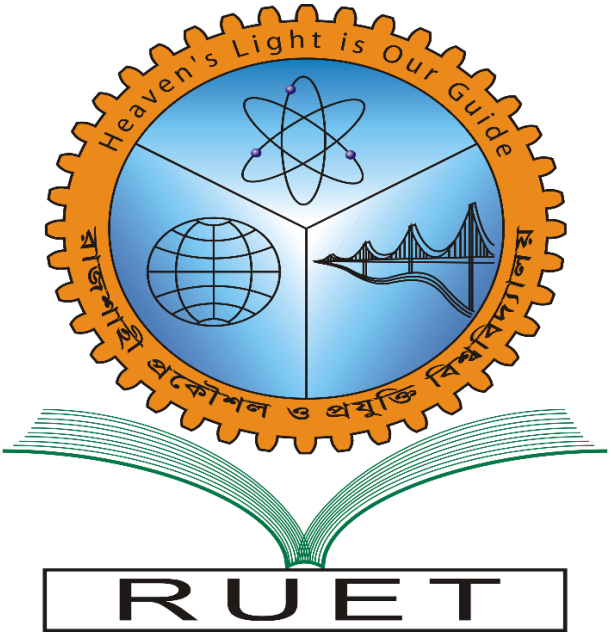
Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology



Department of Electrical & Computer Engineering

Course No: ECE 4124
Course Title: Digital Signal Processing Sessional

Experiment No: 02

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2.1 Experiment Name: Implementation of Circular Convolution

2.1.2 Theory:

Convolution is a mathematical way of combining two signals to form a third signal. It is an important technique in Digital Signal Processing. Convolution is a formal mathematical operation, just as multiplication, addition, and integration. Addition takes two numbers and produces a third number, while convolution takes two signals and produces a third signal.

Circular convolution, also known as cyclic convolution, is a special case of periodic convolution, which is the convolution of two periodic functions that have the same period.

Generally, there are two methods, which are adopted to perform circular convolution and they are:

(i) Concentric circle method
(ii) Matrix multiplication method

2.1.3 Code:

```
xn = [1 2 3 4];
hn = [1 1 1 1];

n1 = length(xn);
n2 = length(hn);
n = max(n1,n2);

if(n1>n2)
    hn = [hn, zeros(1,n-n2)];
else
    xn = [xn, zeros(1,n-n1)];
end
y = zeros(1,n);

for i=0:n-1
    for j=0:n-1
        z = mod(i-j,n);
        y(i+1) = y(i+1)+xn(j+1).*hn(z+1);
    end
end
disp(y)

subplot(3,1,1); stem(xn); xlabel('n');
ylabel('x[n]'); title('First Signal');

subplot(3,1,2); stem(hn); xlabel('n');
ylabel('h[n]'); title('Second Signal');

subplot(3,1,3); stem(y); xlabel('n');
ylabel('Y[n]'); title('Convoluted Signal');
```

2.1.4 Output:

```
>> circular_convolution
xn =
     1     2     3     4

hn =
     1     1     1     1

result =
    10    10    10    10
```

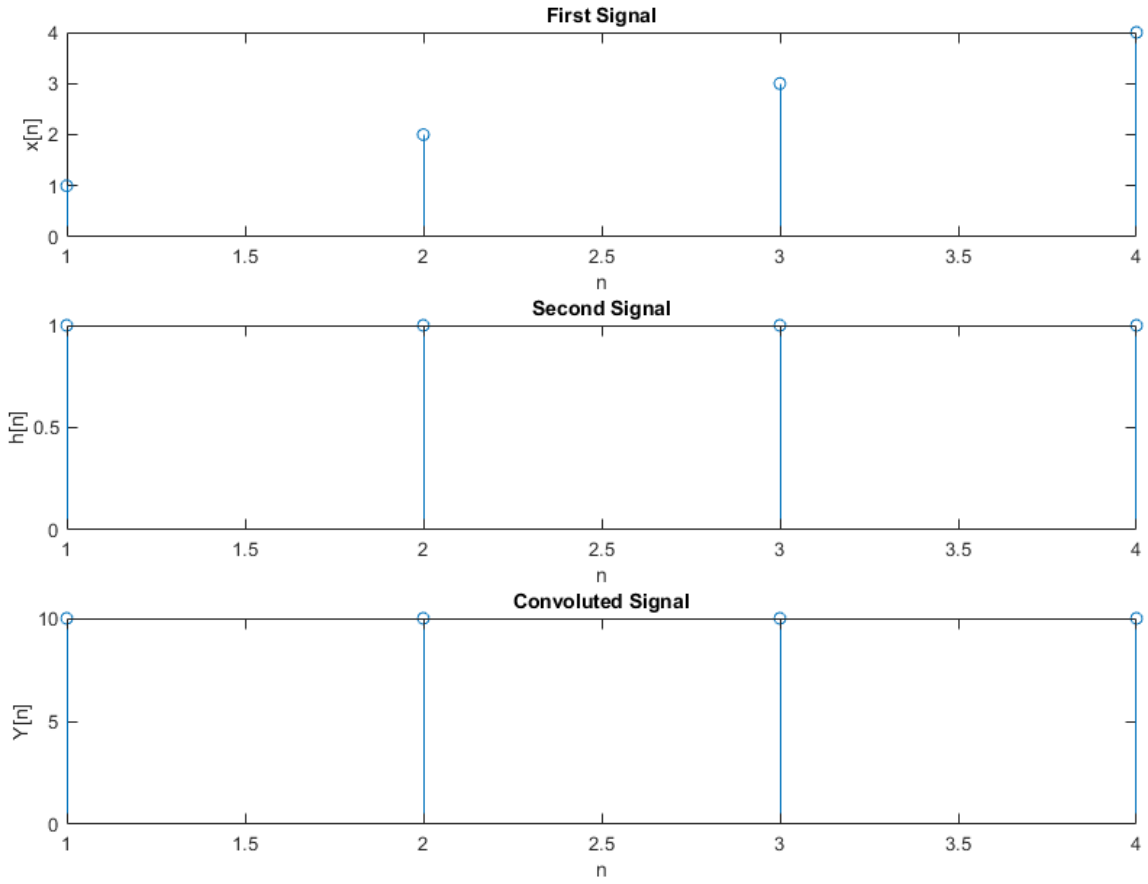

Fig 2.1: Convolution of Two Signals

2.2 Experiment Name: Addition & Subtraction of two signals

2.2.1 Code:

```
sig1= [0 0 0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0];
sig2= [0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 0 0 0 0];
t = 1:19;
subplot(4,1,1);
stem(t,sig1);
xlabel('n');
ylabel('X(n)');
title('Signal 1');

subplot(4,1,2);
stem(t,sig2);
xlabel('n');
ylabel('X(n)');
title('Signal 2');

sig3 = sig1+sig2;
subplot(4,1,3);
stem(t,sig3);
xlabel('n');
ylabel('X(n)');
title('Addition');

sig4 = sig1-sig2;
subplot(4,1,4);
stem(t,sig4);
xlabel('n');
ylabel('X(n)');
title('Subtraction');
```

2.2.2 Output:

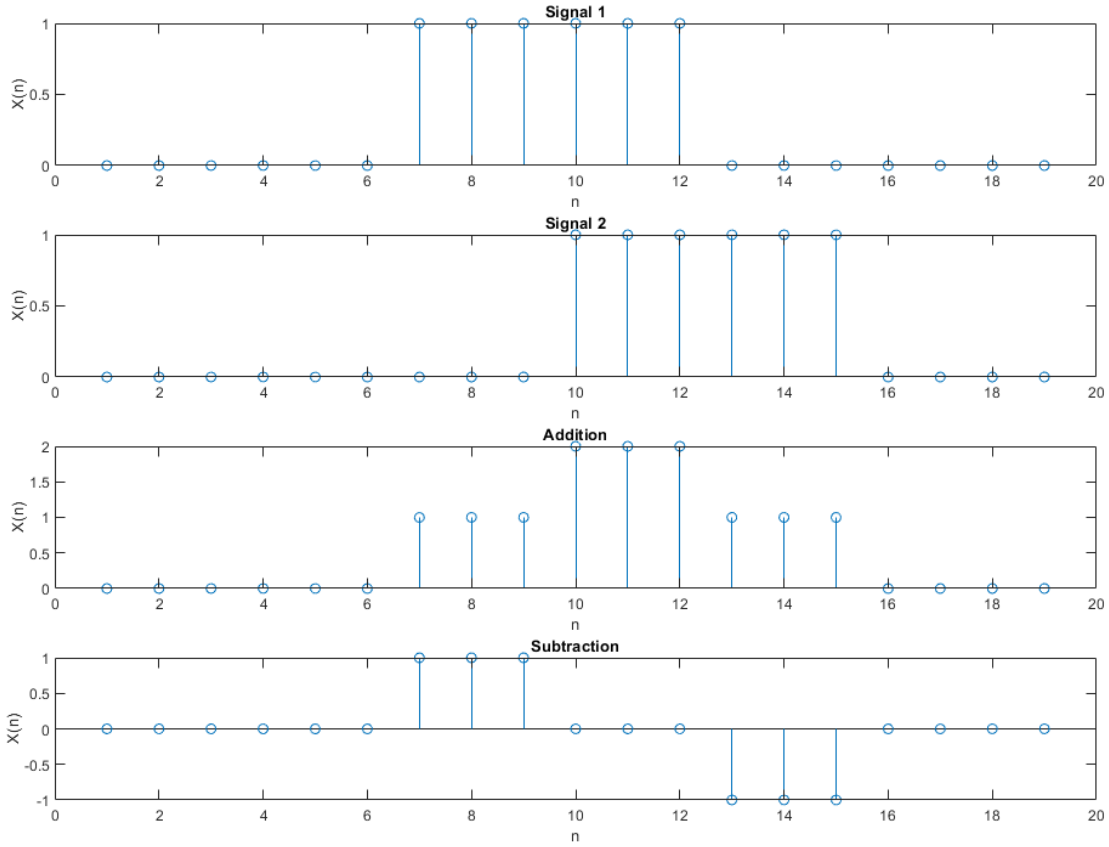

Fig 2.2: Addition and Subtraction of Two Signals

2.3 Experiment Name: Presentation of two Signal

2.3.1 Code:

```
t = 0:4;
t1 = 0:7;
u1 = [0 1 1 1 0];
u2 = [0 1 1 2 2 1 1 0];

subplot(2,1,1)
plot(t,u1);
ylim([0,2]);

subplot(2,1,2)
plot(t1,u2);
ylim([0,3]);
```

2.3.2 Output:

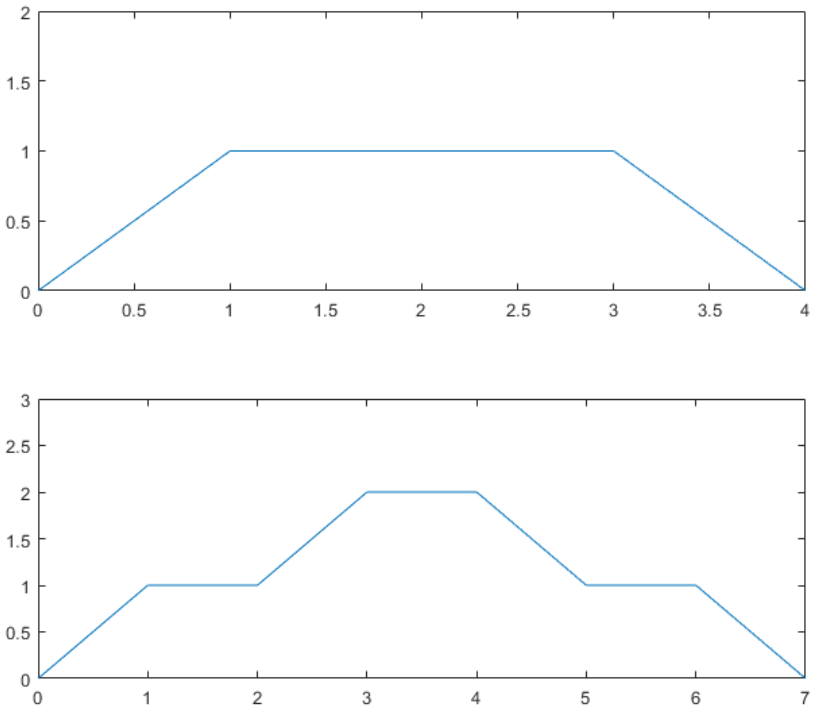

Fig 2.3: Representation of Two Signals

Conclusion:

In this experiment we have implemented circular convolution without using built-in function.

We have plotted two signals and also displayed their addition and subtraction.

Lastly, we have represented two given signals in a single figure.