

Experiment No: 02

Experiment Date: 30.04.2023

Experiment Name: Study of linear convolution

Theory: Linear convolution is a mathematical operation that takes two discrete functions and produces a third function that represents the combination of the two input functions. In signal processing, linear convolution is often used to convolve two signals, which involves multiplying each sample of one signal with each sample of the other signal, and summing up the results to produce a new signal. The resulting output signal will have a length equal to the sum of the lengths of the input signals minus one, since the convolution operation involves overlapping samples at the edges of the input signals. Linear convolution is a fundamental operation in signal processing and is used in many applications, such as image processing, audio processing, and digital filtering.

Required software: MATLAB

Code:

```
1. clc
2. x = input('Enter the elements of function x within [ ] bracket\n');
3. L = length(x);
4. h = input('Enter the elements of function h within [ ] bracket\n');
5. M = length(h);
6.
7. N = L + M - 1;
8.
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:

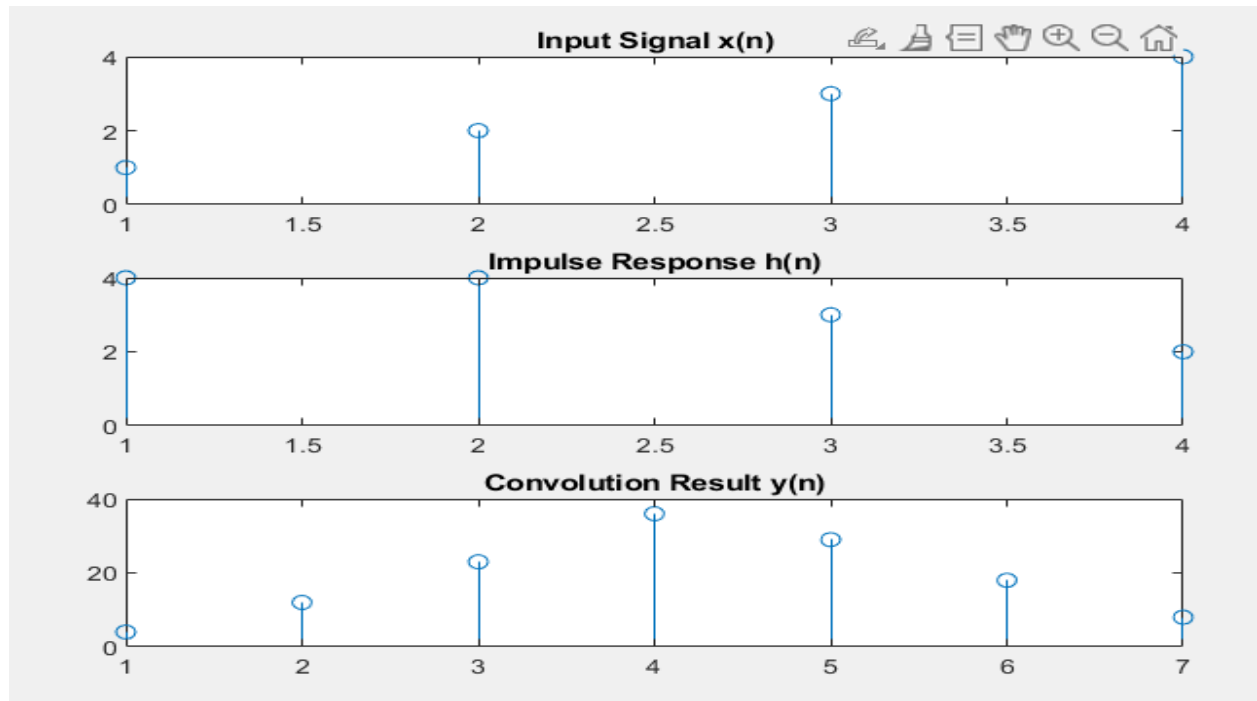


Figure 1: Linear Convolution Plot

Discussion: This experiment demonstrated how to create linear convolution in MATLAB for digital signal processing, which was done without the aid of the convolution function in MATLAB.

Conclusion: Algorithms produced exact output graphs in the experiment that matched the functions and theoretical arguments provided.