clc;

files = dir('\*.csv');

for i=1:size(files,1)

filename = files(i).name;

data=dlmread(filename,',');

data\_x = data(:,1);

data\_y = data(:,2);

data\_z = data(:,3);

%Preprocessing data

%Smoothing or moving average for reducing noise----

k=101;

order=3;

%data\_x=movemedian(data\_x,k);

data\_x=smoothdata(data\_x,'sgolay',k);

%data\_x=sgolayfilt(data\_x,order,k);

figure(1);

plot(data\_x);

%Normal atttributes - std dev, correlation

std\_dev\_x=std(data\_x);

std\_dev\_y=std(data\_y);

std\_dev\_z=std(data\_z);

xy\_correlation=corr(data\_x,data\_y);

yz\_correlation=corr(data\_z,data\_y);

zx\_correlation=corr(data\_x,data\_z);

%RMS of whole data ------------------------------

RMS\_data\_x=rms(data\_x);

RMS\_data\_y=rms(data\_y);

RMS\_data\_z=rms(data\_z);

%-------------------------Frequency components & PSD estimate---------------------

% FOR X

x=data\_x;

% Choose FFT size and calculate spectrum

fsamp= 1200 % 1200 hz sampling rate even though it is 30 fps - to add zero padding

Nfft = 500

win\_len=1500

noverlap=500

[Pxx\_x,f] = pwelch(x,hann(win\_len),noverlap,Nfft,fsamp);

% Plot frequency spectrum

subplot(2,1,2);

stem(f,Pxx\_x);

hold on;

ylabel('PSD'); xlabel('Frequency (Hz)');

grid on;

% Get frequency estimate (spectral peak)

[~,loc] = max(Pxx\_x);

FREQ\_ESTIMATE\_x = f(loc)

title(['Frequency estimate Hz']);

%FOR Y

y=data\_y;

% Choose FFT size and calculate spectrum

fsamp= 1200 % 200 hz sampling rate even though it is 30 fps - to add zero padding

Nfft = 500

win\_len=1500

noverlap=500

[Pxx\_y,f] = pwelch(y,hann(win\_len),noverlap,Nfft,fsamp);

% Plot frequency spectrum

subplot(2,1,2);

stem(f,Pxx\_y);

hold on;

ylabel('PSD'); xlabel('Frequency (Hz)');

grid on;

% Get frequency estimate (spectral peak)

[~,loc] = max(Pxx\_y);

FREQ\_ESTIMATE\_y = f(loc)

title(['Frequency estimate Hz']);

%FOR Z

z=data\_z;

% Choose FFT size and calculate spectrum

fsamp= 1200 % 200 hz sampling rate even though it is 30 fps - to add zero padding

Nfft = 500

win\_len=1500

noverlap=500

[Pxx\_z,f] = pwelch(z,hann(win\_len),noverlap,Nfft,fsamp);

% Plot frequency spectrum

subplot(2,1,2);

stem(f,Pxx\_z);

hold on;

ylabel('PSD'); xlabel('Frequency (Hz)');

grid on;

% Get frequency estimate (spectral peak)

[~,loc] = max(Pxx\_z);

FREQ\_ESTIMATE\_z = f(loc)

title(['Frequency estimate Hz']);

%-----------------------------------------------------------------

Pxx\_xyCorr= corr(Pxx\_x,Pxx\_y);

Pxx\_yzCorr= corr(Pxx\_y,Pxx\_z);

Pxx\_xzCorr= corr(Pxx\_x,Pxx\_z);

%----------------------Peak detection------------------------------

%FOR X

[pks\_x,locs\_x,w,p]=findpeaks(data\_x);

findpeaks(data\_x)

mean\_dist\_pks\_x=mean(diff(locs\_x))

no\_of\_peaks\_x=length(pks\_x);

%FOR Y

[pks\_y,locs\_y,w,p]=findpeaks(data\_y);

findpeaks(data\_y,'MinPeakProminence',10)

mean\_dist\_pks\_y=mean(diff(locs\_y))

no\_of\_peaks\_y=length(pks\_y);

%FOR Z

[pks\_z,locs\_z,w,p]=findpeaks(data\_z);

findpeaks(data\_z,'MinPeakProminence',10)

mean\_dist\_pks\_z=mean(diff(locs\_z))

no\_of\_peaks\_z=length(pks\_z);

%----------------------RMS of peaks ------------------------------

RMS\_peaks\_x=rms(pks\_x);

RMS\_peaks\_y=rms(pks\_y);

RMS\_peaks\_z=rms(pks\_z);

%-----------------------Correlation between peaks--------------------

%xy\_peaks\_mean=(diff(locs\_x),mean(pks\_y));

%yz\_peaks\_mean=mean(mean(pks\_y),var(pks\_z));

%xz\_peaks\_mean=mean(mean(pks\_x),var(pks\_z));

%--------------------------------------------------------------------

M=[FREQ\_ESTIMATE\_x FREQ\_ESTIMATE\_y FREQ\_ESTIMATE\_z Pxx\_xyCorr Pxx\_yzCorr Pxx\_xzCorr mean\_dist\_pks\_x mean\_dist\_pks\_y mean\_dist\_pks\_z...

RMS\_peaks\_x RMS\_peaks\_y RMS\_peaks\_z RMS\_data\_x RMS\_data\_y RMS\_data\_z no\_of\_peaks\_x no\_of\_peaks\_y no\_of\_peaks\_z] ;

dlmwrite('Window.0001.test.tsv',M,'-append');

end