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Experiment 10 : To find DFT & IDFT of given DT signals using FFT

Aim : To write the matlab code to determine DFT/IDFT of a given signal.

Run #01:

(1) Find the circular convolution for the given DT signals using matlab.

x(n) = [2, 1, 2, 1] and h(n) = [1, 2, 3, 4].

Write Matlab code using Matlab built-in functions fft & ifft.

```
clc;
clear all;
close all;
x=[2,1,2,1];
h=[1,2,3,4];
X=fft(x);
H=fft(h);
Y=X.*H;
y=ifft(Y);
disp("circular convolution of x(n) and h(n) is= ");
disp(y);
```

output:

circular convolution of x(n) and h(n) is= 14 16 14 16

Run#02

(2)

Write you own program/code to find the DFT of the given discrete time signal x(n) =[1,2,3,4] and compare output of DFT with inbuilt FFT function. The expression for DFT is given below

$$X(k)=\sum_{n=0}^{N-1} x(n)e^{-i\frac{2\pi}{N}kn}$$

(Hint: use for loop)

```
clc;
clear all;
close all;
x=[1,2,3,4];
```

```
%finding FFT of x(n);
fX=fft(x);
disp('FFT of x(n)= ');
disp(fX);

%finding DFT of x(n)
dX=zeros(1,4);
for k=0:3
    for n=0:3
      dX(k+1)=dX(k+1)+x(n+1).*exp(((-i).*2.*pi.*k.*n)./4);
    end;
end;
disp('DFT of x(n)= ');
disp(dX);
```

OUTPUT:

FFT of x(n)= 10.0000 + 0.0000i -2.0000 + 2.0000i -2.0000 + 0.0000i -2.0000 - 2.0000i

DFT of x(n)= 10.0000 + 0.0000i -2.0000 + 2.0000i -2.0000 - 0.0000i -2.0000 - 2.0000i

The results obtained from dft and built in function fft are same.

Run#03:

(3) Show that equivalence between linear and circular convolution for the given sequences :

x[n] = [6, 4, 3, 7, 8] and h[n] = [1, 2, 3, 4]

Use the “conv” command for linear convolution and “cconv” (or) FFT command for circular convolution.

Plot both the signals using stem function and compare the results obtained.

```
clc;
clear all;
close all;
x=[6,4,3,7,8];
h=[1,2,3,4];

l=conv(x,h);
disp('linear convolution of x(n) and h(n) is= ');
disp(l);
subplot(2,1,1);
stem(l);
title('linear convolution');
xlabel('n');
```

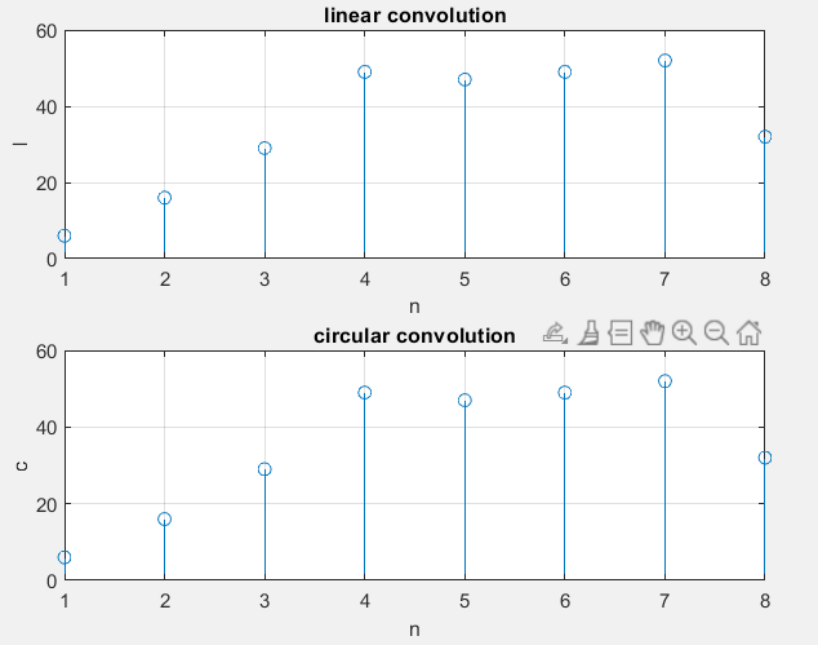
```
ylabel('l');
grid on;

c=cconv(x,h);
disp('circular convolution of x(n) and h(n) is= ');
disp(c);
subplot(2,1,2);
stem(c);
title('circular convolution');
xlabel('n');
ylabel('c');
grid on;
```

OUTPUT:
linear convolution of x(n) and h(n) is= 6 16 29 49 47 49 52 32

circular convolution of x(n) and h(n) is= 6.0000 16.0000 29.0000 49.0000 47.0000 49.0000 52.0000 32.0000

As the samples are of different lengths, cconv command is giving the same result as that obtained after linear convolution of x(n) and h(n)



Last Date of Submission : 15-04-2021(Thursday)

Link

https://forms.gle/dS6xA7y9zMcVAwuQ9