

Experiment No: 02

Experiment Name: Study of linear convolution

Theory: With the use of the mathematical technique known as linear convolution, two discrete functions can be combined to create a third function. It is common practice in signal processing to combine two signals using a process called linear convolution, which entails multiplying each sample of one signal by each sample of the second signal and adding the results to create a new signal. Due to the convolution operation's use of overlapping samples at the boundaries of the input signals, the output signal's length will be equal to the sum of the input signals' lengths minus one. In many signal processing applications, including digital filtering, audio processing, and picture processing, linear convolution is a fundamental technique.

Code:

```
1. clc
2. x = input('Enter the elements of function x within [ ] braket\n');
3. L = length(x);
4. h = input('Enter the elements of function h within [ ] braket\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:

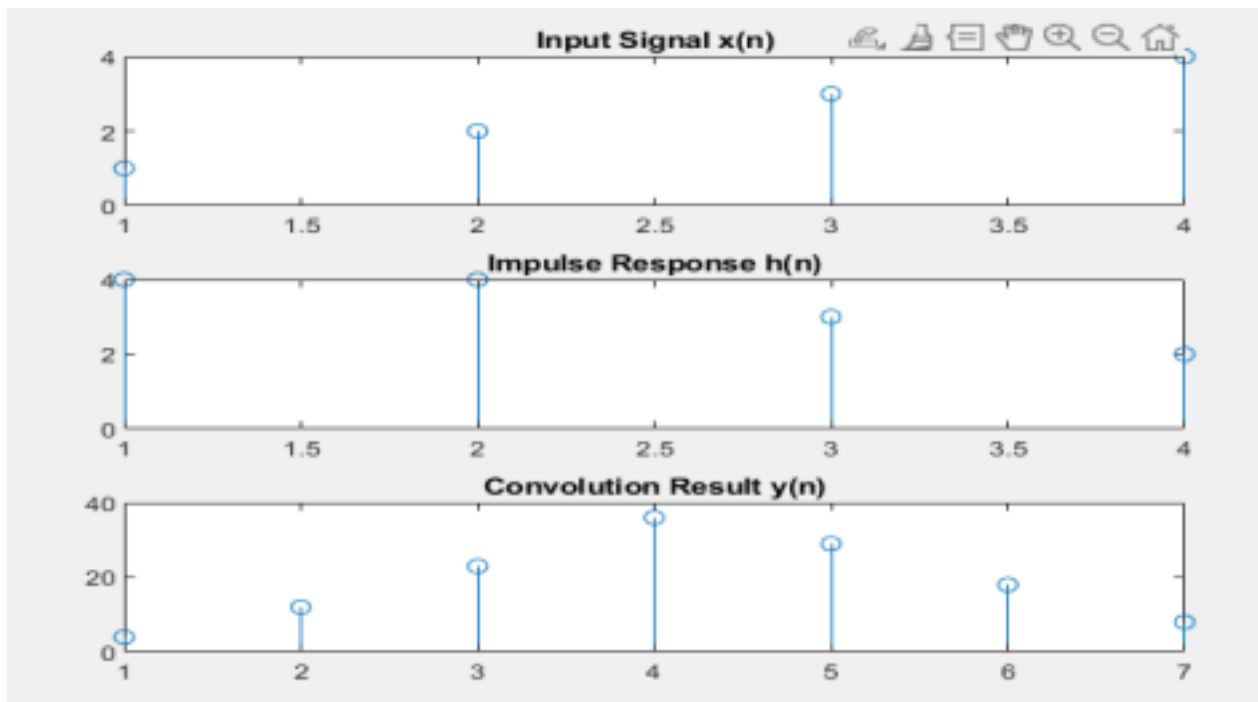


Figure 1: Linear Convolution Plot

Discussion:

This experiment showed how to build linear convolution in MATLAB for digital signal processing.

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