**FFT Analysis – Single Chanel Acceleration or Sound Pressure**

Comments on the Matlab Code

Here's a basic FFT function. It calculates as many averages as it can without overlap using a specified number of FFT points, N and plots both a single-sided magnitude spectrum and a level (in dB with a user specified level, 1 g by default).

Suggestion – assign physical system units to your data of choice; check to make sure that consistent units are used for calculations.

Check calculations for a known periodic function.

% Sample Data

t = 0:1/1024:30; %(S) time vector

a = 3\*sin(25\*2\*pi\*t) + 0.4\*sin(50\*2\*pi\*t - 49\*pi/180) + 5\*(randn(size(t))); %(g) accel data

% Solution

basicFFT(t,a,0.1)

function [] = basicFFT(t,a,aref)

% DSP Parameters

dt = mean(t(2:end)-t(1:end-1)); %(s) sample period

NFFT = 2^10; % fft points

df = 1/(NFFT\*dt); %(Hz) freq resolution

fs = 1/dt; %(Hz) sample frequency

fv = (0:NFFT/2-1)\*df; %(Hz) frequency vector for single-sided spectra

Navg = floor(length(a)/NFFT); % # of no-overlap windows for averaging

A = zeros(Navg,NFFT/2);

for j = 1:Navg

Aj = fft(a((j-1)\*NFFT + (1:NFFT)),NFFT)/NFFT; %(g) double-sided amplitude spectrum

A(j,:) = abs([Aj(1) 2\*Aj(2:NFFT/2)]); %g) single-sided amplitude spectrum (magnitude)

end

Amag = mean(A,1);

figure(600)

semilogy(fv, Amag,'r-')

xlabel('f (Hz)')

ylabel('a (g)')

xlim([fv(1) fv(end)])

% level calculations

if nargin < 3

aref = 1; %(g) default dB reference level

end

Alvl = 20\*log10(Amag/aref);

figure(601)

plot(fv,Alvl,'b-','linewidth',2);

xlabel('f (Hz)')

ylabel(['A (dB, ref ', num2str(aref),' g)'])

xlim([min(fv) max(fv)])

end