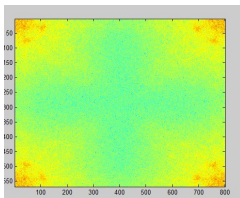


ca4007 Assignment 1 - Mosaic Image

To complete this assignment I fourier transformed the image and tried to isolate any of the unique structures that could be seen in the transform. I attempted to determine what shapes in the fourier transform corresponded to the shapes in the image. I looked for any shapes that could create the obvious shapes in the mosaic image. For example circles, diagonal lines and straight lines.

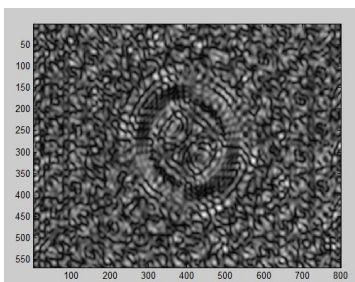
The first thing I did was colormap the fourier transform to jet as can be seen below. I believe this gives a very clear indication of where most of the information of the image lies. It can be seen below that the majority of the image information is in the four corners of the fourier transform.



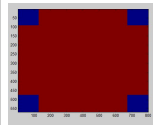
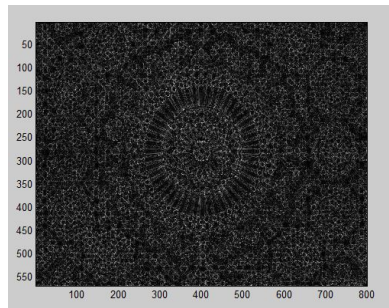
The corners contain a lot of information, to check this theory I masked off everything but the top left corner.

```
>> mask = zeros(569,800);  
>> mask(1:50,3:80) = 1;
```

this resulted in an interesting image that can be seen below. There is quite a lot of detail available considering the amount of information that is not included. The circle in the middle is very clearly distinguishable which might not be expected from such a small portion of the information available.



The next task I completed was masking out all the information in the image except for the four corners of the fourier transform. This should return an image with quite a lot of detail omitted as the corners contain most of the image details. As can be seen in the image below this is the case. Only the finest details are available and it is difficult to make out most of the shapes

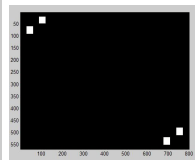
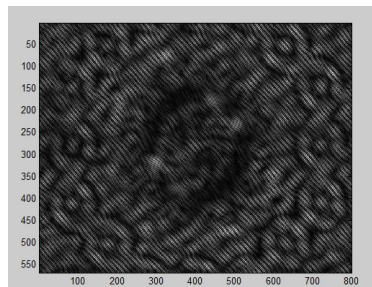


note: Blue is the mask - red is being shown.

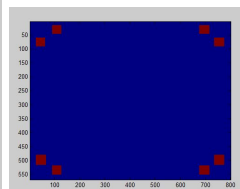
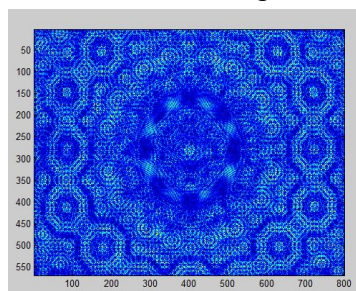
By decreasing the size of the mask i.e. make each of the squares smaller a much clearer image was produced although not quite perfect. It is difficult to see the difference between this image and the previous one so I won't attach it here.

In the fourier transform in each of the corners there are four very distinguishable circular dots. To investigate these dots I created a mask like below.

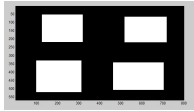
You can see that everything has been masked out except for four of the circular dots. This produced the below image:



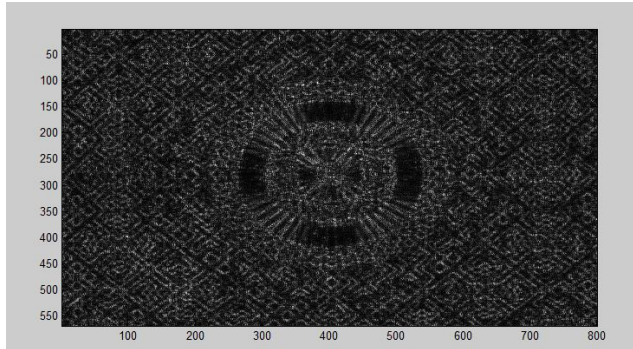
It's not a very clear image but you can see that some circles have formed. I decided to create a mask that allowed all eight dots of the image to be shown. the same as the mask in the image above except that the dots in all corners are included. I assumed that this would produce an image with lots of circles and it did as can be seen below. This means that the majority of the information pertaining to the circles of the mosaic image are in the eight dots in the corners.



I wanted to find out where the straight lines in the image were coming from. When first looking at the grayscale version of the fourier transform it's hard to see where the straight lines could be. If you look at the jet version you can see there is some straight line information away from the corners. This is the mask I created to try and uncover the lines:

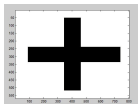


It allows the information away from the corners to be included. This is the image that the mask created:

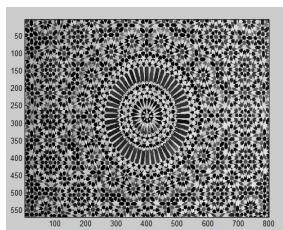


You hopefully can see in the above image that only straight lines from the mosaic image are being shown. So this indicates that a lot of the straight line information is in the areas that have been let through the mask. Whereas the circular information is mainly in the eight dots of the image.

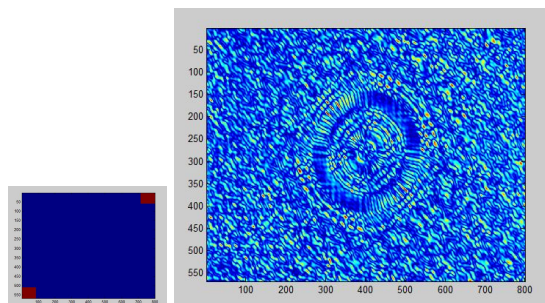
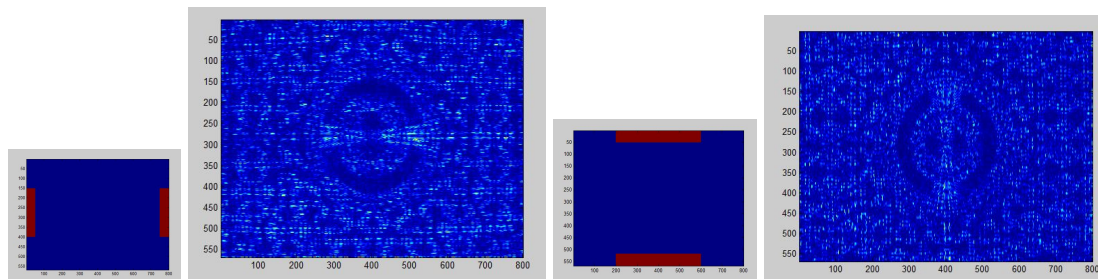
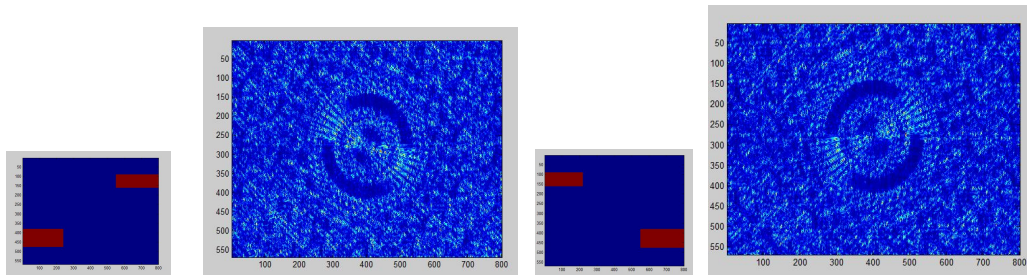
In the jet colored version the fourier transform there is a very blue cross in the middle. this indicates a very low heat signature i.e. there is very little information in the center of the image. I thought that an almost perfect image could be created with any of the information in the blue area so I created the below mask:



The image created from this mask was almost perfect which re enforces the fact that the images information is in the corners of the fourier transform. here's the image:



Below are four masks and the images which were created using the masks. They show exactly where the straight lines are located for the image. In the center of each of the images there are straight lines and interestingly you can isolate the straight lines depending on the mask you use. For instance in the last image below only the vertical lines are shown. There is still a lot of information for the straight lines in the very corners of the fourier transform so it is difficult to remove them.



- The image shown was created using the mask to the left. It shows that the diagonal lines come from the corners of the fourier transform. In the image you can see that the mask is showing the lines travelling is this direction ↘. The dots in the fourier transform have not been included in this mask. The same effect could be achieved by creating a mask in the other two corners which would show an image moving in this direction ↗.