Final Project r11521212 鄭傳嶧

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

input data

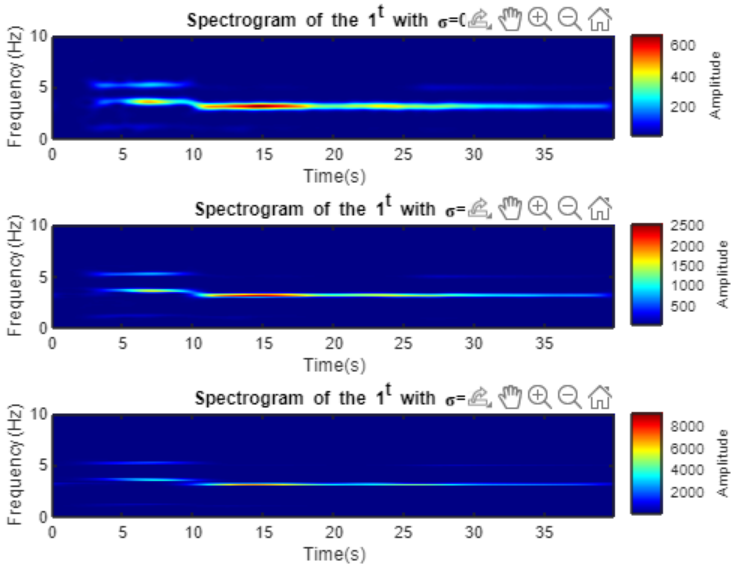
```
data = importdata('Final Project 3-story-with Abrup tReduction Column Stiffness.txt');
```

set up parameters

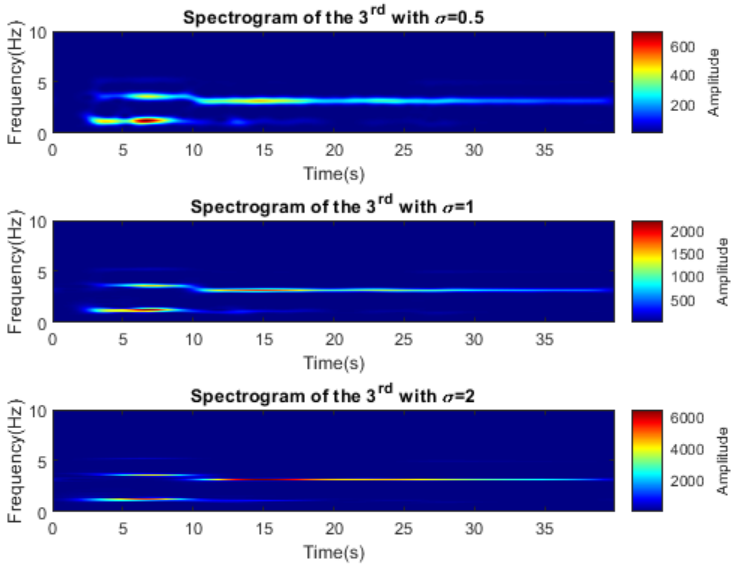
```
time = data.data(:,1);  % seconds

input = data.data(:,2);  % accel (gal) % base
for i = 1:3
    story(:,i) = data.data(:,i+2); % accel (gal)
end

SR = 50;  % Hz
dt = 1/SR; % seconds
L = length(time) ; % length of the signal
```

(1)

```
sigma = [0.5;1;2];
f_range = 0:0.01:10;
str = '1^s^t';
MCMW_VCF_2(time,story(:,1),sigma,dt,f_range,str);
```




```
str = '3^r^d';
MCMW_VCF_2(time,story(:,3),sigma,dt,f_range,str);
```

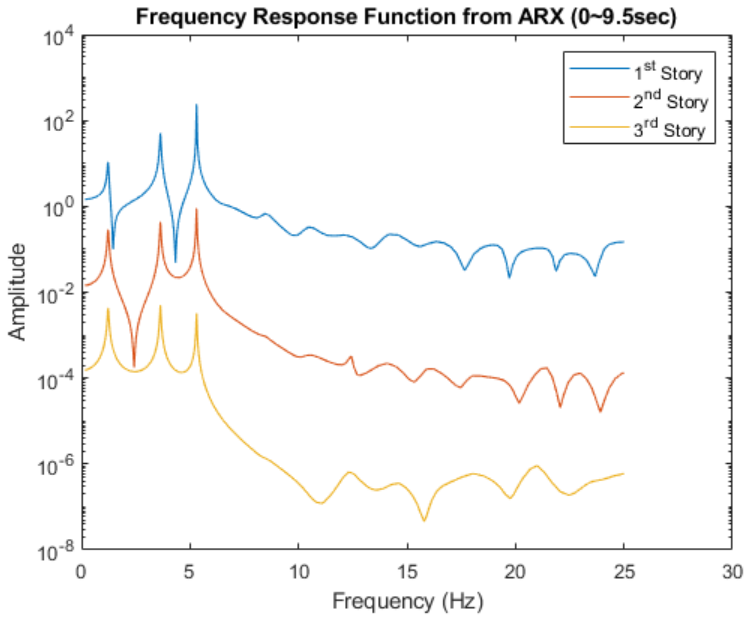


(2)

analysis data (0.0sec - 9.5sec)

```
index = find(time>=9.5, 1);
input2 = input(1:index);
figure()
for i=1:3
```

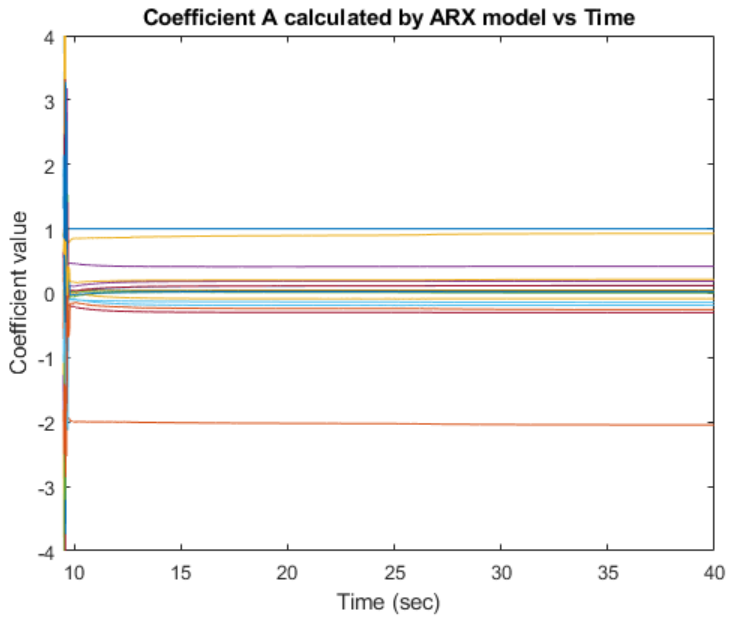
```
    output(:,i) = story(1:index,i);
    na= 30; nb = 30; % user-defined
    [freq,damping]=ARX_model(input2,output(:,i),SR,na,nb,i);
end
xlabel('Frequency (Hz)')
ylabel('Amplitude')
title('Frequency Response Function from ARX (0~9.5sec)')
legend('1^s^t Story','2^n^d Story','3^r^d Story')
```



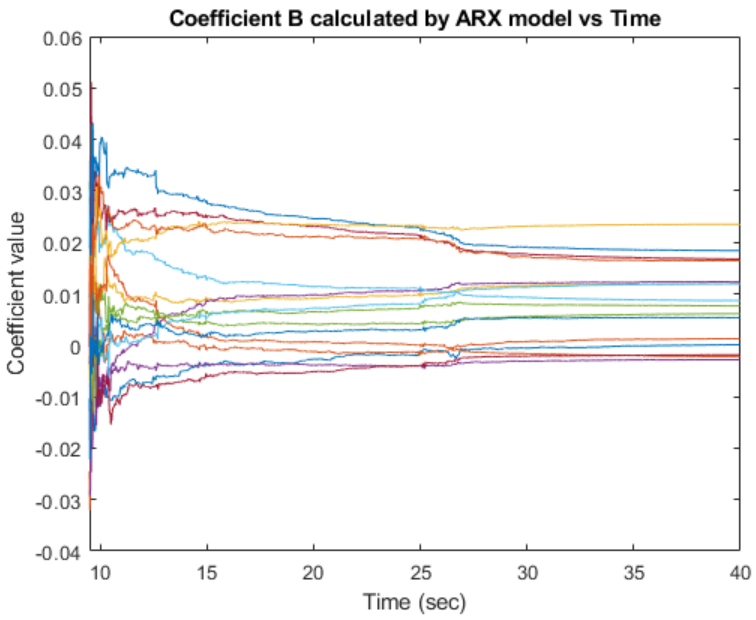
(3)

```
for i = 1:3
    story2(:,i) = story(index:L,i); % 9.5 秒之後
end
input3 = input(index:L);
nn = [16 16 0];
obj = recursiveARX(nn);
A1 = zeros(L,nn(1)+1);
B1 = zeros(L,nn(2));
A2 = zeros(L-index+1,nn(1)+1);
B2 = zeros(L-index+1,nn(2));
for i = 1:L
    [A1(i,:),B1(i,:),outputdata] = step(obj,story(i,3),input(i));
end

for i = 1:L-index+1
    [A2(i,:),B2(i,:),outputdata] = step(obj,story2(i,2),input3(i));
end
% figure()
```

```
% plot(time,A1)
% figure()
% plot(time,B1)
figure()
plot(time(index:L),A2)
xlim([9.5 40]);
ylim([-4 4]);
xlabel('Time (sec)')
ylabel('Coefficient value')
title('Coefficient A calculated by ARX model vs Time')
```

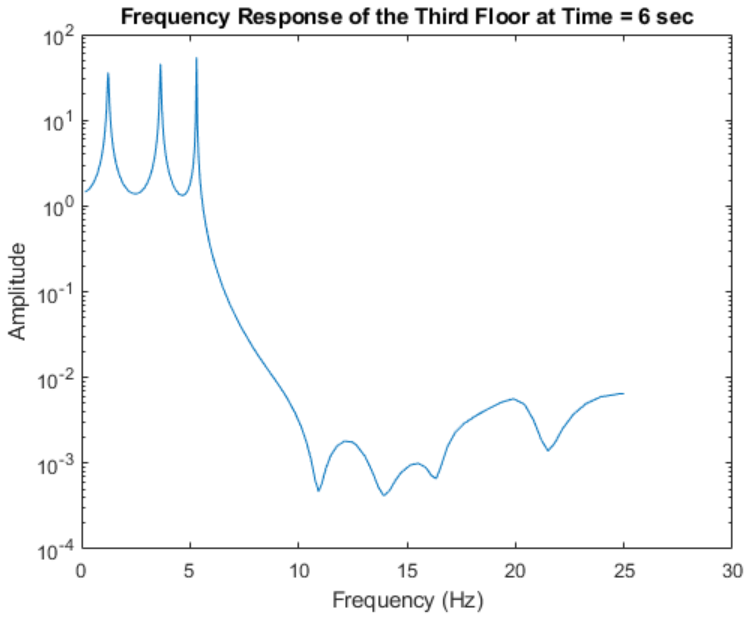


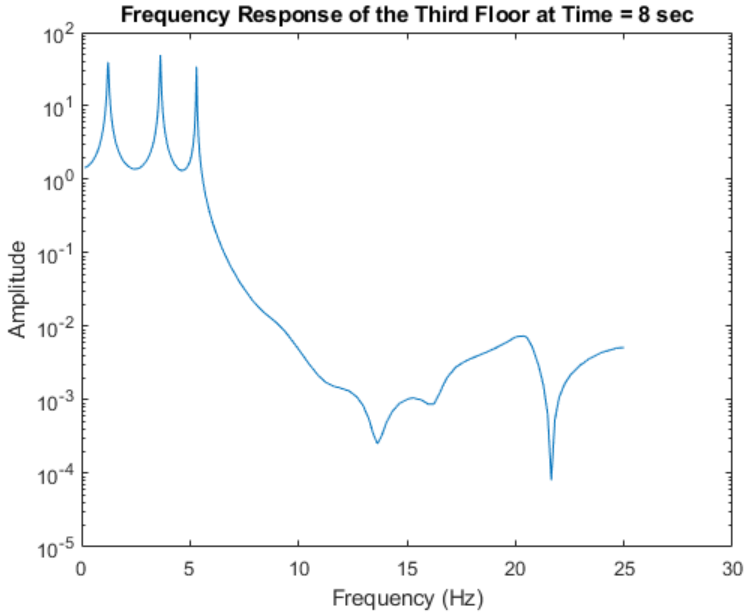

```
figure()
plot(time(index:L),B2)
xlim([9.5 40]);
%ylim([-0.04 0.04]);
xlabel('Time (sec)')
ylabel('Coefficient value')
title('Coefficient B calculated by ARX model vs Time')
```

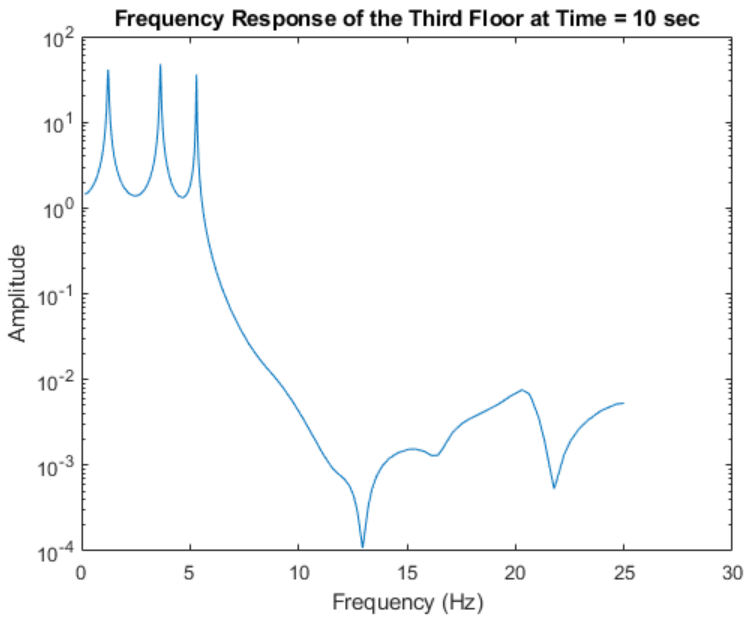


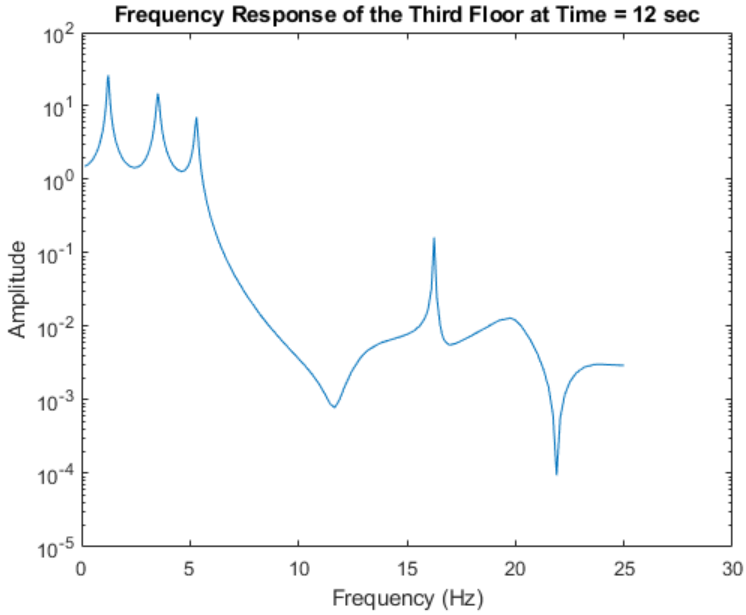
(4)

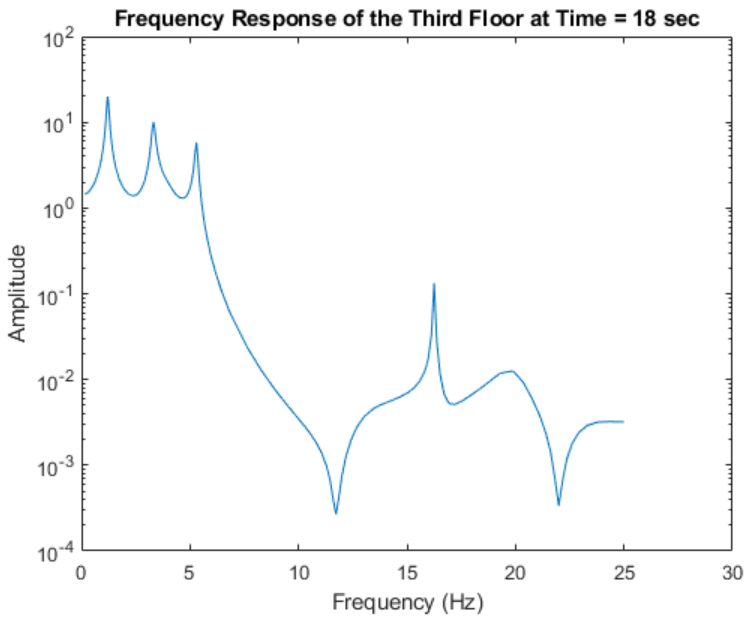
```
 t = [6 8 9.5 12 18];
 for i =1:5
     sys = idpoly(A1(t(i)*SR+1,:),B1(t(i)*SR+1,:),[],[],[],[],dt);
     [mag, phase, wd] = ffplot(sys);
     magnitude = reshape(mag,1,[]);
     figure()
     semilogy(wd,magnitude);
     xlabel('Frequency (Hz)')
     ylabel('Amplitude')
     title(['Frequency Response of the Third Floor at Time = ', int2str(t(i)), '
sec'])
 end
```


Frequency Response of the Third Floor at Time = 6 sec
Amplitude
Frequency (Hz)


Frequency Response of the Third Floor at Time = 8 sec
Amplitude
Frequency (Hz)


Frequency Response of the Third Floor at Time = 10 sec
Amplitude
Frequency (Hz)


Frequency Response of the Third Floor at Time = 12 sec
Amplitude
Frequency (Hz)


Frequency Response of the Third Floor at Time = 18 sec
Amplitude
Frequency (Hz)
10^2
10^1
10^0
10^-1
10^-2
10^-3
10^-4
0
5
10
15
20
25
30