College of Engineering and Physics

Electrical Engineering Department

EE562 - Digital Signal Processing I

Second Semester (212)

Computer Assignment 6

Solved By: Mahmoud Yassin

ID: 202113650

Supervised by: Dr. Wail A. Mousa

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%Assignment 6
% Done by Mahmoud Yassin Mahmoud
% ID: 202113650
% Submitted To Dr. Wail A. Mousa
% Bism Allah and I will start with
%(Q1):
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
clc;
clear;
%-----------------------------------------------
n1=0:2000;
u=ones(size(n1));
u10=[zeros(1,10) ones(size(n1)-[0 10])];
u1000=[zeros(1,1000) ones(size(n1)-[0 1000])];
x1=u-u10;
x2=u-u1000;
N1=16;
N2=1024;
%-------------------------------------
%DFT calculations
%-------------------------------------
%16-point DFT for x1
tStart_x1_DFT_16 = tic;
for k=0:N1-1
    for n=0:N1-1
      X1_16_point(n+1) = x1(n+1) *exp(-j*2*pi*k*n/N1);
    end
 Xk1_DFT_16_point (k+1) = sum(X1_16_point);
end
tEnd_x1_DFT_16 = toc(tStart_x1_DFT_16)
%_____________________________________________
%1024-point DFT for x2
tStart_x2_DFT_1024 = tic;
for k=0:N2-1
    for n=0:N2-1
      X2_1024_point(n+1) = x2(n+1) *exp(-j*2*pi*k*n/N2);
    end
 Xk2_DFT_1024_point (k+1) = sum(X2_1024_point);
end
tEnd_x2_DFT_1024 = toc(tStart_x2_DFT_1024)
%_____________________________________________
%FFT calculations
%-----------------------
%16-point FFT for x1

tStart_x1_FFT_16 = tic;
   Xk1_FFT_16_point=fft(x1,N1);
tEnd_x1_FFT_16 = toc(tStart_x1_FFT_16)

%16-point FFT for x2

tStart_x2_FFT_1024 = tic;
   Xk2_FFT_1024_point=fft(x2,N2);
tEnd_x2_FFT_1024 = toc(tStart_x2_FFT_1024)
```

```
tEnd_x1_DFT_16 =

    0.0053


tEnd_x2_DFT_1024 =
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    0.2019

tEnd_x1_FFT_16 =

   9.2700e-05

tEnd_x2_FFT_1024 =

   4.7400e-05
```

Published with MATLAB® R2021b

Results for Assignment 6

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Function	N	DFT runtime in seconds	FFT runtime in seconds	FFT time savings %
$x_1(n)$	16	0.0053	$9.27*10^{-5}$	98.25%
$x_2(n)$	1024	0.2019	$4.74*10^{-5}$	99.98%

Results table