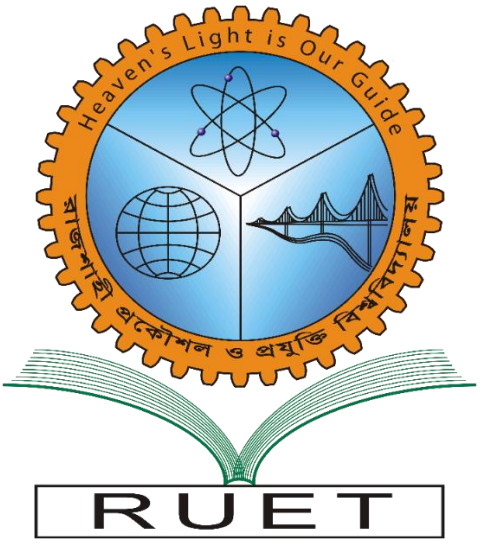
Heaven's Light is Our Guide

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY



Department of Electrical & Computer Engineering

Course Title : Digital Signal Processing Sessional

Course No. : ECE 4124

Experiment No. : 02

Experiment Name : Study and Implementation of Convolution in MATLAB

Experiment Date : 30-04-2023

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2.1) Experiment No.: 02

2.2) Experiment Date: 30-04-2023

2.3) Name of the Experiment:

Study and Implementation of Convolution in MATLAB.

2.4) Theory:

Convolution is a mathematical way of combining two signals to form a third signal. It is the single most important technique in Digital Signal Processing. For discrete-time signals, the convolution of two sequences x[n] and h[n] is defined as:

$$y[n] = x[n] * h[n] = \sum_{k=-\infty}^{\infty} x[k]\, h[n-k]$$

where * denotes convolution, n is the time index, and k is the convolution index. In the context of DSP, tabular method usually refers to the use of tables or matrices to represent signals or systems, and convolution can be performed using these tables. One way to perform convolution using tables is to represent the signals as rows or columns in a matrix and then multiply the matrices using matrix multiplication. This approach can be more efficient than performing the convolution sum formula directly, especially for large signals or systems.

2.5) Code:

```
clear all;
t=1:1:7;
x=[1 2 3 4];
h=[4 4 3 2];
y=zeros(1, length(x)+length(h)-1);

for i=1:length(x)
    for j=1:length(h)
        val=x(j)*h(i);
        array(i,j)=val;
    end
end

for k=1:length(x)
    j=1;
   for i=k:-1:1
     %disp(y(k));
     y(k)=array(i,j)+y(k);
     j=j+1;
   end
end
val=2;
for k=length(x)+1:length(x)+length(h)-1
    row=length(x);
    for i=val:length(x)
        y(k)=y(k)+array(row,i)
        row=row-1;
    end
    val=val+1;
end

subplot(3,1,1);
stem(x);
title('x(n)');
```

```
35 subplot(3,1,2);
36 stem(h);
37 title('h(n)');
38
39 subplot(3,1,3);
40 stem(y);
41 title('y(n)');
```

Output:

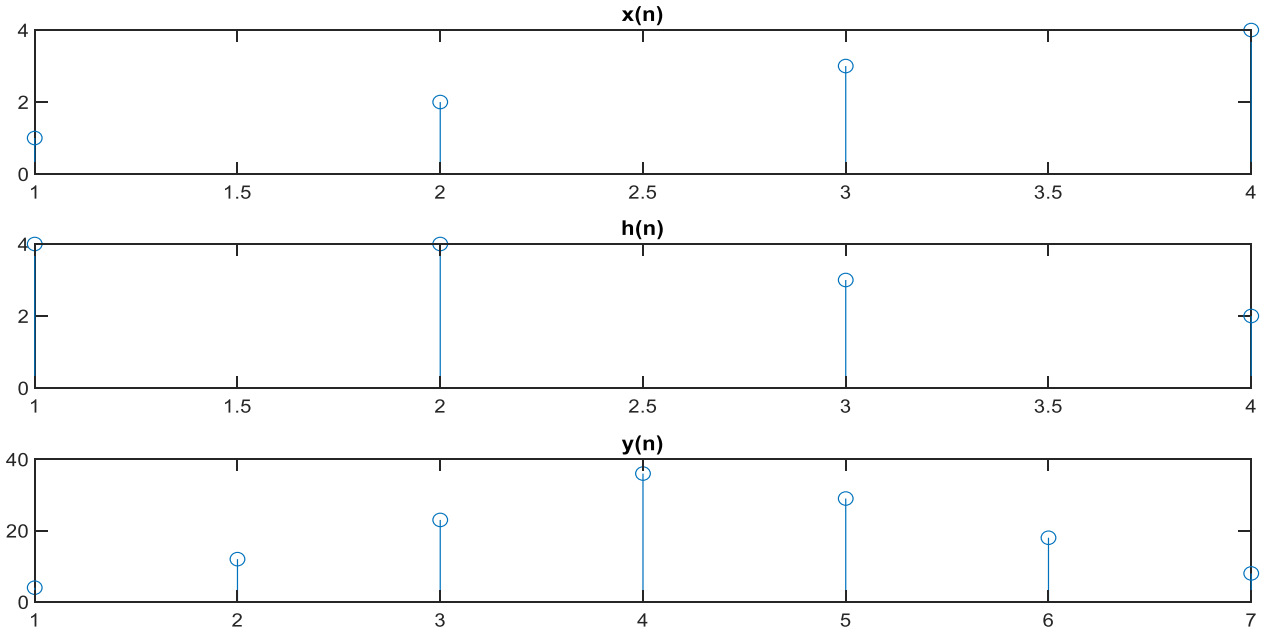

Figure 1: Convolution

2.6) <u>Discussion & Conclusion</u>:

In this experiment, we have implemented the convolution in MATLAB. Here we have given two signals: one is x(n) and another is h(n). By those two signals we can find out the convolution y(n). In here we have implemented the tabular method or matrix method. By this we have found total L+M-1 entries to the y(n). Where L and M both were 4 in my experiment. Thus, this experiment was successfully implemented and there was no error found during the execution.