

CA5 - pt. 1

Wednesday, February 16, 2022 12:47 AM

Sample rate	44100
Input length	1043609
Impulse length	35173
Output length	1048576
FFT size	1048576
For loop execution time	86.103671 seconds
FFT product execution time	0.135666 seconds

The convolution performed previously in the enclosure assignment was repeated using two different methods. One was performed in the time domain using for loops to multiply and sum the signals. The other was performed by multiplying the signals together in the frequency domain. As can be seen in the table above, the execution time was significantly shorter when processed in the frequency domain.

```
P = 2^20;  
[x,Fs] = audioread('Demons anechoic_01.wav');  
N = length(x);
```

```
% Read in input signal  
[h,Fh] = audioread('Impulse gym_01.wav');
```

```
L = length(h);
```

```
% Convolve using custom convolution function  
tic,  
y = myconv(x,h);  
toc  
M = N+L-1;
```

```
% Visualize signals in time domain  
figure();  
t = [0:M-1]/Fs; % Time vector [seconds]  
plot(t,y); hold on;  
t = [0:N-1]/Fs; % Time vector [seconds]  
plot(t,x); hold off;
```

```
xlabel('Time [seconds]');  
ylabel('Amplitude');  
legend('Input x[n]','Output y[n]');
```

```

title('Input & Output Signals');
grid on;
shg;

% Convolve using frequency domain multiplication
tic,
yf = real(ifft(fft(x,P).*fft(h,P)));
toc

% Visualize signals in time domain
figure();
tf = [0:M-1]/Fs; % Time vector [seconds]
plot(yf); hold on;
tf = [0:N-1]/Fs; % Time vector [seconds]
plot(tf,x); hold off;

xlabel('Time [seconds]');
ylabel('Amplitude');
legend('Input x[n]','Output y[n]');
title('Input & Output Signals');
grid on;
shg;

```