"Heaven's light is our guide"

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

Course No: ECE 4124

Course Title: Digital Signal Processing Sessional

Experiment No: 01

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Experiment No: 01

Experiment Name: Convolution of two signals

1. Using conv function
2. Without using conv function

Objectives

The objectives of the experiments are:

1. To know about determining convolution of two signals using MATLAB conv function.
2. To know about determining convolution of two signals without using MATLAB conv function.

Theory

Convolution is a mathematical process that combines two signals to create a third signal. It is the most crucial approach in digital signal processing. Using the impulse decomposition strategy, systems are described by a signal called the impulse response. Convolution is significant because it connects the three signals of interest: input, output, and impulse response.

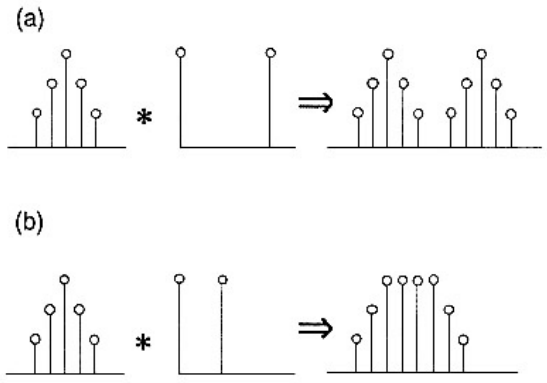

Figure 1.1: Calculation of convolution of two signals [1]

[1] *https://www.sfu.ca/~truax/conv.html*

Convolving two time-domain waveforms means increasing their spectra (i.e. frequency content) in the frequency domain. By "multiplying" the spectra, we imply that any frequency that is strong in both signals will be extremely strong in the combined signal, and any frequency that is weak in either input signal will be weak in the combined signal.

Code

Convolution of two signals using MATLAB conv function.

```
clc;
clear all;

n=-10:10;
x= [1 2 3 4 5 2 1];
h= [4 3 2 0 1];
Y=conv(x,h);

% plot results
  figure(2);
  subplot(3,1,1); stem(x, '-b^'); xlabel('n');
  ylabel('x[n]'); grid on;
  subplot(3,1,2); stem(h,'-ms');
  xlabel('n'); ylabel('h[n]'); grid on;
  subplot(3,1,3); stem(Y, '-ro');
  ylabel('Y[n]'); xlabel('----->n'); grid on;
  title('Convolution of Two Signals using conv function');
```

Output

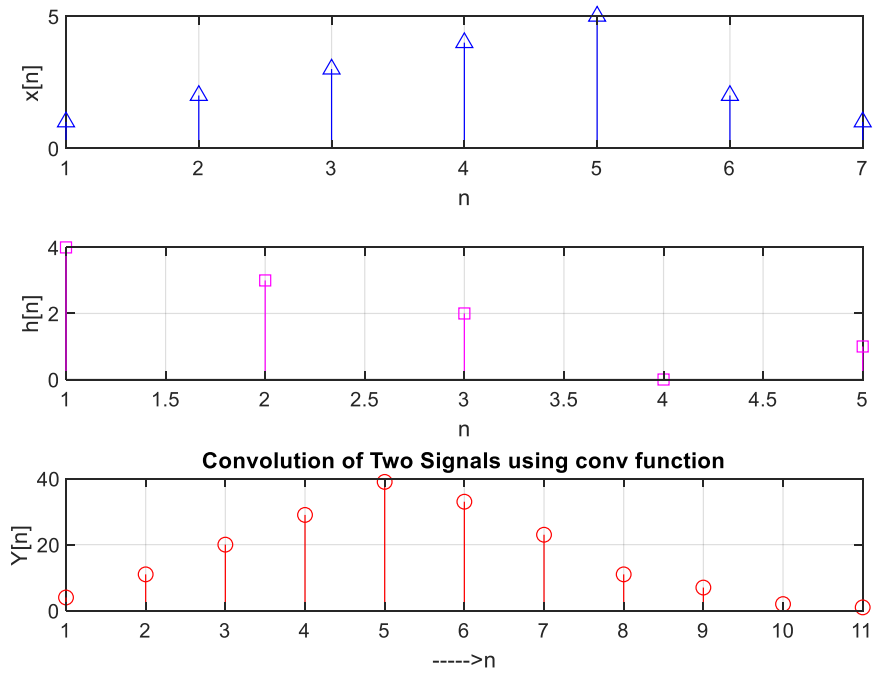

Figure 1.2: Output of convolution of two signals using MATLAB conv function.

Code

Convolution of two signals without using MATLAB conv function.

```
clc;
clear all;

n=input('input N:');
m=input('input M:');
x=input('input matrix x:');
h=input('input matrix h:');

X=[x,zeros(1,n)];
    H=[h,zeros(1,m)];
    for i=1:n+m-1
        Y(i)=0;
        for j=1:m
            if(i-j+1>0)
                Y(i)=Y(i)+X(j)*H(i-j+1);
            else
            end
        end
    end

    % plot results
    figure;
    subplot(3,1,1); stem(x, '-b^'); xlabel('n');
    ylabel('x[n]'); grid on;
    subplot(3,1,2); stem(h, '-ms');
    xlabel('n'); ylabel('h[n]'); grid on;
    subplot(3,1,3); stem(Y, '-ro');
    ylabel('Y[n]'); xlabel('----->n'); grid on;
    title('Convolution of Two Signals without conv function');
```

Input

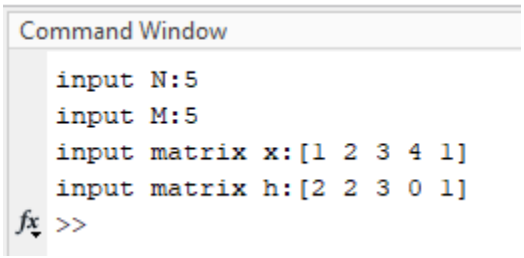

Figure 1.3: Input of two signals

Output

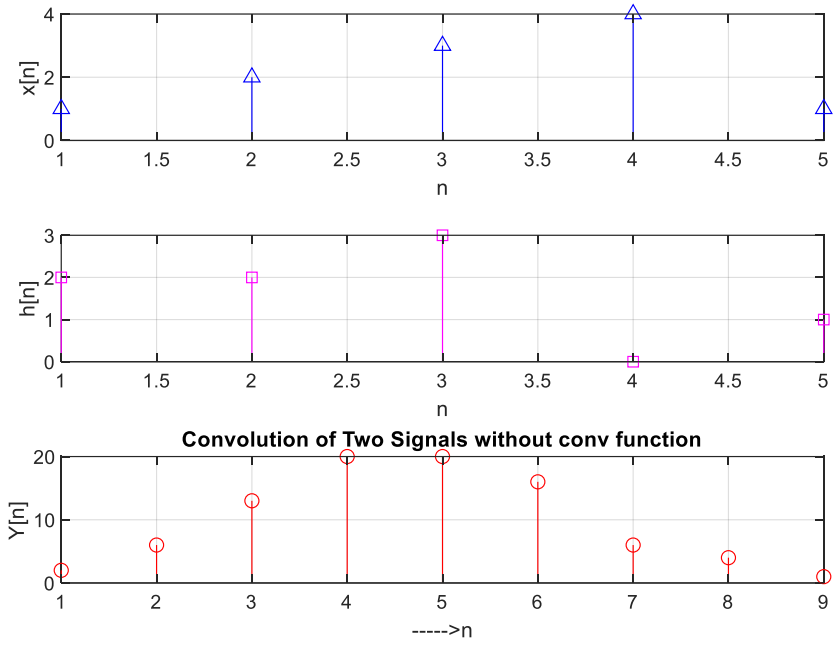

Figure 1.4: Output of convolution of two signals without using MATLAB conv function.

Discussion

The code was executed successfully and no errors were found. Form this experiment, we had learned about determining convolution of two signals using and without using conv function in MATALB software.

References:

[1] *https://www.sfu.ca/~truax/conv.html*

[2] *https://www.analog.com/media/en/technical-documentation/dsp-book/dsp_book_ch6*