LAB-9

Aim: Image filtering in spatial and frequency domain

Code:

Low Pass Filter (Frequency domain):

```
--> xdel (winsid());
Warning: Feature xdel(…) is obsolete and will be permanently removed in Scilab 6.2
Warning: Please use close(…) instead.

--> fc = input ("Enter Analog cutoff freq. in Hz=") //250
Enter Analog cutoff freq. in Hz=250

 fc =

   250.

--> fs = input (" Enter Analog sampling freq. in Hz=")
 Enter Analog sampling freq. in Hz=2000

 fs  =

   2000.

--> M = input ("Enter order of filter =")//4
Enter order of filter =4

 M =

   4.

--> w = (2* %pi)*(fc/fs);

--> disp (w, ' Digital cutoff frequency in radians. cycles/samples');

   0.7853982

  " Digital cutoff frequency in radians. cycles/samples"
```

```
--> wc = w/%pi;

--> disp (wc, 'Normalized digital cutoff frequency in cycles /samples');

  0.25

 "Normalized digital cutoff frequency in cycles /samples"

--> [wft,wfm,fr]=wfir('lp',M+1,[wc/2,0],'re' , [0,0]);

--> disp(wft, 'Impulse Response of LPF FIR Filter:h[n} =');

  0.1591549  0.2250791  0.25  0.2250791  0.1591549

 "Impulse Response of LPF FIR Filter:h[n} ="

--> //Plotting the Magnitude Response of LPF FIR Filter

--> subplot (2,1,1)

--> plot (2*fr, wfm)

--> xlabel ('Normalized Digital Frequency W -------->')

--> ylabel (' Magnitude | H(w) |=')

--> title ( 'Magnitude Response of FIR LPF')

--> xgrid (1)

--> subplot (2,1,2)

--> plot (fr*fs,wfm)

--> xlabel ('Analog Frequency in Hz f - >')

--> ylabel ('Magnitude |H(w) |=')

--> title ('Magnitude Response of FIR LPF')

--> xgrid (1)
```

Spatial domain: Linear filtering & Non-Linear Filtering

```
--> clear

--> clear;

--> close;

--> I=imread("C:\Users\Diksha Nasa\Desktop\Study Material\IT Workshop using
scilab\saltpepperlenna.png");

--> I_noise=imnoise(I,"salt & pepper");

--> figure
 ans  =

Handle of type "Figure" with properties:
=======================================
children: "Axes"
figure_position = [200,200]
figure_size = [626,587]
axes_size = [610,460]
auto_resize = "on"
viewport = [0,0]
figure_name = "Graphic window number %d"
figure_id = 0
info_message = ""
color_map = matrix 33x3
pixel_drawing_mode = "copy"
anti_aliasing = "off"
immediate_drawing = "on"
background =  33
visible = "on"
rotation_style = "unary"
event_handler = ""
event_handler_enable = "off"
user_data = []
resizefcn = ""
closerequestfcn = ""
resize = "on"
toolbar = "figure"
toolbar_visible = "on"
menubar = "figure"
menubar_visible = "on"
infobar_visible = "on"
```

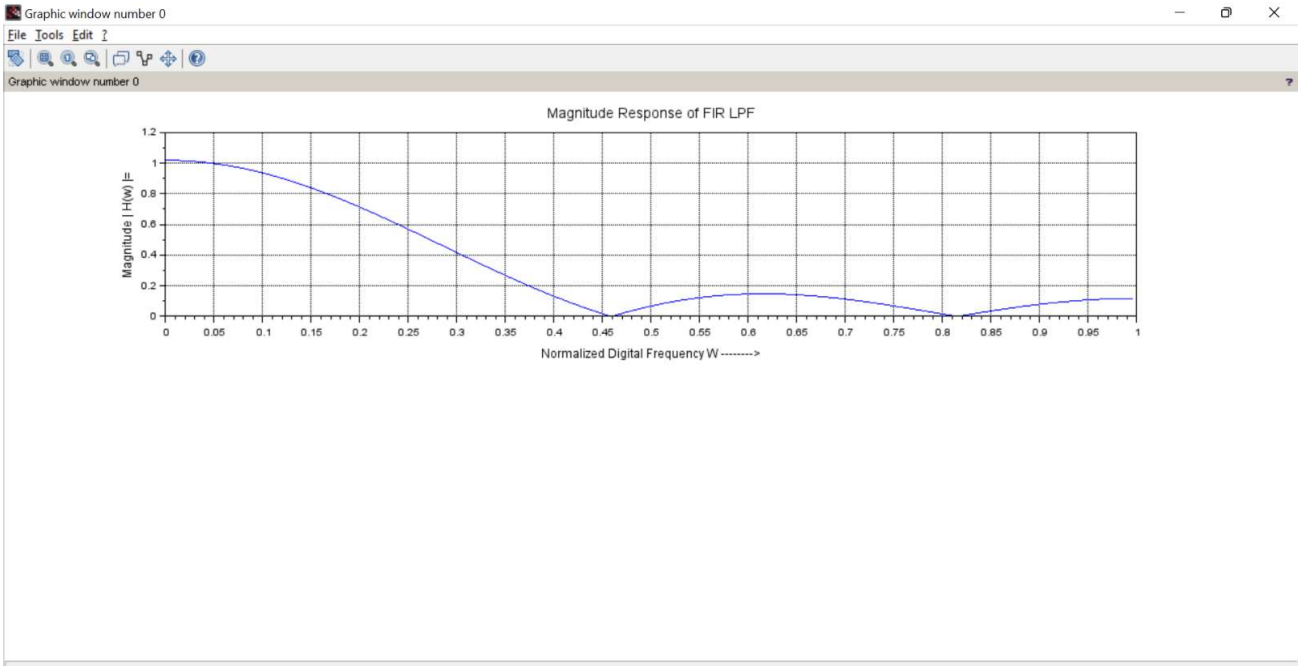
```
dockable = "on"
layout = "none"
layout_options = "OptNoLayout"
default_axes = "on"
icon = ""
tag = ""

--> imshow(I)

--> figure;

--> imshow(I_noise);

--> F_Linear1=1/25*ones(5,5);


--> I_linear1=imfilter(I_noise,F_Linear1);

--> figure
 ans  =

Handle of type "Figure" with properties:
========================================
children: "Axes"
figure_position = [200,200]
figure_size = [626,587]
axes_size = [610,460]
auto_resize = "on"
viewport = [0,0]
figure_name = "Graphic window number %d"
figure_id = 1
info_message = ""
color_map = matrix 33x3
pixel_drawing_mode = "copy"
anti_aliasing = "off"
immediate_drawing = "on"
background =  33
visible = "on"
rotation_style = "unary"
event_handler = ""
event_handler_enable = "off"
user_data = []
resizefcn = ""
closerequestfcn = ""
resize = "on"
```

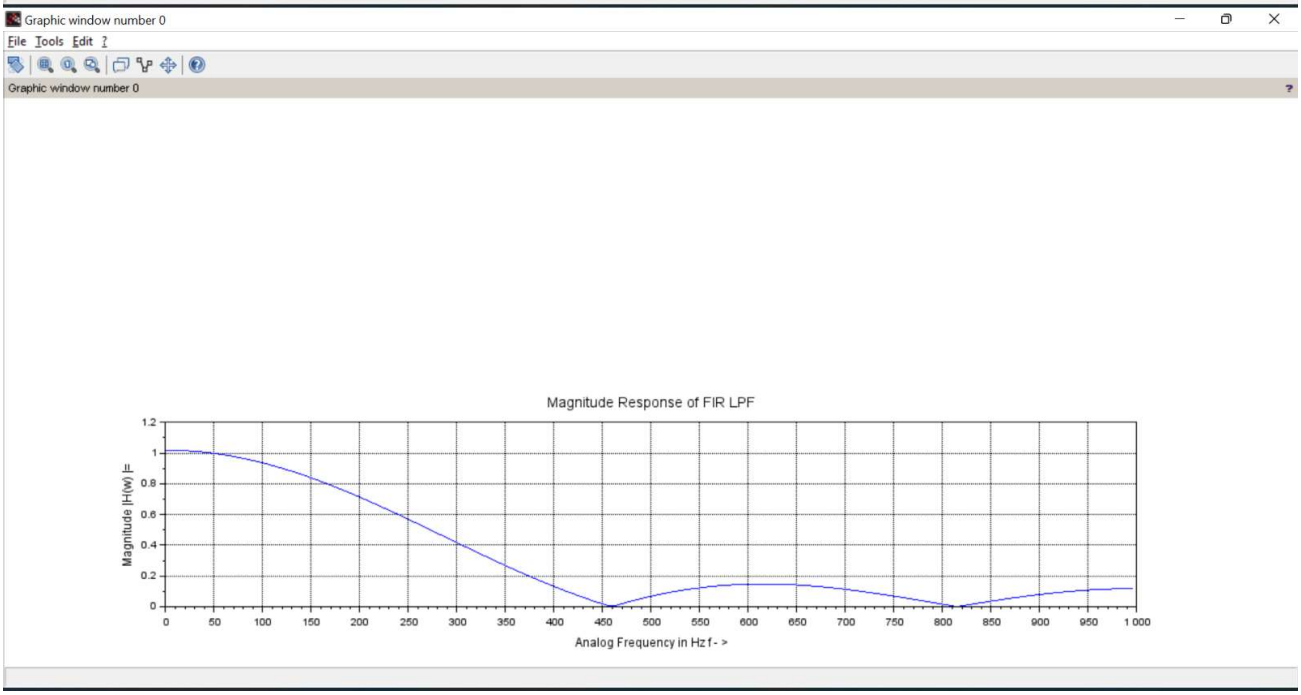
```
toolbar = "figure"
toolbar_visible = "on"
menubar = "figure"
menubar_visible = "on"
infobar_visible = "on"
dockable = "on"
layout = "none"
layout_options = "OptNoLayout"
default_axes = "on"
icon = ""
tag = ""

--> imshow(I_linear1);

--> hsize=[5,5];

--> sigma=1;

--> F_Linear2=fspecial('gaussian',hsize,sigma);

--> I_linear2=imfilter(I_noise,F_Linear2);

--> figure
 ans  =

Handle of type "Figure" with properties:
========================================
children: "Axes"
figure_position = [200,200]
figure_size = [626,587]
axes_size = [610,460]
auto_resize = "on"
viewport = [0,0]
figure_name = "Graphic window number %d"
figure_id = 2
info_message = ""
color_map = matrix 33x3
pixel_drawing_mode = "copy"
anti_aliasing = "off"
immediate_drawing = "on"
background =  33
visible = "on"
rotation_style = "unary"
event_handler = ""
event_handler_enable = "off"
```

```
user_data = []
resizefcn = ""
closerequestfcn = ""
resize = "on"
toolbar = "figure"
toolbar_visible = "on"
menubar = "figure"
menubar_visible = "on"
infobar_visible = "on"
dockable = "on"
layout = "none"
layout_options = "OptNoLayout"
default_axes = "on"
icon = ""
tag = ""

--> imshow(I_linear2);

--> F_NonLinear=[3,3];


--> [m,n]=size(I);


--> for i=2:m-1
 > for j=2:n-1
 > d(i,j)=median([I(i-1,j+1),I(i,j+1),I(i+1,j+1);I(i-1,j),I(i,j),I(i+1,j);I(i-1,j-1),I(i,j-1),I(i+1,j-1)]);
 > end
 > end

--> imshow(d)
```

Output:

Low pass filter :





Spatial Domain Processing: