AMRITA VISHWA VIDYAPEETHAM

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Unit 1 - Sem 4 - 22MAT230

Mathematics for Computing 4

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If you find any mistakes or have any comments to share,

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https://github.com/mfcpjt/MFC4_22MAT230

```
clearvars
clear all
ready = true;
PUBLISH = ready;
```

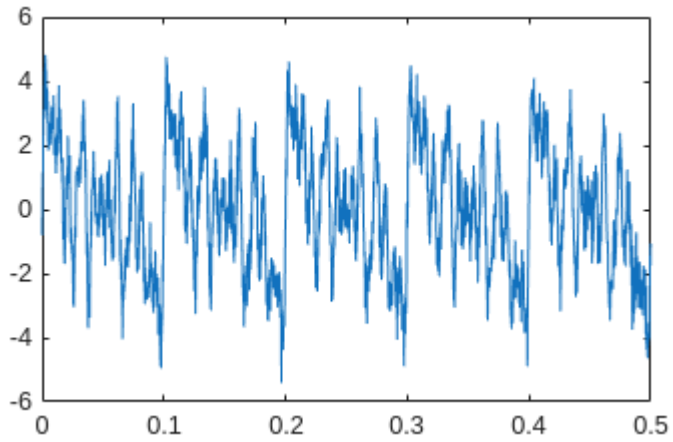
Constructing the noisy signal

```
f = [10 20 30 40 70 100 150];
A = [1 1 1 1 1 1 1];
f1 = 35; % lower cutoff freq
f2 = 80; % upper cutoff freq

N = 2000; % no: samples
T = 0.5; % signal duration
t = linspace(0,T,N+1);
t = t(1:N);
```

Noisy signal

```
y = sum(A.*sin(2*pi*t'*f),2) + 0.5*randn(N,1);
plot(t,y)
```



Analysing the noisy signal using fft

(Analysis)

```
f = (0:N-1)/T;
c = fft(y);
mag = abs(c)/N;
hidx = 1:floor(N/2);
% [peaks,locs] = findpeaks(mag(hidx),"MinPeakHeight",0.2);
% freqs = f(find(mag(hidx)>0.4))
freqs = f(mag(hidx)>0.4)
```

```
freqs = 1×7
    10    20    30    40    70   100   150
```

```
freq_rec = mag(hidx) > 0.4;
f(freq_rec)
```

```
ans = 1×7
    10    20    30    40    70   100   150
```

```
% stem(c(freq_rec))
% freqs = f(locs)
fL = freqs(freqs < f1)
```

```
fL = 1×3
    10    20    30
```

```
fM = freqs(and(freqs < f2,freqs > f1))
```

```
fM = 1×2
    40    70
```

```
fH = freqs(freqs > f2)
```

```
fH = 1×2
   100   150
```

Reconstructing the signal in different bands

(Synthesis)

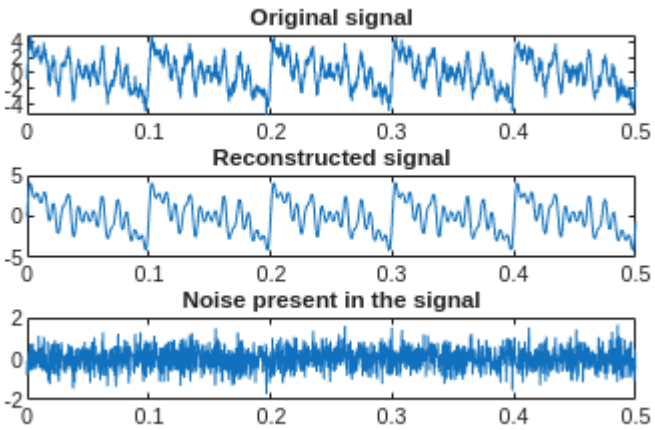
```
yL = sum(sin(2*pi*t'*fL),2);
yM = sum(sin(2*pi*t'*fM),2);
yH = sum(sin(2*pi*t'*fH),2);
```

Plotting

```
np = 3;
figure
subplot(np,1,1)
plot(t,y)
title("Original signal")

subplot(np,1,2)
plot(t,yL+yM+yH)
title("Reconstructed signal")

subplot(np,1,3)
plot(t,(y-(yL+yM+yH)))
title("Noise present in the signal")
```



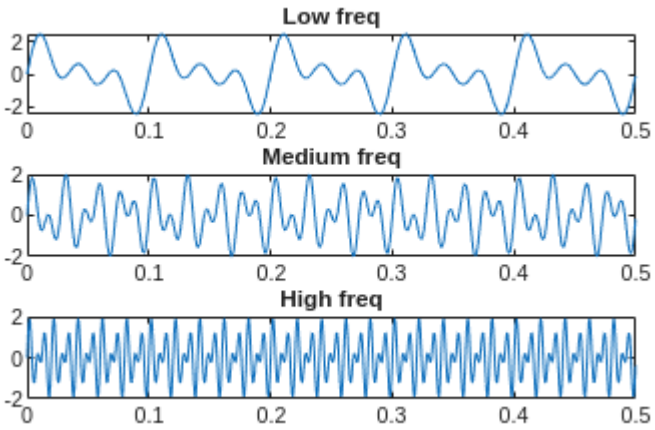

```


figure
subplot(np,1,1)
plot(t,yL)
title("Low freq")

subplot(np,1,2)
plot(t,yM)
title("Medium freq")

subplot(np,1,3)
plot(t,yH)
```

```
title("High freq")
```




```
if(PUBLISH == ready)
    path = '/media/user/DATA4LINUX/new1/Repos/Mine/MFC4_22MAT230/';
    cd(path)
    mlxfile = matlab.desktop.editor.getActive().Filename;
    [~, name, ext] = fileparts(mlxfile);
    outfile = [path, name, ext,'.pdf']
    export(matlab.desktop.editor.getActive().Filename, outfile);
    if ispc
        winopen(outfile);
    elseif ismac
        system(['open ' char(outfile)]);
    else
        system("env -u LD_LIBRARY_PATH xdg-open '" + outfile + "' &");
    end
end
```

```
outfile =
'/media/user/DATA4LINUX/new1/Repos/Mine/MFC4_22MAT230/U1_filtering_fft_reconstruction.mlx.pdf'
```