"Heaven's light is our guide"

Rajshahi University of Engineering & Technology

Department of Electrical & Computer Engineering

Course Name : Digital Signal Processing Sessional
Course No : ECE 4124

Lab Report

Submitted To	***Submitted By***
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Experiment No: 02

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Experiment Name: *Calculation & Plotting of Linear Convolution method in Matrix method.*

Theory:

Convolution is a mathematical tool to combining two signals to form a third signal. Convolution of x(t) with h(t), where h(t) = T[δ(t)] is denoted by x(t) * δ(t). Mathematical representation of convolution is:

$$x(t) = \int_{\infty}^{\infty} x(\tau)\delta(t-\tau)d\tau$$

In Matrix Method of calculating the convolution, there are two number of sequences of discreate signal, a matrix has been formed by cross multiplying every element. Then addition of every of-diagonal element is taken as the result of the convolution of the following two discreate signal.

This method is occurred for Linear Invariant System or LTI. So, it is called linear convolution.

Code:

- ***Code for plotting Linear Convolution by Matrix method:***

```
x=[1 2 3 4];
h=[4 4 3 2];

subplot(3,1,1);
stem(x);
title('x(t)');

subplot(3,1,2);
stem(h);
title('h(t)');

lenx = length(x);
```

```
lenh = length(h);
M=zeros(lenx, lenh);

for i=1:lenx
    for j=1:lenh
        M(i,j)=x(i)*h(j);
    end
end


E=lenx+lenh-1;
H=zeros(1,E);
count=1;

for t=1:E
    for i=count:lenx
        for j=1:i
            if(j==1)
                a=i;
                b=j;
            else
                a=a-1;
                b=b+1;
            end
            H(t)=H(t)+M(a,b);
        end
        break
    end
    count=count+1;
end

count=lenh;
temp=2;

for t=lenx+1:E
    for i=count:E-1
        for j=i:E-1
            if(j==i)
                a=lenh;
                b=lenx-temp;
            else
                a=a-1;
                b=b+1;
            end
            H(t)=H(t)+M(a,b);
        end
        temp=temp-1;
        break;
    end
    count=count+1;
end


subplot(3,1,3);
stem(H);
title('x(t)*h(t)');
```

Output:

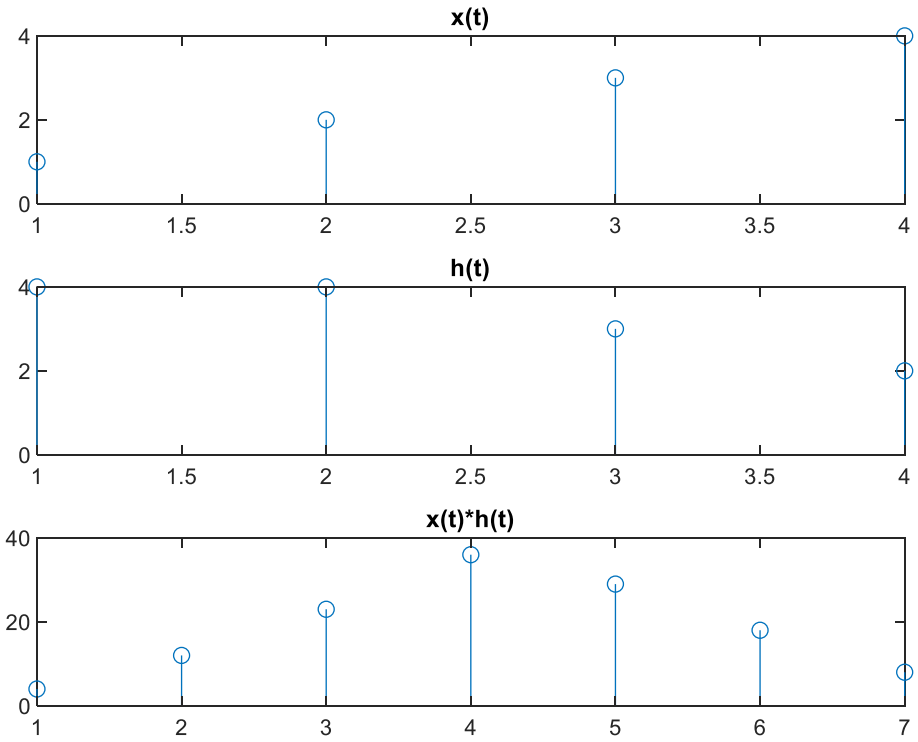

Fig. 1: Output of Linear Convolution by Matrix Method.

Discussion:

This experiment is based on MATLAB simulation. Here we have plotted two discreate signal & their convolve form. The program has been completed successfully & ran in MATLAB without any warning or Error.