DEPARTMENT OF
ROBOTICS AND MECHATRONICS ENGINEERING

LAB REPORT

DIGITAL SIGNAL PROCESSING (CSE-401)

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Name of the experiment

Convolution of a digital signal with a given filter signal.

Objectives

- To learn how to use linear filters.

- To understand the basics of convolution.

Theory

Implementation Code

<div align="center">main.m</div>

```
1  clc; clear; close all;
2  h = [ 1 2 1 -1 ]; ho = 2;
3  x = [ 1 2 3 1 ];  xo = 1;
4
5  [out,outOrigin] = convolution(x,h,xo,ho);
```

Functions Used:

<div align="center">convolution.m</div>

```
1  function [out,outOrigin] = convolution(input, h, ino
      , ho)
2      hneg = fliplr(h);
3      L = size(input,2);
4      ho = L-ho+1;
5      X = zeros(1, 3*L);
6      H=X;
7      out = X;
8      for i=1:size(input,2)
9          H(i) = hneg(i);
10     end
11     for i =L+1:2*L
12         X(i) = input(i-L);
```

```
13        end
14        for i =1:size(X,2)
15            out(1,i) = Ws(X,H);
16            H = rightShift(H);
17        end
18        out = out(2:size(out,2)-L);
19        outOrigin = L-ho;
20 end
```

rightShift.m

```
1 function [outSignal] =  rightShift(inSignal,inOrigin
    )
2     l = size(inSignal,2);
3     outSignal = zeros(1,l);
4
5     for i = 2:l
6         outSignal(i) = inSignal(i-1);
7     end
8 end
```

Ws.m

```
1 function out = Ws(a,b)
2     s=0;
3     for j = 1:size(b,2)
4         s = s+ a(1,j)*b(1,j);
5     end
6     out=s;
7 end
```