R11521212 鄭傳嶧 HW10

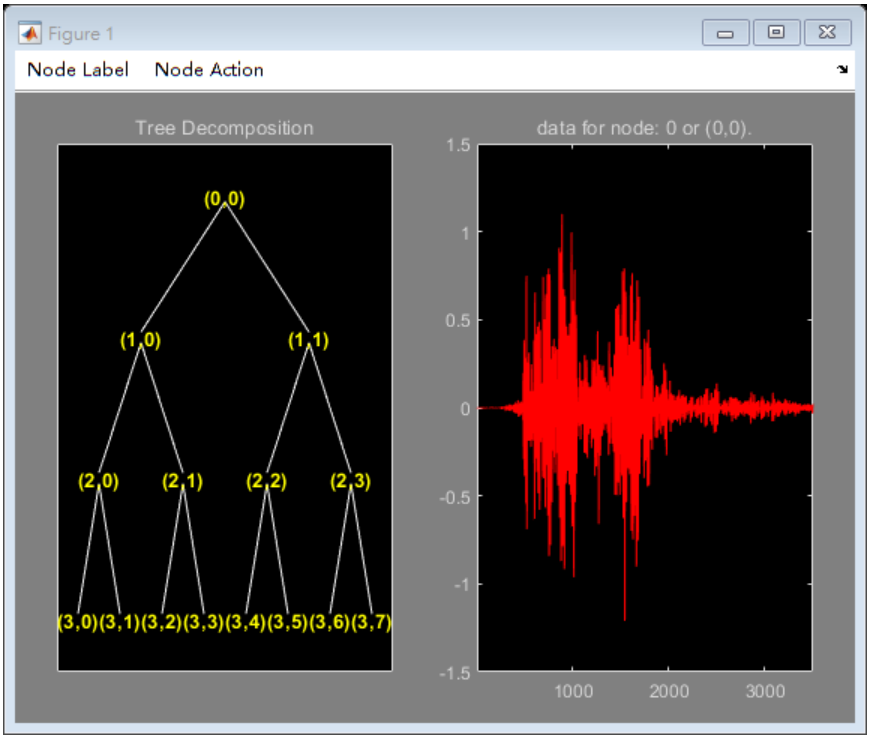
```
clc;clear;close all;
opengl hardware;
```

read data

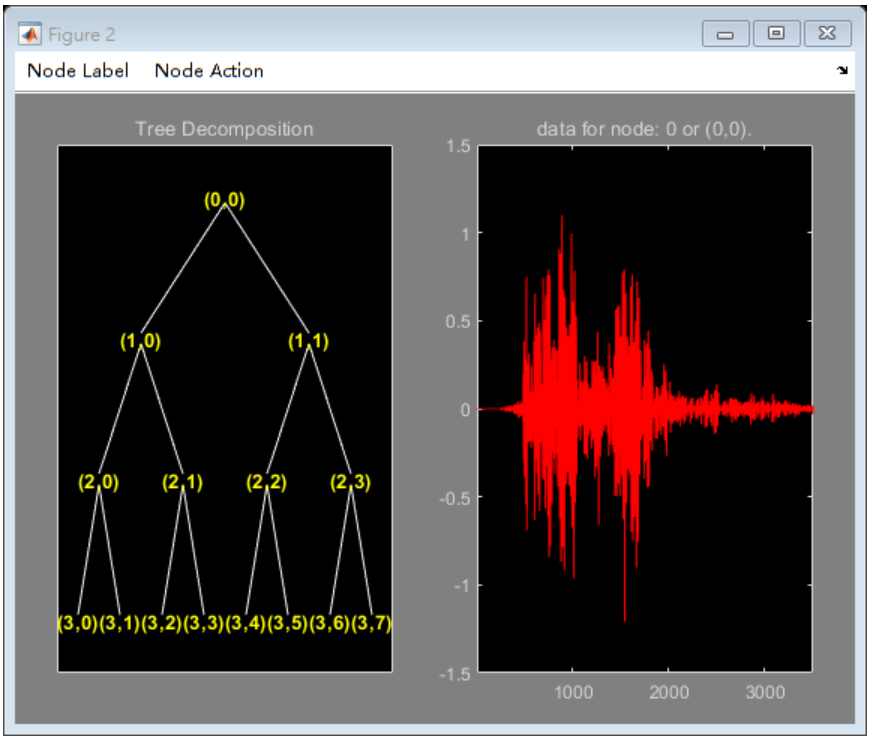
```
[data,txt,raw] = xlsread('Homework-2 data set-RCF-Four Specimen Test Data.xlsx');
dur = 4001:1:18001;
t = data(:,1);
sr = round(1/(t(2)-t(1)));  % sampling rate
```

define data, low pass, down-sample, plot WPT

```
% case 1
RCF6_x = data(dur,3);
RCF6_y = data(dur,2);
relacc1 = RCF6_x - RCF6_y;
x1 = lowpass(relacc1,50,sr);
y1 = downsample(x1,4);
wpt1 = wpdec(y1,3,'db1');
plot(wpt1)
```



```
% case 2
RCF4_x = data(dur,7);
RCF4_y = data(dur,6);
relacc2 = RCF4_x - RCF4_y;
x2 = lowpass(relacc1,50,sr);
y2 = downsample(x1,4);
wpt2 = wpdec(y2,3,'db1');
plot(wpt2)
```



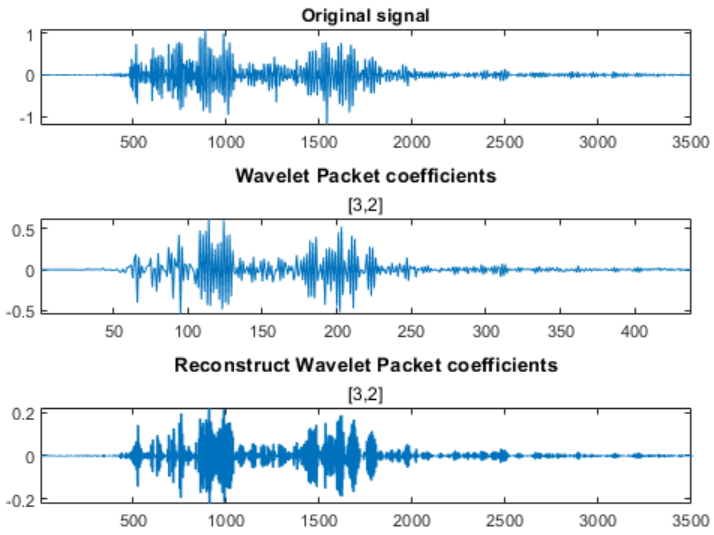

```
str = [y1 y2];
wpt = [wpt1 wpt2];
casename = ['case1'; 'case2'];
titlename = ['[3,2]';'[3,3]';'[3,4]'];
for i = 1:2
    cfs32 = wpcoef(wpt(:,i),[3,2]);
    rcfs32 = wprcoef(wpt(:,i),[3,2]);
    cfs33 = wpcoef(wpt(:,i),[3,3]);
    rcfs33 = wprcoef(wpt(:,i),[3,3]);
    cfs34 = wpcoef(wpt(:,i),[3,4]);
    rcfs34 = wprcoef(wpt(:,i),[3,4]);
    cfs = [cfs32 cfs33 cfs34];
    rcfs = [rcfs32 rcfs33 rcfs34];

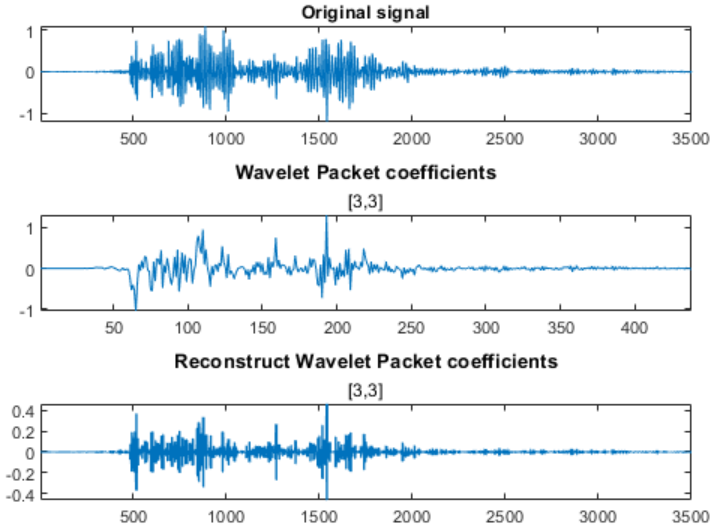
    for j = 1:3
```

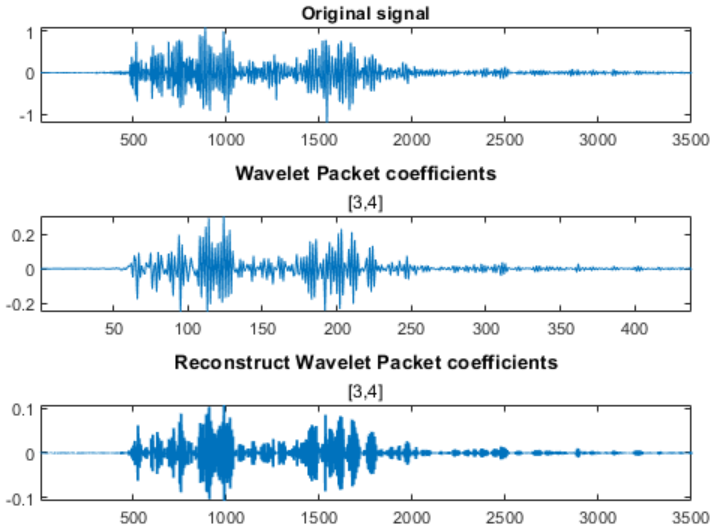
```
        figure
        subplot(3,1,1)
        plot(str(:,i))
        title('Original signal')
        axis tight

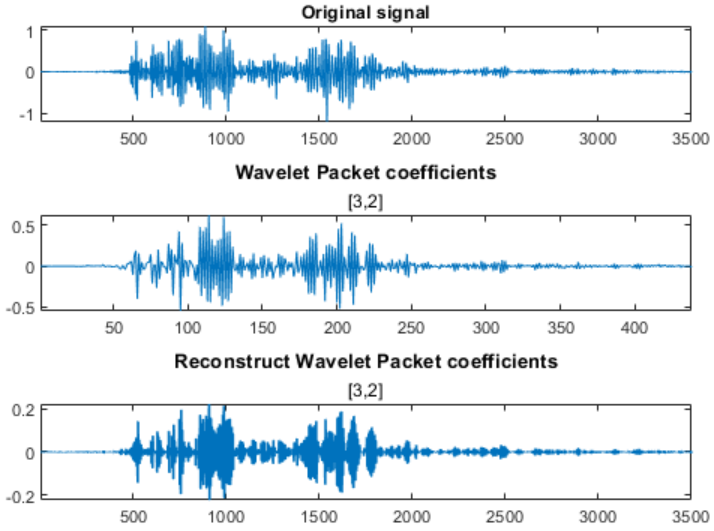
        subplot(3,1,2)
        plot(cfs(:,j))
        [t,s] = title('Wavelet Packet coefficients',
convertCharsToStrings(titlename(j,:)));
        t.FontSize = 10;
        axis tight

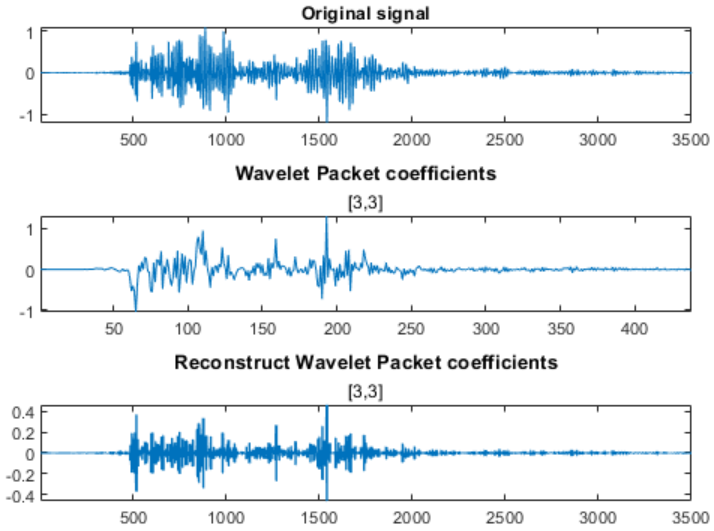
        subplot(3,1,3)
        plot(rcfs(:,j))
        [t,s] = title('Reconstruct Wavelet Packet coefficients',
convertCharsToStrings(titlename(j,:)));
        t.FontSize = 10;
        axis tight
        % saveas(gcf,fullfile(cd,'Packet (3,2).png'))
        % saveas(gcf,fullfile(cd,'Packet (3,2).fig'))
    end
 end
```

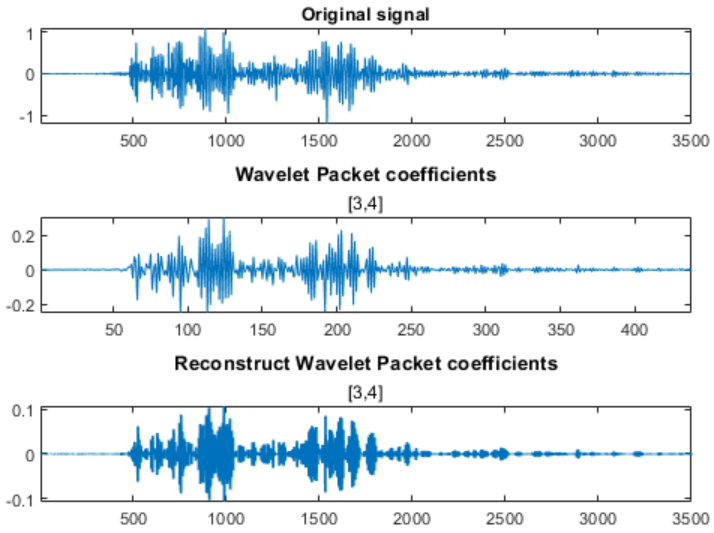



Original signal
Wavelet Packet coefficients
[3,3]
Reconstruct Wavelet Packet coefficients
[3,3]


Original signal
Wavelet Packet coefficients
[3,4]
Reconstruct Wavelet Packet coefficients
[3,4]

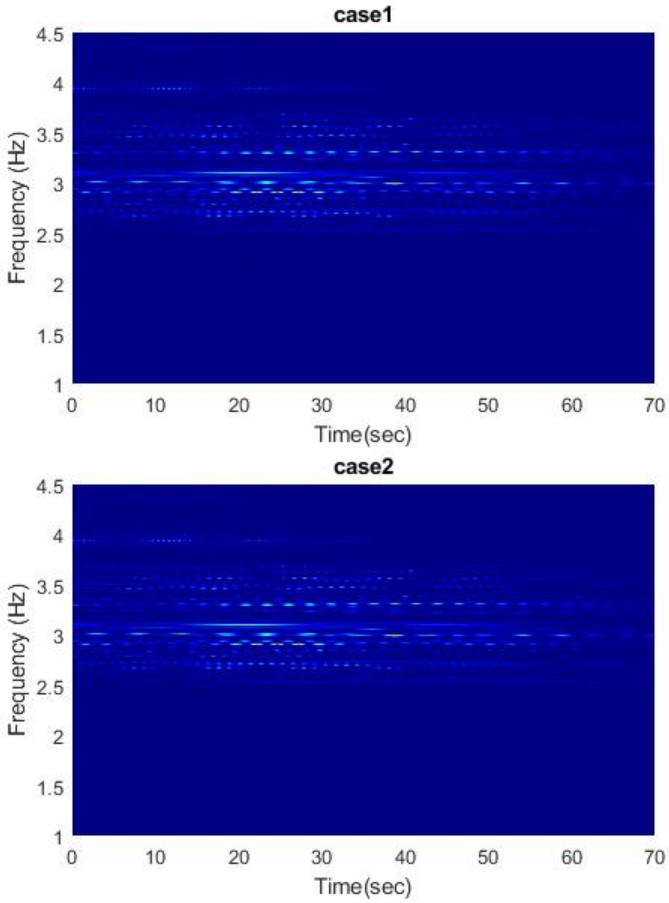

Original signal
Wavelet Packet coefficients
[3,2]
Reconstruct Wavelet Packet coefficients
[3,2]


Original signal
Wavelet Packet coefficients
[3,3]
Reconstruct Wavelet Packet coefficients
[3,3]




```
 for i = 1:2
     [t,F,E,A,T,C] = wptspect(str(:,i),50,11);
     temp = find(F<=50);
     figure('Position',[200 50 500 300])

surf(t,F(temp),E(:,temp)','LineStyle','none','FaceColor','interp','FaceLighting'
,'phong','EdgeColor','interp')
     view(0,90),colormap('jet')
     ylim([1 4.5])
     xlabel('Time(sec)')
     ylabel('Frequency (Hz)')
     xlim([0 t(end)])
     title(casename(i,:))
 end
```




```
function[t,F,E,A,T,C] = wptspect(u,SR,level)
if size(u,1) == 1
    u = u';
end
wname = 'bior6.8';
dt = 1/SR;
N = max(size(u));
t = [0:dt:(N-1)*dt];
% index of paley order
index = 0;
for i = 1:1:level
    index = [index fliplr(index)+2^(i-1)];
end
index = index + 1;

T = wpdec(u,level,wname);

A=zeros(length(u),2^level);
for i = 1:2^level
    C(:,i) = wprcoef(T,[level,index(i)-1]);
```

```
    A(:,i) = abs(hilbert(wprcoef(T,[level,index(i)-1])));
end
E = A.*A;
F = linspace(0,1/dt/2,2^level);
end
```

Part 2

```
clc;clear;close all;
opengl hardware;
```

read data

```
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Data.xlsx');
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sr = round(1/(t(2)-t(1)));  % sampling rate
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define data, low pass, down-sample

```
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RCF6_x = data(dur,3);
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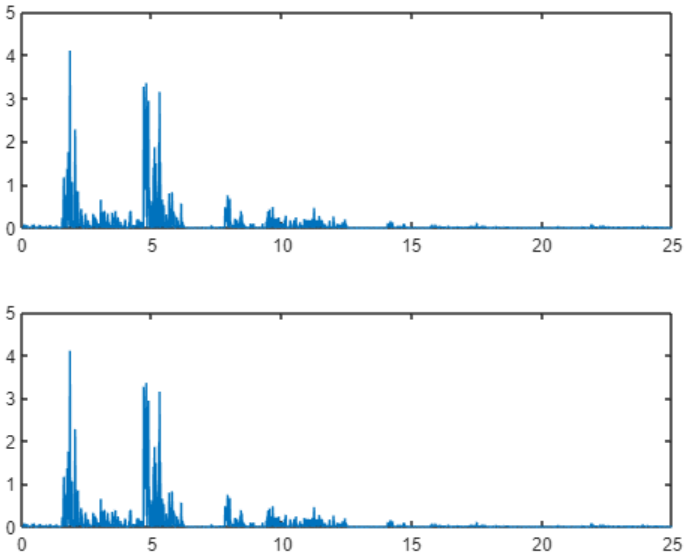
x1 = lowpass(relacc1,50,sr);
y1 = downsample(x1,4);
wpt1 = wpdec(y1,11,'db1');
% case 2
RCF4_x = data(dur,7);
RCF4_y = data(dur,6);
relacc2 = RCF4_x - RCF4_y;
x2 = lowpass(relacc1,50,sr);
y2 = downsample(x1,4);
wpt2 = wpdec(y2,11,'db1');
```

```
wpt = [wpt1 wpt2];
F=zeros(1,2^11);
E=zeros(2,2^11);
rcfs = zeros(2,3501);
for i = 1:2
    for j=1:1:(2^11)
```

```
        summation = 0;
        F(j)=(2*j-1)*25/(2^12);
        rcfs(i,:) = (wprcoef(wpt(:,i),[11,j-1]))';
        for k = 1:3501
            summation = summation + rcfs(i,k).^2;
        end
        E(i,j) = summation;
    end
end

for i = 1:2
    subplot(2,1,i)
    plot(F,E(i,:))
end
```