
# Rajshahi University of Engineering and Technology

## DEPT. of Electrical and Computer Engineering

**Course No:** ECE 4124

**Course Title:** Digital Signal Processing Sessional

Date of the submission: 15.05.23

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1. **Experiment No:** 03
2. **Experiment Date:** 08.05.2023

3. **Experiment Name**:
   Study and implementation of cross correlation and auto correlation using xcorr function and also without function.
4. **Theory:**

In the experiment, we worked with correlation and autocorrelation of signals. A discrete-time signal is a sequence of values of interest, where the integer index can be thought of as a time index, and the values in the sequence represent some physical quantity of interest.

Autocorrelation is the correlation of a time series and its lagged version over time. Although similar to correlation, autocorrelation uses the same time series twice. Financial analysts and traders use autocorrelation to examine historical price movements and predict future ones.
Cross-correlation is a measurement that tracks the movements of two or more sets of time series data relative to one another. It is used to compare multiple time series and objectively determine how well they match up with each other and, in particular, at what point the best match occurs.

5. **Required Software: MATLAB**

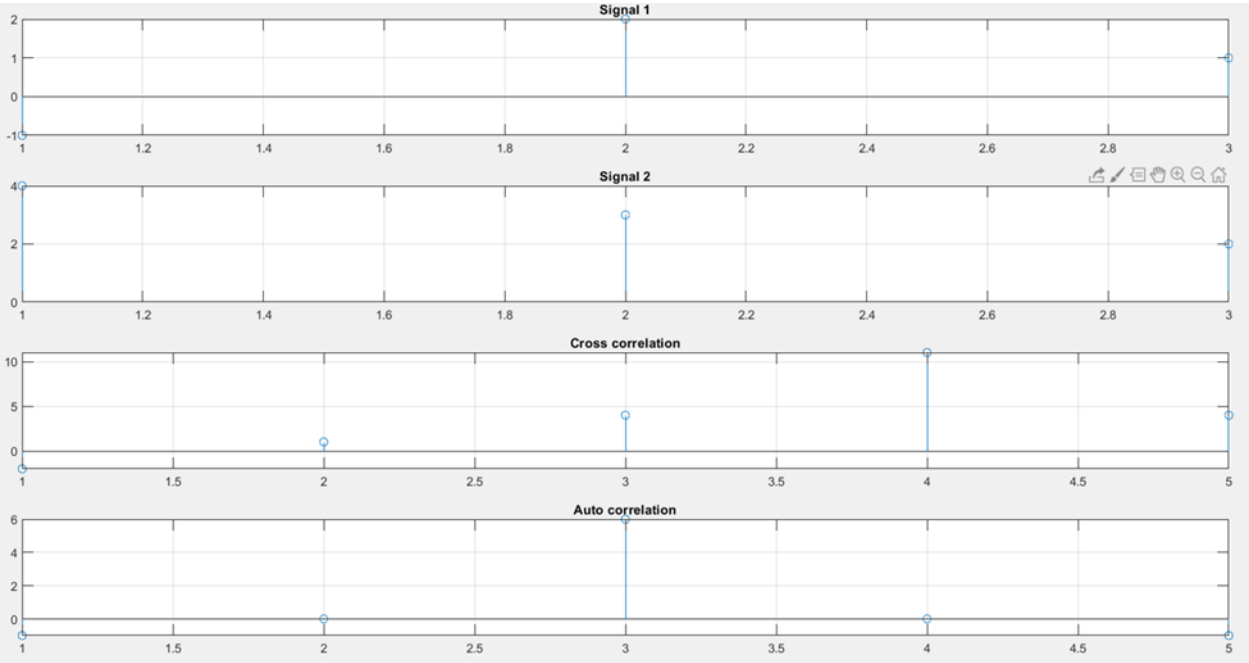
6. **Code with Output:**

a) Cross correlation and auto correlation with function:

```
clc;
clear all;
close all;
x = input('Enter x: ');
y = input('Enter y: ');
c = xcorr(x,y)
a = xcorr(x,x)
subplot(4,1,1);
stem(x)
title('Signal 1');
grid on;
subplot(4,1,2);
stem(y)
title('Signal 2');
grid on;

subplot(4,1,3);
stem(c)
title('Cross correlation');
grid on;
subplot(4,1,4);
stem(a)
title('Auto correlation');
grid on;
```

Output:

```
Enter x: [-1 2 1]
Enter y: [4 3 2]

c =

   -2.0000    1.0000    4.0000   11.0000    4.0000


a =

    -1     0     6     0    -1
```




b) Cross correlation and auto correlation without function:

```
clc;
clear all;
close all;
x = input('Enter x:');
y = input('Enter y:');
y = fliplr(y);
l1 = length(x);
l2 = length(y);
tot = l1+l2-1;
for i= 1:tot
    z(i) = 0;
    for k = 1:l1
        if(i>l1)
            y(i) = 0;
        end
        if(i-k+1>0)
            z(i) = z(i)+x(k)*y(i-k+1);
        else
        end
    end
end
```

```
subplot(3,1,1);
stem(x)
title('Signal 1');
grid on;

subplot(3,1,2);
stem(y)
title('Signal 2');
grid on;

subplot(3,1,3);
stem(z)
title('Correlation');
grid on;
```

Output:

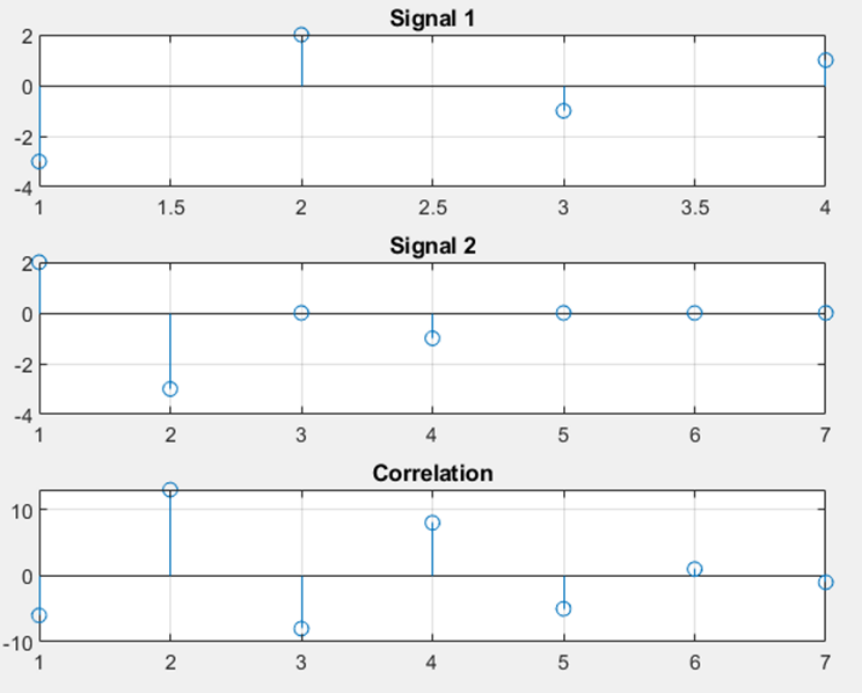
**Cross correlation:**

```
Enter x:[-3 2 -1 1]
Enter y:[-1 0 -3 2]

z =

    -6    13    -8     8    -5     1    -1
```

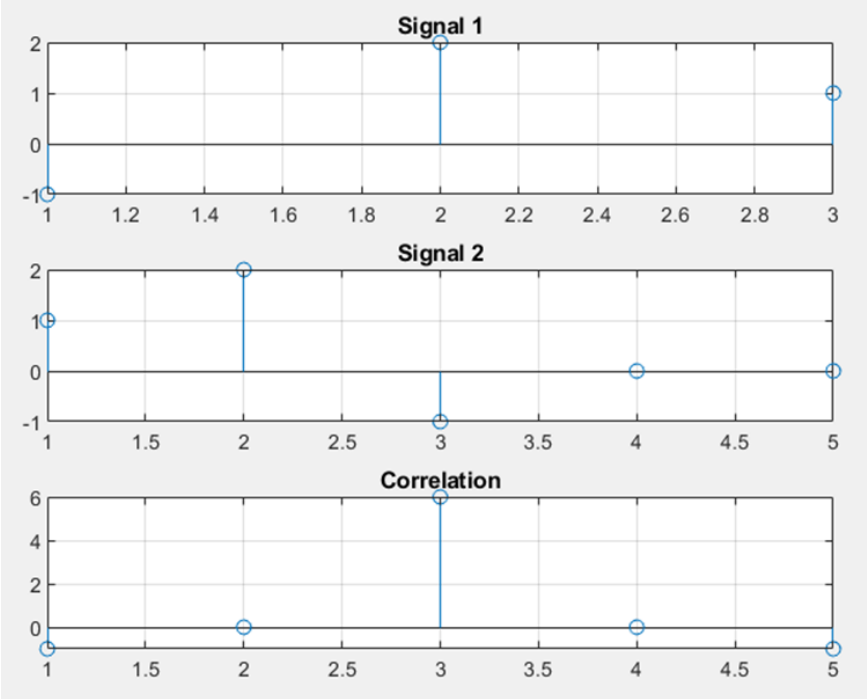
**Auto correlation:**

```
Enter x:[-1 2 1]
Enter y:[-1 2 1]

z =

    -1     0     6     0    -1
```

**Cross correlation:**




**Auto correlation:**




## 7. Conclusion:

In the experiment, we have plotted all the signals correctly. So, we can say, the experiment is done successfully and the desired output is achieved.