data\_test\_eeg1=trial2.eeg1;

data\_test\_emg1=trial2.emg7;

data\_test\_eeg1=data\_test\_eeg1\*(3.3/4096);

data\_test\_emg1=data\_test\_emg1\*(3.3/4096);

Fr\_data=length(data\_test\_emg1)/120;

ti\_data=1/Fr\_data;

T\_data1=[0:1:(length(data\_test\_eeg1)-1)]\*ti\_data;

data\_test\_eeg1\_fft=fft(data\_test\_eeg1);

data\_test\_eeg1\_fft(1)=0;

data\_test\_eeg1=ifft(data\_test\_eeg1\_fft);

plot(T\_data1,data\_test\_eeg1)

title('eeg data')

xlabel('Time(s)')

ylabel('Voltage(v)')

data\_test\_emg1\_fft=fft(data\_test\_emg1);

data\_test\_emg1\_fft(1)=0;

data\_test\_emg1=ifft(data\_test\_emg1\_fft)

plot(T\_data1,data\_test\_emg1)

grid on

xlim('auto')

ylim('auto')

title('emg data')

xlabel('Time(s)')

ylabel('Voltage(v)')

%smooth eeg data

% Smooth input data

smoothedData\_1 = smoothdata(data\_test\_eeg1,"movmean","SmoothingFactor",0.5);

% Display results

clf

plot(data\_test\_eeg1,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData\_1,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Smoothed data")

hold off

legend

%detrended eeg data

% Remove trend from data

smoothedData\_1 = detrend(smoothedData\_1);

% Display results

clf

plot(smoothedData\_1,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData\_1,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Detrended data")

plot(smoothedData\_1-smoothedData\_1,"Color",[217 83 25]/255,"LineWidth",1,...

"DisplayName","Trend")

hold off

legend

%smooth emg data

% Smooth input data

smoothedData\_5 = smoothdata(data\_test\_emg1,"movmean","SmoothingFactor",0.3);

% Display results

clf

plot(data\_test\_emg1,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData\_5,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Smoothed data")

hold off

legend

%detrended emg data

% Remove trend from data

smoothedData\_5 = detrend(smoothedData\_5);

% Display results

clf

plot(smoothedData\_5,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData\_5,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Detrended data")

plot(smoothedData\_5-smoothedData\_5,"Color",[217 83 25]/255,"LineWidth",1,...

"DisplayName","Trend")

hold off

legend

pspectrum(data\_test\_eeg1,Fr\_data,"power")

title('Power V/S freq EEG\_r\_a\_w')

pspectrum(smoothedData\_1,Fr\_data,"power")

title('Power V/S freq EEG\_s\_m\_o\_o\_t\_h\_e\_n\_e\_d\_+\_d\_e\_t\_r\_e\_n\_d\_e\_d')

pspectrum(data\_test\_emg1,Fr\_data,"power")

title('Power V/S freq EMG\_r\_a\_w')

pspectrum(smoothedData\_5,Fr\_data,"power")

title('Power V/S freq EEG\_s\_m\_o\_o\_t\_h\_e\_n\_e\_d\_+\_d\_e\_t\_r\_e\_n\_d\_e\_d')

pspectrum(data\_test\_eeg1\*1,Fr\_data,"spectrogram",'MinThreshold',-40,"TimeResolution",1.3,"FrequencyLimits",[0,10],"OverlapPercent",90)

title('EEG\_r\_a\_w')

view(-45,45)

colormap jet

title('EEG\_r\_a\_w')

%pspectrum(data\_test\_eeg1\*1,Fr\_data,"spectrogram",'MinThreshold',-40,"TimeResolution",1.3,"FrequencyLimits",[0,10],"OverlapPercent",90)

%colormap jet;

pspectrum(data\_test\_emg1\*1,Fr\_data,"spectrogram",'MinThreshold',-40,"TimeResolution",1,"FrequencyLimits",[0,10],"OverlapPercent",90)

title('EMG\_r\_a\_w')

[eeg1corr,lagscorr1]=crosscorr(data\_test\_eeg1\*10,data\_test\_emg1\*10);

plot(lagscorr1,eeg1corr)

title('cross corelation of the eeg and emg')

pspectrum(smoothedData\_1\*1,Fr\_data,"spectrogram",'MinThreshold',-40,"TimeResolution",1.3,"FrequencyLimits",[0,10],"OverlapPercent",90)

title('EEG\_s\_m\_o\_o\_t\_h\_+\_d\_e\_t\_r\_e\_n\_d\_e\_d')

pspectrum(smoothedData\_5\*1,Fr\_data,"spectrogram",'MinThreshold',-40,"TimeResolution",1.3,"FrequencyLimits",[0,10],"OverlapPercent",90)

title('EMG\_s\_m\_o\_o\_t\_h\_+\_d\_e\_t\_r\_e\_n\_d\_e\_d')

note that the trial 2 coducted is discarded due to conection issues

data\_test2\_eeg1=trial3.VarName1;

data\_test2\_emg1=trial3.VarName7;

data\_test2\_eeg1=data\_test2\_eeg1\*(3.3/4096);

data\_test2\_emg1=data\_test2\_emg1\*(3.3/4096);

Fr\_data2=length(data\_test2\_emg1)/120;

ti\_data2=1/Fr\_data2;

T\_data2=[0:1:(length(data\_test2\_eeg1)-1)]\*ti\_data2;

plot(T\_data2,data\_test2\_eeg1)

plot(T\_data2,data\_test2\_emg1)

data\_test2\_eeg1\_fft=fft(data\_test2\_eeg1);

data\_test2\_eeg1\_fft(1)=0;

data\_test2\_eeg1=ifft(data\_test2\_eeg1\_fft)

plot(T\_data2,data\_test2\_eeg1);

pspectrum(data\_test2\_eeg1,Fr\_data2,"spectrogram");

pspectrum(data\_test2\_emg1,Fr\_data2,"spectrogram");

3rd trial data

data\_test3\_eeg1=trial4.VarName1;

data\_test3\_emg1=trial4.VarName7;

data\_test3\_eeg1=data\_test3\_eeg1\*(3.3/4096);

data\_test3\_emg1=data\_test3\_emg1\*(3.3/4096);

Fr\_data3=length(data\_test3\_emg1)/120;

ti\_data3=1/Fr\_data3;

T\_data3=[0:1:(length(data\_test3\_eeg1)-1)]\*ti\_data3;

data\_test3\_eeg1\_fft=fft(data\_test3\_eeg1);

data\_test3\_eeg1\_fft(1)=0;

data\_test3\_eeg1=ifft(data\_test3\_eeg1\_fft)

data\_test3\_emg1\_fft=fft(data\_test3\_emg1);

data\_test3\_emg1\_fft(1)=0;

data\_test3\_emg1=ifft(data\_test3\_emg1\_fft)

plot(T\_data3,data\_test3\_eeg1\*1)

grid on

xlim('auto')

ylim('auto')

title('eeg data')

xlabel('Time(s)')

ylabel('Voltage(v)')

plot(T\_data3,data\_test3\_emg1\*1)

grid on

xlim('auto')

ylim('auto')

title('emg data')

xlabel('Time(s)')

ylabel('Voltage(v)')

overlap=0

% Smooth input data

smoothedData\_6 = smoothdata(data\_test3\_eeg1,"movmean","SmoothingFactor",0.25);

% Display results

clf

plot(data\_test3\_eeg1,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData\_6,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Smoothed data")

hold off

legend

% Remove trend from data

smoothedData\_6 = detrend(smoothedData\_6);

% Display results

clf

plot(smoothedData\_6,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData\_6,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Detrended data")

plot(smoothedData\_6-smoothedData\_6,"Color",[217 83 25]/255,"LineWidth",1,...

"DisplayName","Trend")

hold off

legend

% Smooth input data

smoothedData\_7 = smoothdata(data\_test3\_emg1,"rlowess","SmoothingFactor",0.02);

% Display results

clf

plot(data\_test3\_emg1,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData\_7,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Smoothed data")

hold off

legend

% Remove trend from data

smoothedData\_7 = detrend(smoothedData\_7);

% Display results

clf

plot(smoothedData\_7,"Color",[77 190 238]/255,"DisplayName","Input data")

hold on

plot(smoothedData\_7,"Color",[0 114 189]/255,"LineWidth",1.5,...

"DisplayName","Detrended data")

plot(smoothedData\_7-smoothedData\_7,"Color",[217 83 25]/255,"LineWidth",1,...

"DisplayName","Trend")

hold off

legend

pspectrum(data\_test3\_eeg1\*1,Fr\_data3,"spectrogram",'MinThreshold',-25,"TimeResolution",0.5,"FrequencyLimits",[0,10],"OverlapPercent",90)

title('EEG\_r\_a\_w')

pspectrum(data\_test3\_emg1\*1,Fr\_data3,"spectrogram",'MinThreshold',-30,"TimeResolution",0.5,"OverlapPercent",80,"FrequencyLimits",[0,10])

title('EMG\_r\_a\_w')

pspectrum(smoothedData\_6\*1,Fr\_data3,"spectrogram",'MinThreshold',-30,"TimeResolution",0.5,"OverlapPercent",80,"FrequencyLimits",[0,10])

title('EEG\_s\_m\_o\_o\_t\_h\_+\_d\_e\_t\_r\_e\_n\_d\_e\_d')

pspectrum(smoothedData\_7\*1,Fr\_data3,"spectrogram",'MinThreshold',-30,"TimeResolution",0.5,"OverlapPercent",80,"FrequencyLimits",[0,10])

title('EMG\_s\_m\_o\_o\_t\_h\_+\_d\_e\_t\_r\_e\_n\_d\_e\_d')

[eeg3corr,lagscorr3]=crosscorr(data\_test3\_eeg1\*10,data\_test3\_emg1\*10);

plot(lagscorr3,eeg3corr)

outeeg\_and\_emg1=[data\_test\_eeg1,data\_test\_emg1];

outeeg\_and\_emg1\_smooth=[smoothedData\_1,smoothedData\_5];

outeeg\_and\_emg3=[data\_test3\_eeg1,data\_test3\_emg1];

outeeg\_and\_emg3\_smooth=[smoothedData\_6,smoothedData\_7];

writematrix(outeeg\_and\_emg1,'D:\matlab\ymaps\code\outeeg\_and\_emg1.csv');

writematrix(outeeg\_and\_emg1\_smooth,'D:\matlab\ymaps\code\outeeg\_and\_emg1\_smooth.csv');

writematrix(outeeg\_and\_emg3,'D:\matlab\ymaps\code\outeeg\_and\_emg3.csv');

writematrix(outeeg\_and\_emg3\_smooth,'D:\matlab\ymaps\code\outeeg\_and\_emg3\_smooth.csv');