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# Digital Signal Processing [Lab-4]

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## Objective:

Correlation (In this lab we computed correlation of signals. we also computed the timeperiod of noisy period signal by computing the the auto-correlation of the signal and then finding period with its peaks)

## Program:

```
clc;
clear all;
close all;

% * |*Matlab Commands Cross-Correlation of class example*|

x=[1,2,3,4];
y=[4,3,2,1];
out=zeros(1,4);%For reversing the y
for i=1:4
    out(i)=y(5-i);%Changing the poition of y and storing in out variable
end
y=out;%y is out variable (Reversing is done)

[x_row, x_col]=size(x);%Size of x
[y_row, y_col]=size(y);%Size of y

size_x_col=x_col+y_col-1;%X column length

X=zeros(size_x_col,y_col);%Making X matrix full of zeros

k=0;%variable for shifting in the matrix
for i=1:y_col%Looping through column
    for j=1:x_col%Looping through the row
        X(j+k,i)=x(j);
    end
    k=k+1;
```

end

```
Y = mtimes(X,transpose(y));%Matrix Multiplication
conv_ans=transpose(Y);
```

• **Matlab Commands for Cross-Correlation using function**

% cross\_corr function stored in cross\_corr.m file

```
% function [ conv_ans ] = cross_corr( x,y )
% This function computes cross-correlation of input x,y
```

```
% y=fliplr(y);%Flipped the y
% [x_row, x_col]=size(x);%Size of x
% [y_row, y_col]=size(y);%Size of y
% size_x_col=x_col+y_col-1;%X column length
% X=zeros(size_x_col,y_col);%Making X matrix full of zeros
%
% k=0;%variable for shifting in the matrix
% for i=1:y_col%Looping through column
%     for j=1:x_col%Looping through the row
%         X(j+k,i)=x(j);
%     end
%     k=k+1;
% end
% Y = mtimes(X,transpose(y));%Matrix Multiplication
% conv_ans=transpose(Y);
%
% end
```

```
x=[1,2,3,4];
y=[4,3,2,1];
```

```
func_crossc=cross_corr(x,y);
```

• **Matlab Commands for finding period in noise added periodic signal**

```
load('noiseData.mat');
noise_autoc=cross_corr(noiseData,noiseData);%Computing cross-correlation
count=0;%Counter for counting the peaks of cross correlation
for i=2:98
    if noise_autoc(i)>noise_autoc(i-1)&&noise_autoc(i)>noise_autoc(i+1)
        %if the ith sample is more than its immediate neighbours
        count=count+1;%Increase the counter
        peak(count)=noise_autoc(i);%Storing the peak value in the peak variable
        index(count)=i;%Storing the peak value indexes
    end
end

[size_index_row, size_index_col]=size(index);%Finding the size of index
for i=1:size_index_col-1
    diff_index(i)=index(i+1)-index(i);%Taking the difference between indexes
end
[diff_index_row, diff_index_col]=size(diff_index);%Finding the size of
% diff_index variable
avg_ans=sum(diff_index)/diff_index_col;%Finding the average difference in
```

%the peaks by computing the sum and dividing by size of diff\_index

## Results:

- \*Result for Cross-Correlation of class example \*

conv\_ans

conv\_ans =

1      4      10      20      25      24      16

- Result for Cross-Correlation using function

func\_crossc

func\_crossc =

1      4      10      20      25      24      16

- Result for finding period in noise added periodic signal

avg\_ans

avg\_ans =

10

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