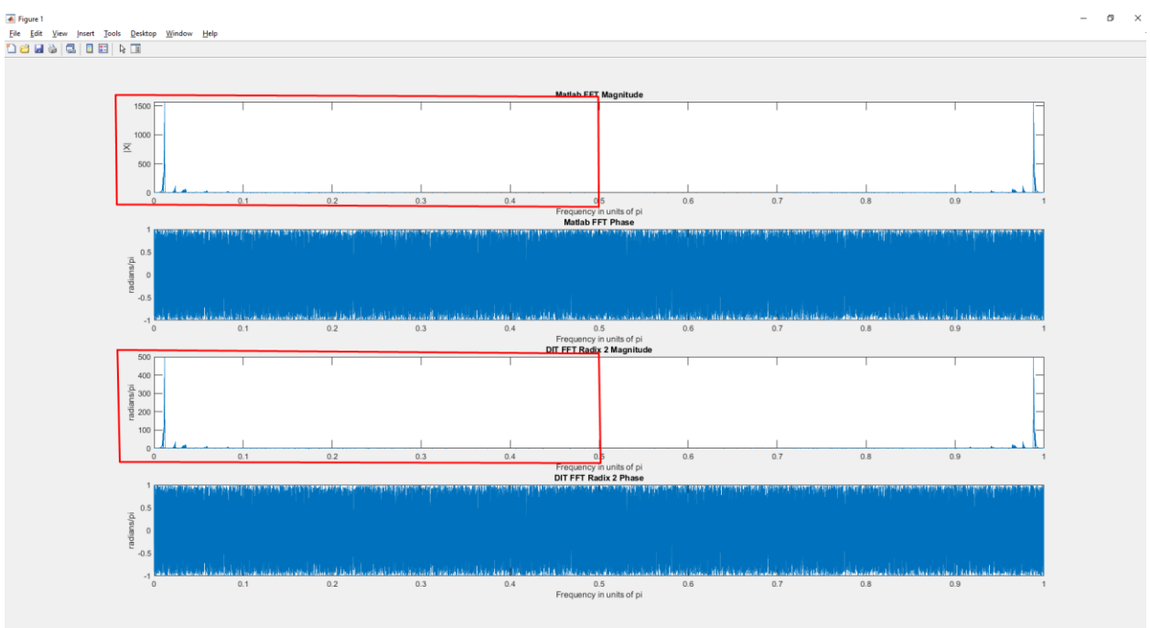
Editor - G:\My Drive\1 MSU - IIT\8 Fourth Year Second Sem\Digital Signal Processing\Matlab\Baliguat_Exercise_8.m

Baliguat_Exercise_7.m | Quiz3.m | Baliguat_Exercise_8.m

```
%Baliguat, Dennis Ivan C.
clear
clc
[Y, FS] = audioread('Recording (16).wav');
Y_final = Y(17409:82944);
sound(Y_final, FS);
Y_length = length(Y_final)
matlab_fft = fft(Y_final);
% plot(Y_final);
% plot(abs(matlab_fft));

Y_final_binary = de2bi(1:Y_length);
Y_final_binary_reversed = bitrevorder(Y_final_binary);
Y_final_reversed = bi2de(Y_final_binary_reversed);


twiddle_factor_length = 1:log2(Y_length-1);

w16 = cos((2*pi.*twiddle_factor_length)/Y_length) - j*sin((2*pi.*twiddle_factor_length)/Y_length)


aw = dit_fft_radix_2(Y_final);

k = 0 : Y_length-1;
w = (pi/Y_length)*k;
subplot(4,1,1); plot(w/pi, abs(matlab_fft)); xlabel('Frequency in units of pi'); ylabel('|X|'); title('Matlab
subplot(4,1,2); plot(w/pi, angle(matlab_fft)/pi); xlabel('Frequency in units of pi'); ylabel('radians/pi');
subplot(4,1,3); plot(w/pi, abs(aw)/pi); xlabel('Frequency in units of pi'); ylabel('radians/pi'); title('DIT
subplot(4,1,4); plot(w/pi, angle(aw)/pi); xlabel('Frequency in units of pi'); ylabel('radians/pi'); title('D


function [y] = dit_fft_radix_2(x)
N=length(x);
twiddle_factor_length = log2(length(x));
twiddle_factor_length
Half=1;
x_binary = de2bi(1:length(x));
x_binary_reversed = bitrevorder(x_binary);
x_reversed = bi2de(x_binary_reversed);
x = x(x_reversed);
for stage = 1 : twiddle_factor_length
    for index = 0 : (2^stage):(N-1)
        for n = 0 : (Half-1)
            pos = n + index + 1;
            pow = (2 ^(twiddle_factor_length - stage))*n;
            w16 = exp((-1i)*(2*pi) * pow/N);
            a = x(pos) + x(pos+Half) .* w16;
            b = x(pos) - x(pos+Half) .* w16;
            x(pos) = a;
            x(pos + Half) = b;
        end
    end
Half=2*Half;
end
y=x;
end
```



Command Window

```
Y_length =

       65536


w16 =

  Columns 1 through 4

   1.0000 - 0.0001i   1.0000 - 0.0002i   1.0000 - 0.0003i   1.0000 - 0.0004i

  Columns 5 through 8

   1.0000 - 0.0005i   1.0000 - 0.0006i   1.0000 - 0.0007i   1.0000 - 0.0008i

  Columns 9 through 12

   1.0000 - 0.0009i   1.0000 - 0.0010i   1.0000 - 0.0011i   1.0000 - 0.0012i

  Columns 13 through 15

   1.0000 - 0.0012i   1.0000 - 0.0013i   1.0000 - 0.0014i


twiddle_factor_length =

    16

fx >>
```

W_{16}^{0-15}