Experiment Name: Finding auto correlation and cross correlation of signal using matlab.

Theory: The correlation of two functions or signals or waveforms is defined as the measure of similarity between those signals. There are two types of correlations −

- Cross-correlation
- Autocorrelation

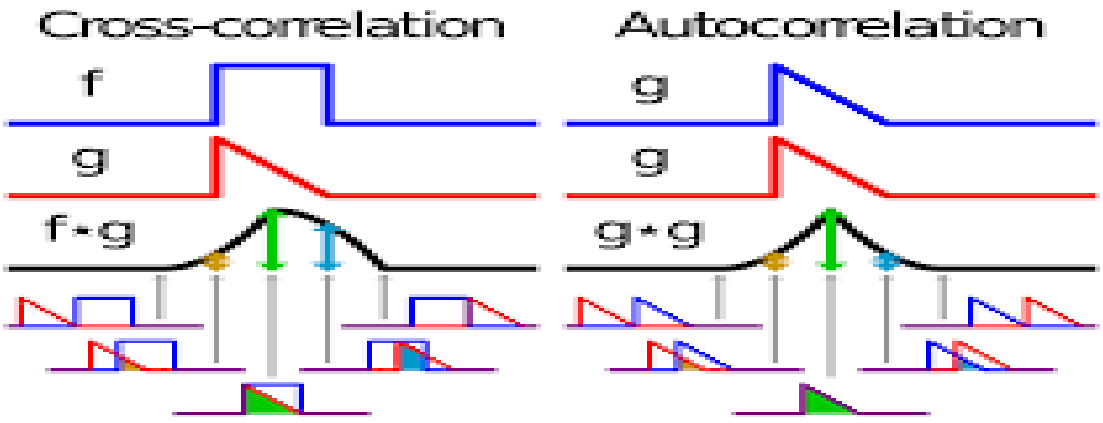
The cross-correlation between two different signals or functions or waveforms is defined as the measure of similarity or coherence between one signal and the time-delayed version of another signal. The cross-correlation between two different signals indicates the degree of relatedness between one signal and the time-delayed version of another signal.

If the two signal x1(t) and x2(t) is real then cross correlation between them

$$\mathbf{X12(\tau)}=\int_{-\infty}^{+\infty} \boldsymbol{x1(t)x2(t-\tau)dt}=\int_{-\infty}^{+\infty} \boldsymbol{x1(t+\tau)x2(t)\,dt}$$

Autocorrelation:The autocorrelation function is defined as the measure of similarity or coherence between a signal and its time delayed version. Therefore, the autocorrelation is the correlation of a signal with itself. Autocorrelation is a mathematical representation of the degree of similarity between a given time series and a lagged version of itself over successive time intervals. It's conceptually similar to the correlation between two different time series, but autocorrelation uses the same time series twice: once in its original form and once lagged one or more time periods.

- Autocorrelation represents the degree of similarity between a given time series and a lagged version of itself over successive time intervals.
- Autocorrelation measures the relationship between a variable's current value and its past values.
- An autocorrelation of +1 represents a perfect positive correlation, while an autocorrelation of -1 represents a perfect negative correlation.



Code:

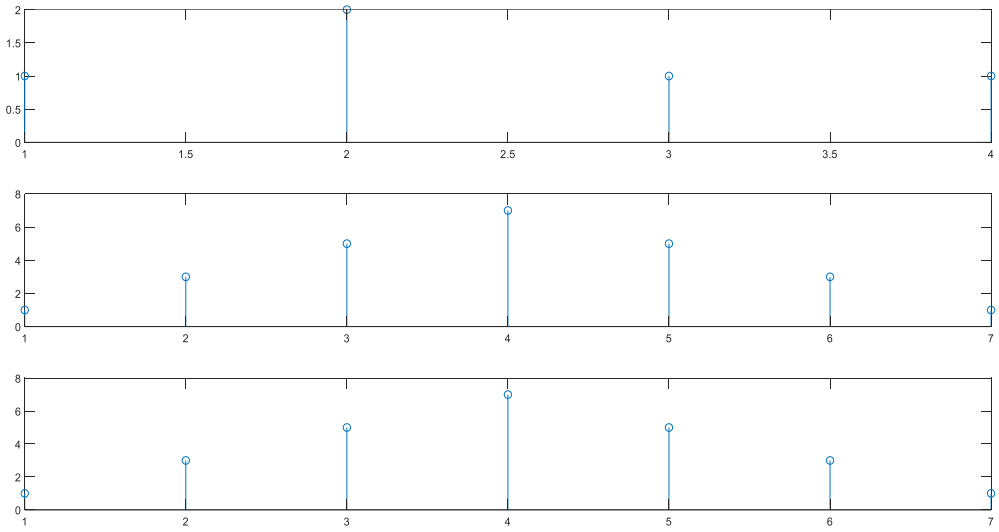
```
clear all
clc
x =input('enter the value of x');
R= input('enter the value of Y');
y=[];
for i=length(R):-1:1
    Y=R(i);
    y=[y Y];
end
p=[];
k=zeros(1,7);
m=length(x)
n=length(y)
l=0;
q=1;
for i=1:m
    for j=1:n
        z(i,j)=y(i).*x(j);
    end
end
for i=1:m
 p=i;

    for j=1:n
        k(i)=k(i)+z(p,j);
        p=p-1;
        if p==0
            break
        end

        if i>=j
            continue
        else
            break
       end
    end
end
q=1;
for i=m+1:m+n-1
```

```
        p=4;
        q=q+1;
              for j=q:n
               k(i)=k(i)+z(p,j);
               p=p-1;
              end
end
j=xcorr(x,x);
subplot(3,1,1);
stem(x);
subplot(3,1,2);
stem(k);
subplot(3,1,3);
stem(j);
```

Output:



<u>Conclusion and discussion:</u>I implement this code by using tabular method of convolution.The difference is the entry of row is given in a reverse from.If I want to get autocorrelation result then I have to give same input for two signal.For getting cross correlation two signal has to be given as input.Finally the output of original signal,output of correlation generated by program and correlation using library function is plotted.

Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology, Rajshahi

Lab report

Course No: ECE 4124

Course Title: Digital Signal Processing Sessional

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