

Time Series Analysis Tutorial – Session 1

Exercise 1:

Create a nice figure showing 2 seconds of nice tremor activity. To do this load the tremor time series and work with variable EMG

- find out the number of samples
- use sampling frequency to create a time vector
- plot the time series with the correct time (x-axis)
- plot the data between 35-37s
- use sptool to inspect the time series. Look for a 2s segment of clear tremor activity
- exit sptool and plot this segment using the plot function
- remove any possible offset (baseline correction) or trend (detrending)
- smooth the data to remove high frequency noise. Try different types of smoothing and check for smoothing artifacts.
- label the axis appropriately (y-axis is mV).

Useful commands: whos, plot, mean, detrend, filter, medfilt1, sgolayfilt

Exercise 2:

Use fdatool to familiarize yourself with the different types of filters.

- Compare the magnitude response of FIR and IIR filters (compare the order)
- Compare the magnitude response for several IIR filters (check smoothness)
- See how steepness of the filter changes with different filter orders

Exercise 3:

- Use butter (the Matlab function) to create a 4th order Butterworth filter, lowpass 10 Hz.
- Apply the filter to the EMG time series.
- try different orders and compare the filtered time series
- filter the EMG with a passband filter (1 to 30 Hz). Now decrease the lower corner of the passband filter below 1 and check the filtered time series.

Useful commands: butter, filtfilt

Exercise 4:

- decimate the EMG time series by a factor of 5.

Useful commands: decimate