**CE-712: Digital Image Processing of Remotely Sensed Data**

**Laboratory Exercise #**

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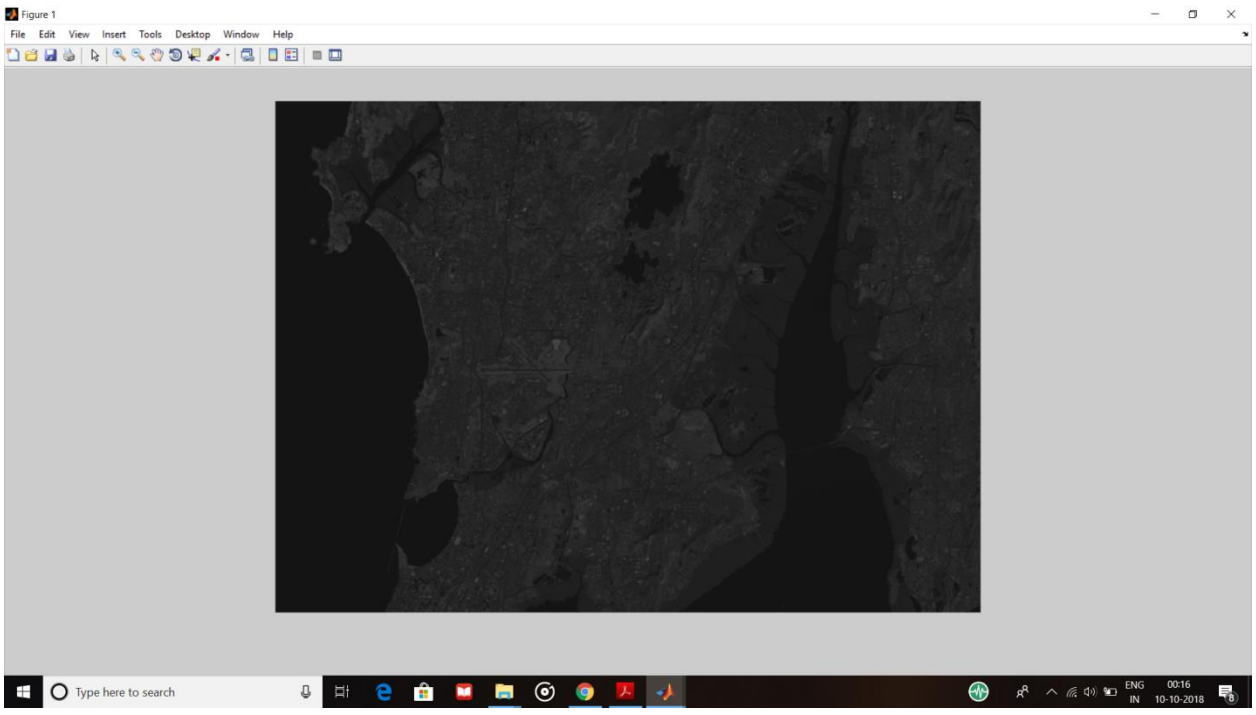
# 1.

## LOW-PASS FILTER

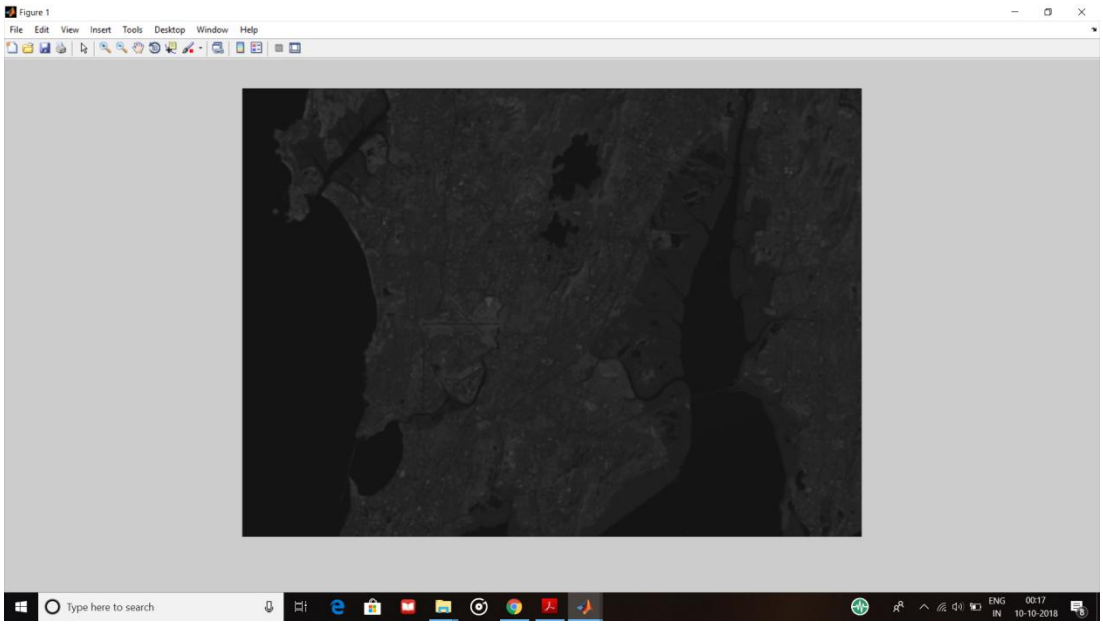
```
b =

     0     0     0
     0     1     0
     0     0     0
```

Fliter used :

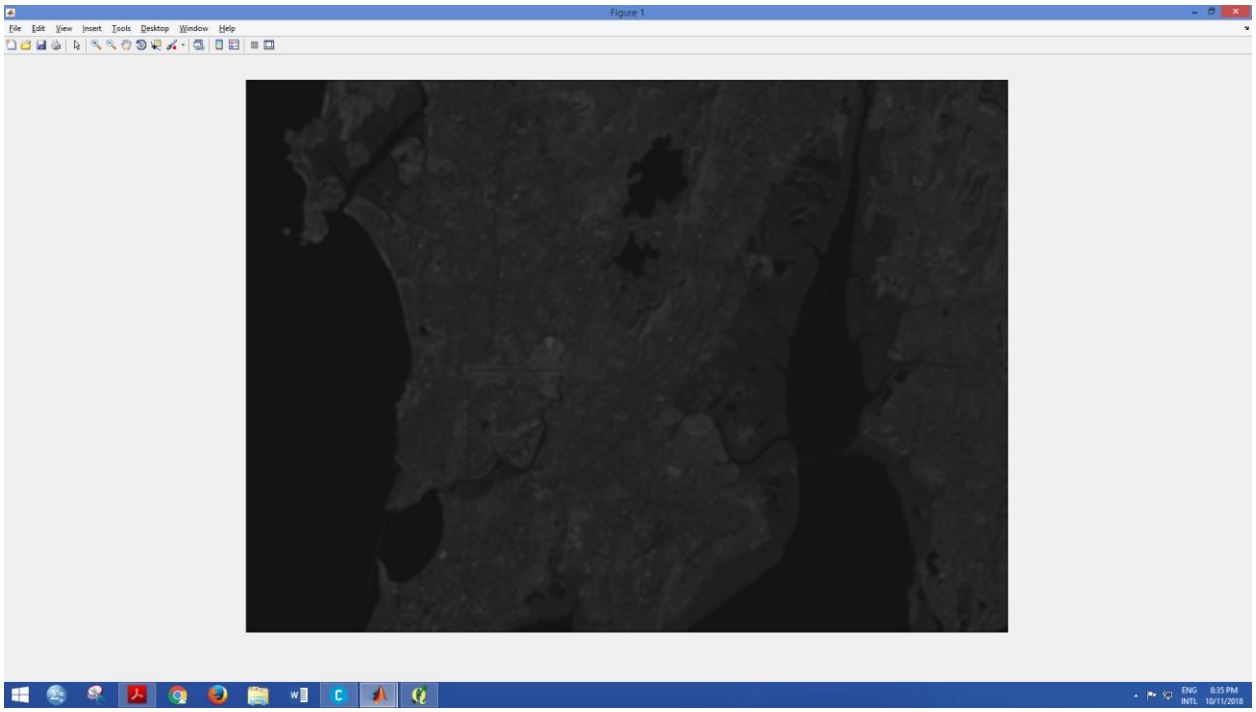


```
a =

     1     1     1
     1     1     1
     1     1     1
```

Fliter used :



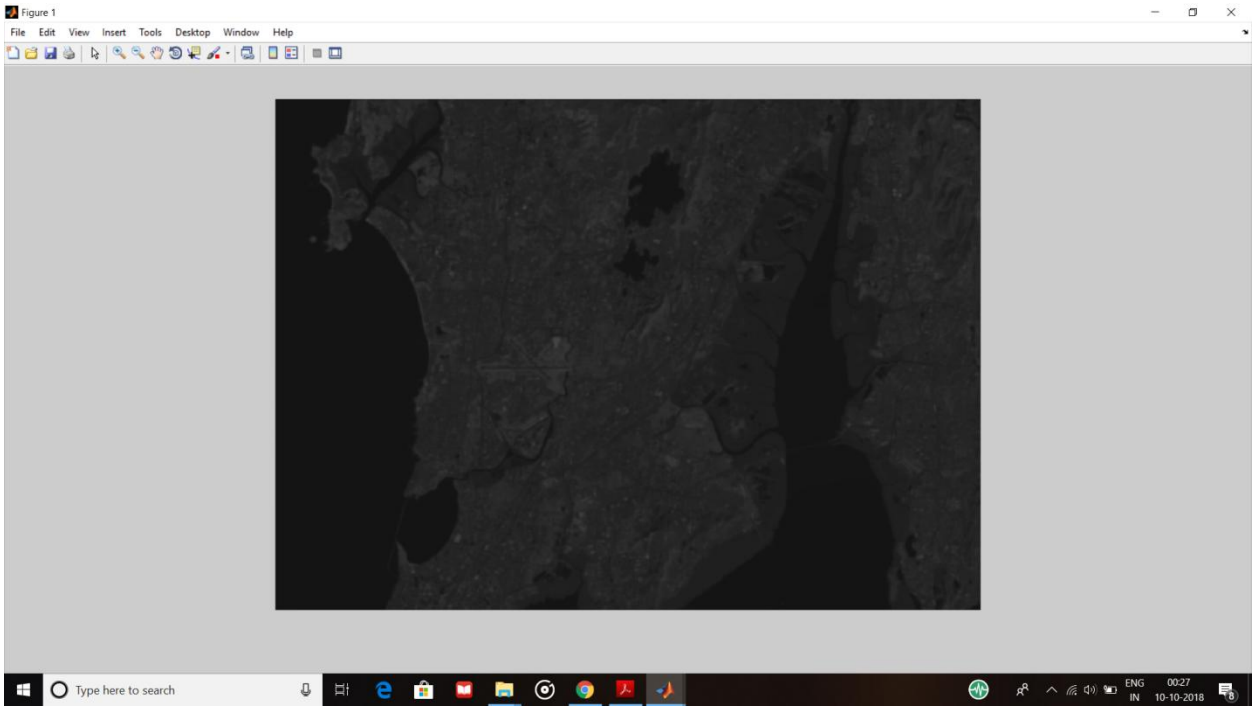

Here filter used is 5*5 identity matrix.



On increasing the kernel size the image becomes more blurred(or smoother ). The resulting value of the pixel is being processed out from its surrounding pixels. So bigger is the kernel size, more is no. of surrounding pixel values used to obtain that resulting pixel value. Hence the values of pixel are the close to each other.

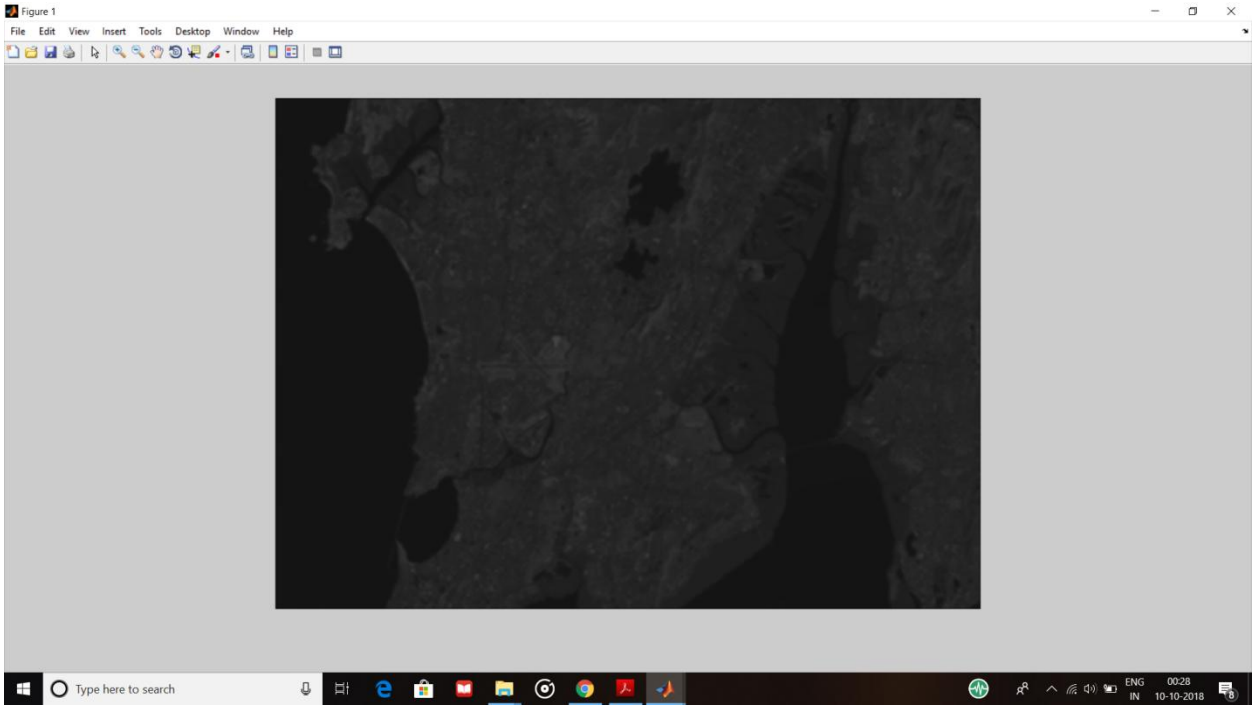
```
c =

     0     0     1     0     0
     0     0     1     0     0
     1     1     1     1     1
     0     0     1     0     0
     0     0     1     0     0
```

Fliter used :



```
d =

     1     0     0     0     1
     0     1     0     1     0
     0     0     1     0     0
     0     1     0     1     0
     1     0     0     0     1
```

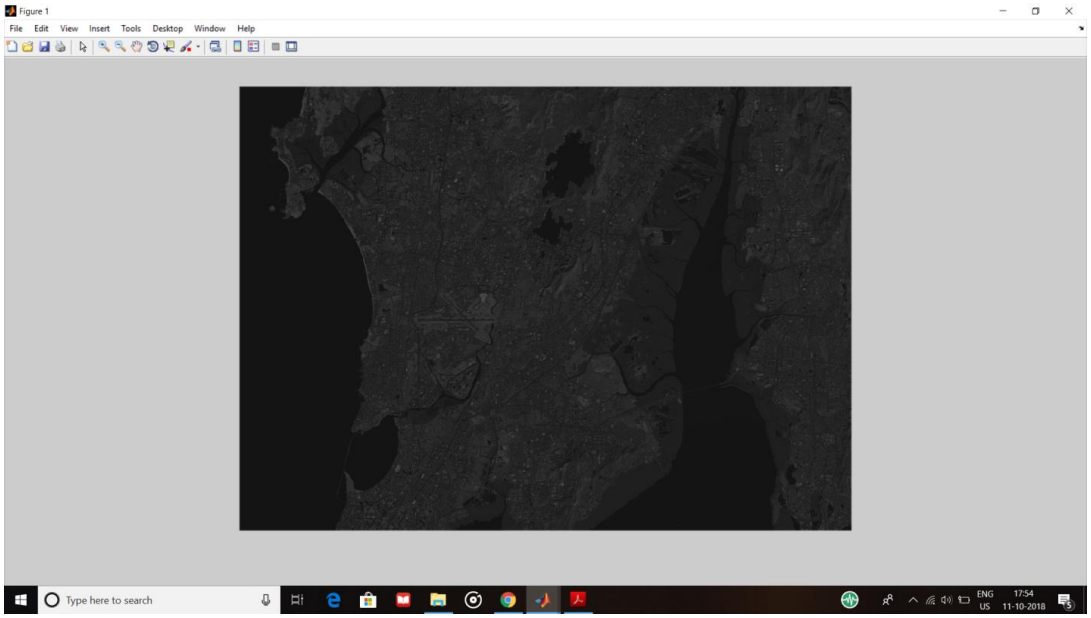
Fliter used :



# HIGH-PASS FILTERS

```
h =

    -1    -1    -1
    -1    16    -1
    -1    -1    -1
```

Fliter used :




Code Used:

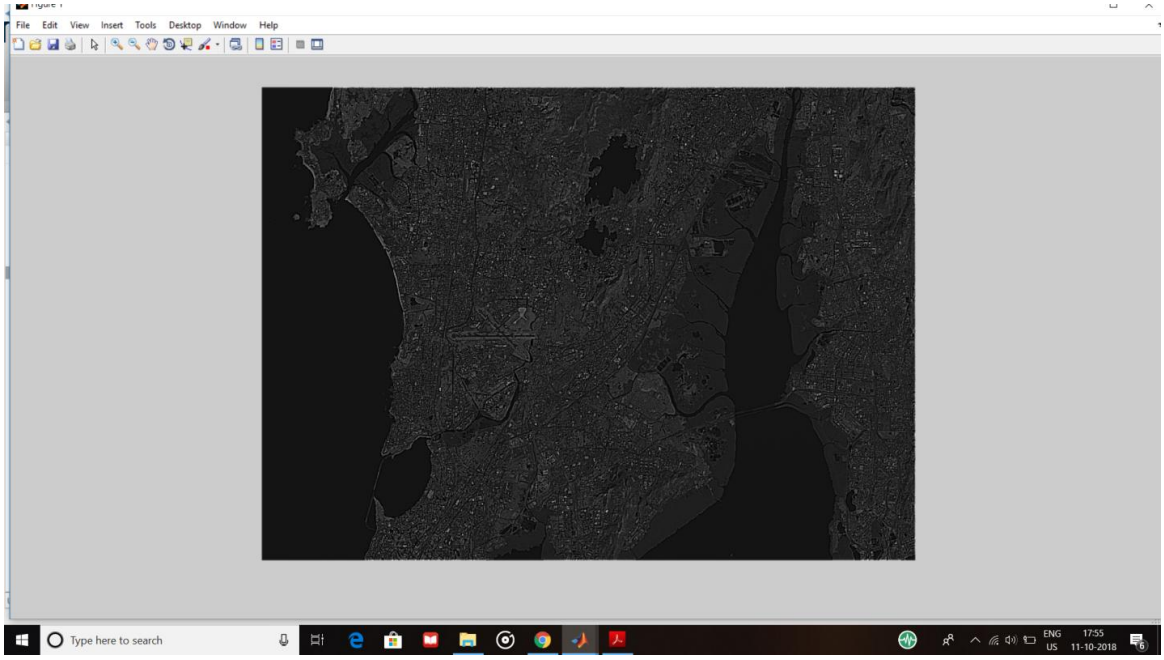
```
high=h./8;
b6_high = imfilter(B6_mumbai,high);
imshow( b6_high)
```

Code used:

```
high=g;
b6_high = imfilter(B6_mumbai,high);
imshow( b6_high)
```

```
g =

    -1    -1    -1
    -1     9    -1
    -1    -1    -1
```

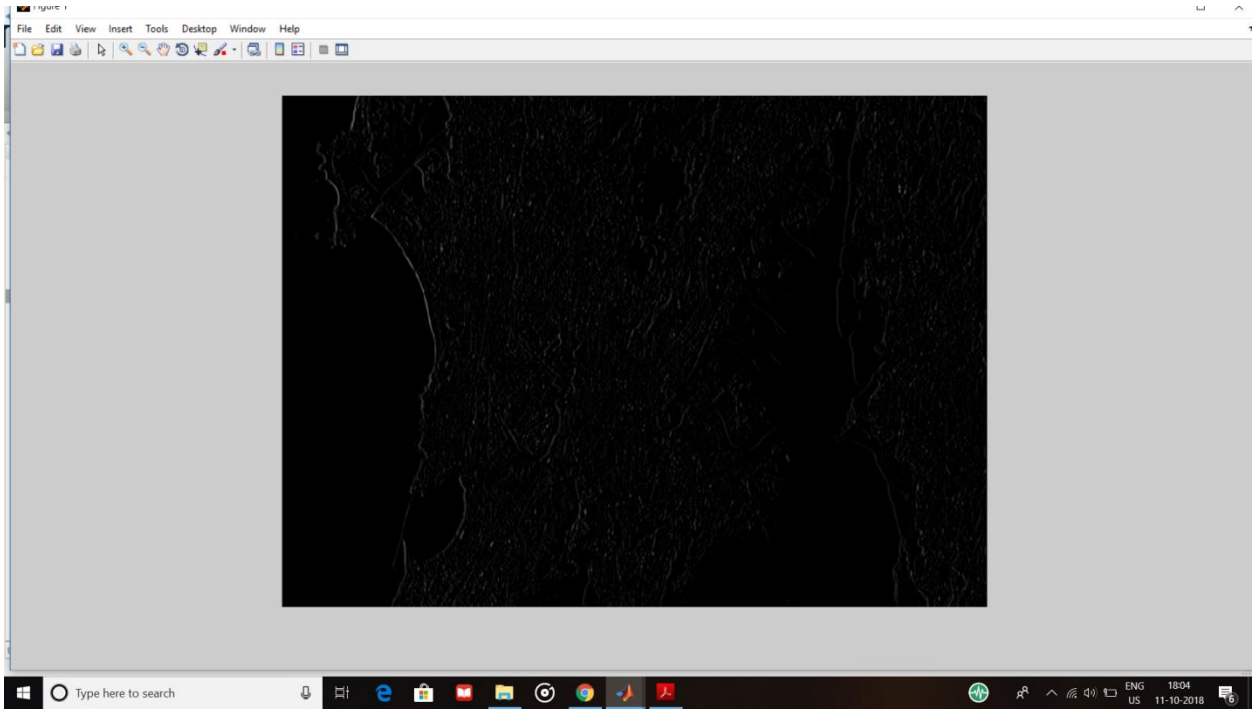
Fliter used :




The image in which filter of matrix having central element 9 is more sharper than that having central element 16. Then abrupt changesin the Digital number is enhanced more in the filter ‘g’ than that of filter ‘h’.

## HORIZONTAL MASK

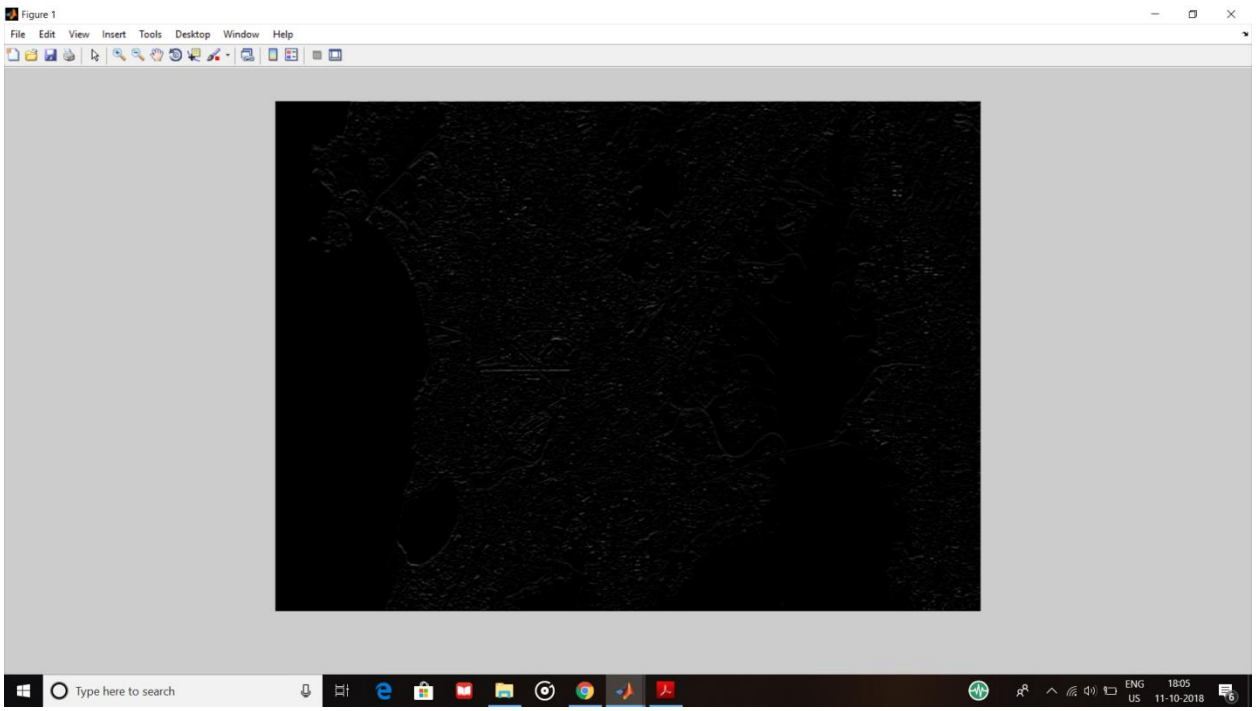
```
t =

    -1     0     1
    -1     0     1
    -1     0     1
```




Horizontal mask as name suggests masks(filters out) the horizontal edges. Hence, all we can see in the image is vertical edges whihch are enhance with the above used filter ‘t’.

## VERTICAL MASK

```
    -1    -1    -1
     0     0     0
     1     1     1
```




Likewise, Vertical mask as name suggests masks(filters out) the vertical edges. Hence, all we can see in the image is horizontal edges whihch are enhance with the above used filter ‘t’.

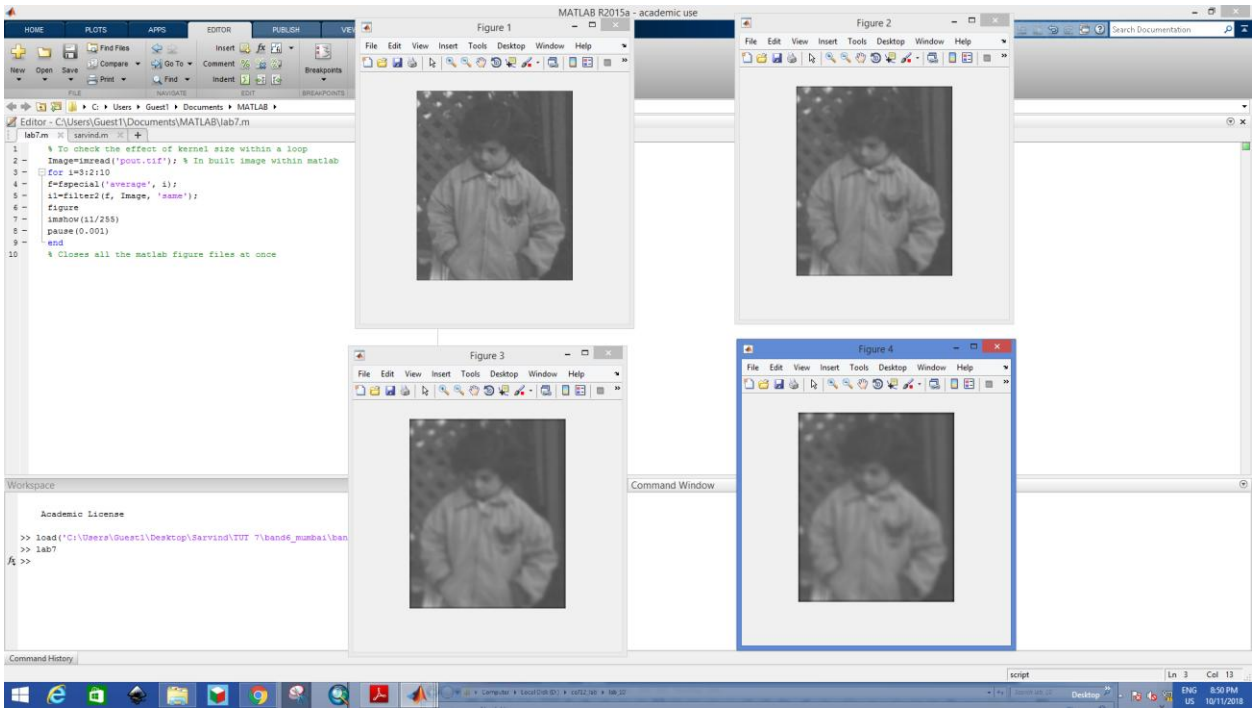
## 3. Difference between filter2 and imfilter

Y = filter2( H , X ) applies a finite impulse response filter to a matrix of data X according to coefficients in a matrix H. filter2 implements correlation imfilter does the same as filter2 but with lots of extra features, such as handling different data types, handling colour images, switching the algorithm between correlation and convolution, and offering more options than conv2 and filter2 for what happens at the image boundaries.

```
g =

    -1    -1    -1
    -1     9    -1
    -1    -1    -1

high=g;
b6_high = filter2(high,B6_mumbai,'same');
imshow( b6_high)
```

After executing the above shown code we obtained the following image

**4.**


MATLAB R2015a - academic use
Figure 1
Figure 2
Figure 3
Figure 4
Editor - C:\Users\Guest1\Documents\MATLAB\lab7.m
% To check the effect of kernel size within a loop
Image=imread('pout.tif'); % In built image within matlab
for i=3:2:10
f=fspecial('average', i);
i1=filter2(f, Image, 'same');
figure
imshow(i1/255)
pause(0.001)
end
% Closes all the matlab figure files at once
Workspace
Command Window
Academic License
>> load('C:\Users\Guest1\Desktop\Sarvind\TUT 7\band6_mumbai\ban
>> lab7
>>
Command History

We can see that with increase in kernel size the image is becoming more smoother/ blurr. The resulting value of the pixel(digital number) is being processed out from its surrounding pixels. So bigger is the kernel size, more is no. of surrounding pixel values used to obtain that resulting pixel value. Hence the values of pixel are the close to each other.hence the image is blurr or we can say smooth.

Also with increase in kernel size, the edge pixels have values zero(DN=0) , hence we can see dark borders with increasing iteration.

## CONCLUSION

In the lab we learned to apply filter to images in matlab using imfilter function. There are other functions which are also used like filter2, fspecial etc. Low pass filter are used filter out the abrupt changes in digital numbers by averaging out it with surrounding digital numbers. We also realized the effect of increasing the kernel size and came to a conclusion that increasing kernel size increases the smoothness of the image.

High pass filter on ther hand glorifies /enhances the abrupt changes in the digital numbers. Chnaging the coefficients of the filter increases or decreases the efficiency of the high pass filter.

Thereby we went on exploring about edge enhancers where we used a horizontal and vertical mask and observed the images .