Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

Department of Electrical & Computer Engineering

Lab Reports

Course Title :   *Digital Signal Processing Sessional*

Course No: *ECE 4124*

Submitted By:

Md. Shafayat Tazoar

Roll: 1810050

Submitted To:

Hafsa Binte Kibria

Lecturer, ECE,

RUET.

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Experiment No.: 02

Experiment Name: Study of Linear Convolution.

Theory:

Linear convolution is a fundamental operation in digital signal processing (DSP) that is used to combine two discrete-time signals into a third signal that represents their convolution. It plays a key role in many DSP applications such as filtering, signal analysis, and image processing. Linear convolution is based on the convolution sum formula, which states that the output of linear convolution is obtained by summing the products of the input signals at each time index. In practical DSP applications, linear convolution is often performed using built-in functions provided by DSP software packages such as MATLAB and Python's NumPy library. These functions are optimized for efficiency and accuracy and can handle large input signals with high precision.

Software Used: MATLAB

Code:

```
1. clc
2. clear all
3. t=0:1/100:1;
4. x=[1 2 3 4];
5. h=[4 4 3 2];
6. L=length(x);
7. M=length(h);
8. N=L+M-1;
9. for i=1:N
10.          y(i)=0;
11.          for j=1:L
12.              if ((i-j+1)>0 && (i-j)<4)
13.                  y(i)=y(i)+x(j)*h(i-j+1);
14.                  disp(y(i));
15.              end
16.          end
17.      end
18.      subplot(3,1,1);
19.      stem(x);
20.      title('Input Signal x(n)');
21.      subplot(3,1,2);
22.      stem(h);
23.      title('Impulse Response h(n)');
24.      subplot(3,1,3);
25.      stem(y);
26.      title('Convolution Result y(n)');
```
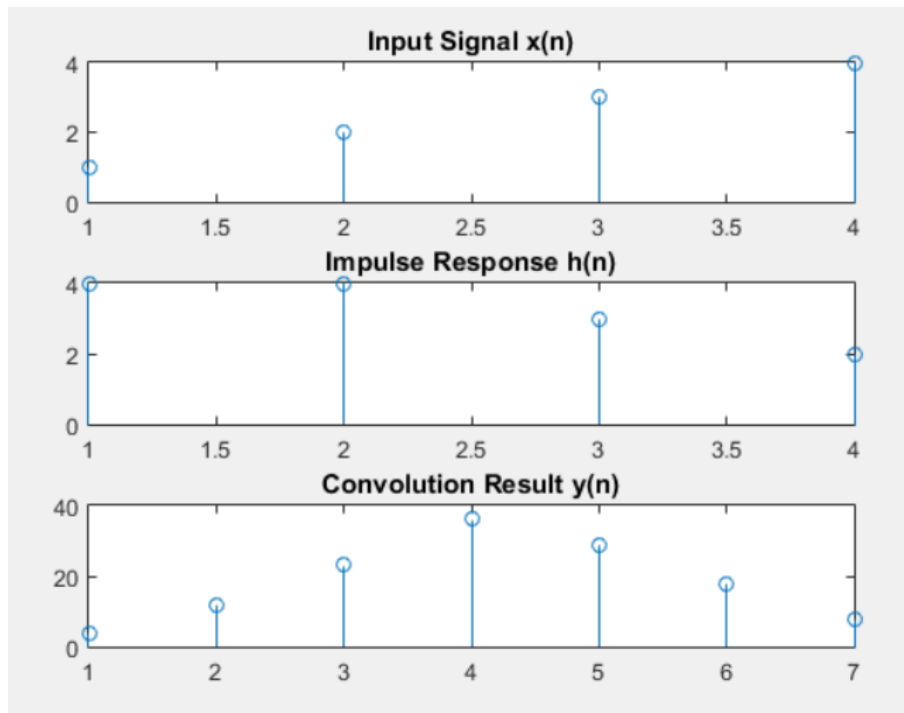
Output:

Figure 1: Linear Convolution Plot

Discussion:

In this experiment the MATLAB implementation of linear convolution in digital signal processing was taught which was coded logically without using MATLAB's convolution function.

Conclusion:

The experiment was successfully completed without any error.