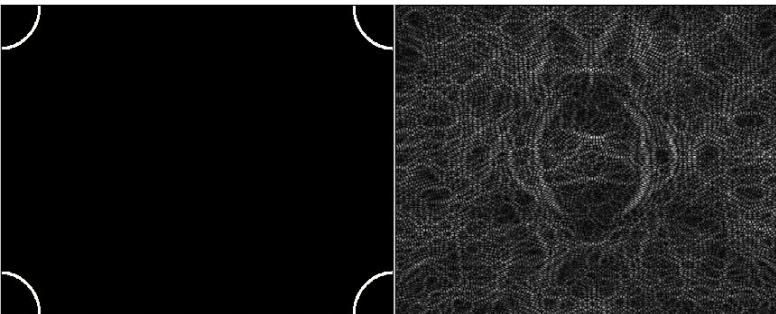
When we zoom in on the corners of the FT we can see that there are 3 ring shaped patterns.



Zooming into the corners of the FT show another interesting structure which is a ring at each corner. I created a mask so I could see what information these rings carried.



```
function mask =  
createCircleMask(cx,cy,ix,iy,r  
)  
[x,y]=meshgrid(-(cx-1):(ix-cx)  
,-(cy-1):(iy-cy));  
mask=((x.^2+y.^2)<=r^2);  
image(256*mask);
```



Applying the above masks to each of the rings show they contain the information on the individual diamond structures that makes up the mosaic image where each ring represents a different sized diamond. The smaller the ring the larger the diamond it relates to. The reason for this is due to the effect of scaling on the FT. As each diamond has the same structure changing the scale to be smaller squeezes the waves making the frequencies higher and as such creating a larger ring in the FT. Along with this we can see interference in the waves caused by the diamonds being shifted versions of each other this is easily identifiable by the lighter lines in the first ring shown in the zoomed in picture of the FT.