

EXERCISES – BIOLOGICAL SIGNALS

Exercise 9 - SS 2014 – Michel Kana

Team Projects

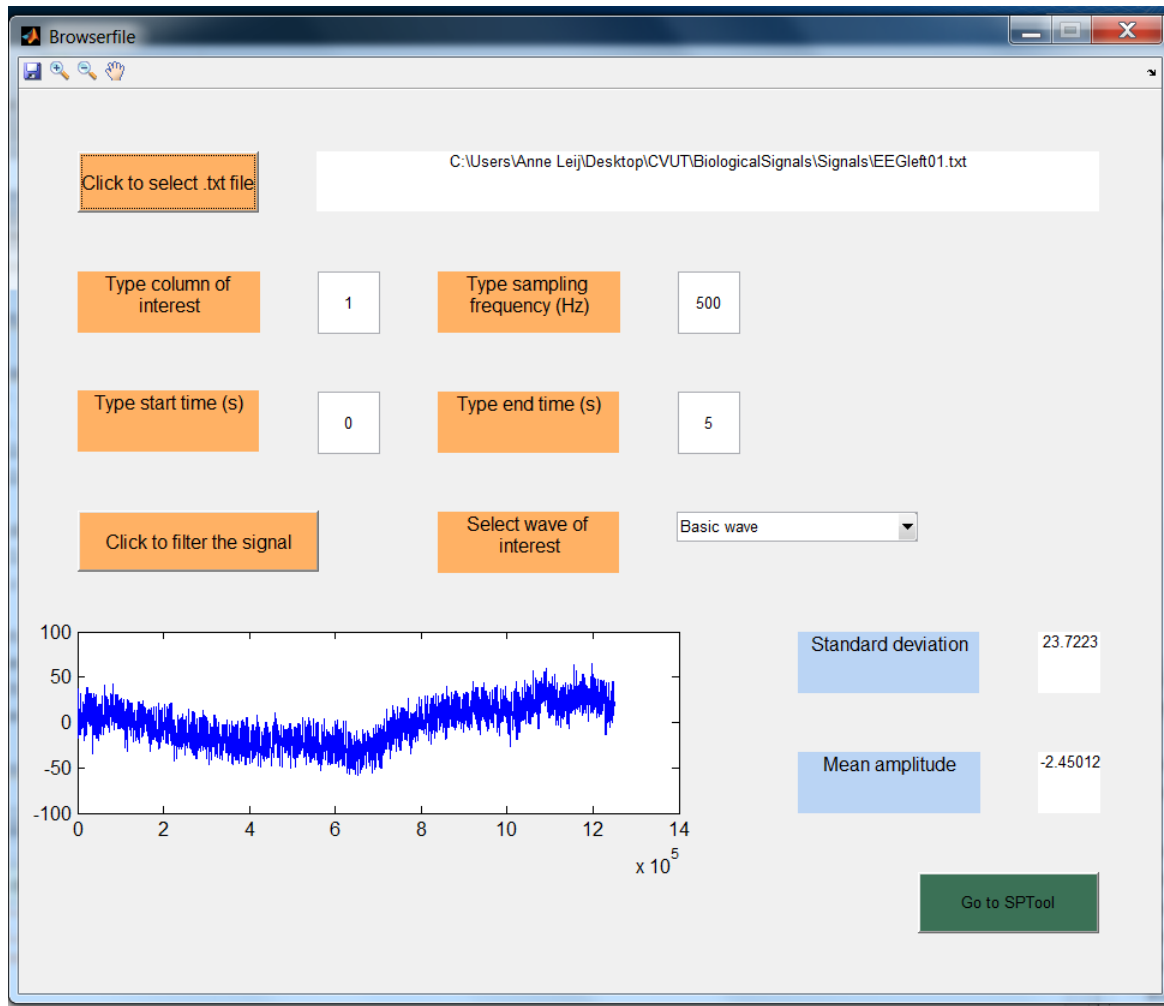
❑ **Project 1: Cardiovascular Signal Analyzer**

- ❑ Digital filtering of a raw PPG signal
- ❑ Extraction of PH (pulse height) and PP (peak-to-peak) values from a filtered PPG signal
- ❑ MAP estimation using PH
- ❑ Fourier transform of PP intervals and estimation of HF and LF
- ❑ Implementation in Matlab, if possible with an interactive GUI
 - ❑ User should be able to import the raw signal import from a Biopac text export
 - ❑ User should be able to enter the sampling frequency, signal type (ECG or PPG or both) and channel numbers
 - ❑ User should be able to filter the raw signal
 - ❑ User should be able to execute PP, PH, MAP, LF, HF computation
 - ❑ User should be able to display plots of the raw signal for a given start and end timestamp
 - ❑ User should be able to display plots of PP, PH, MAP over the time for a given start and end timestamp and display the value of LF and HF

Team Projects

□ **Project 2: Nervous Activity Analyzer**

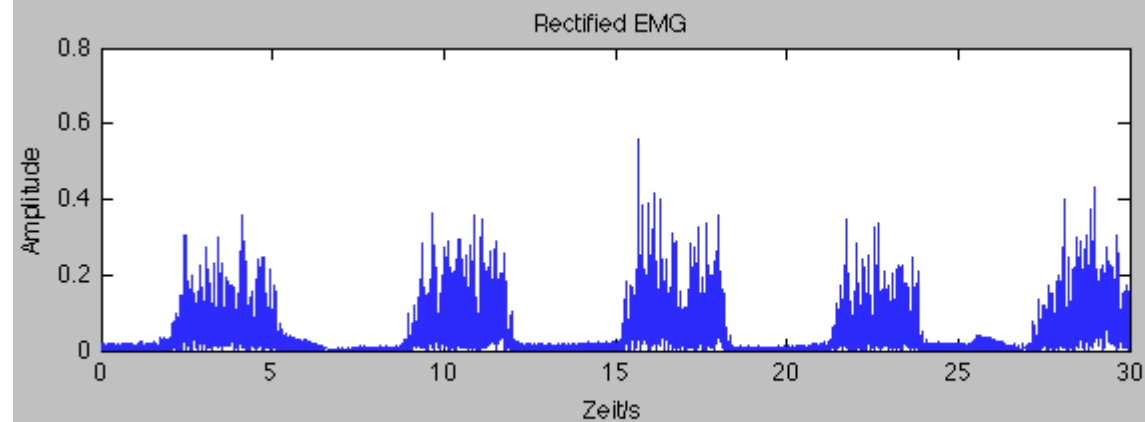
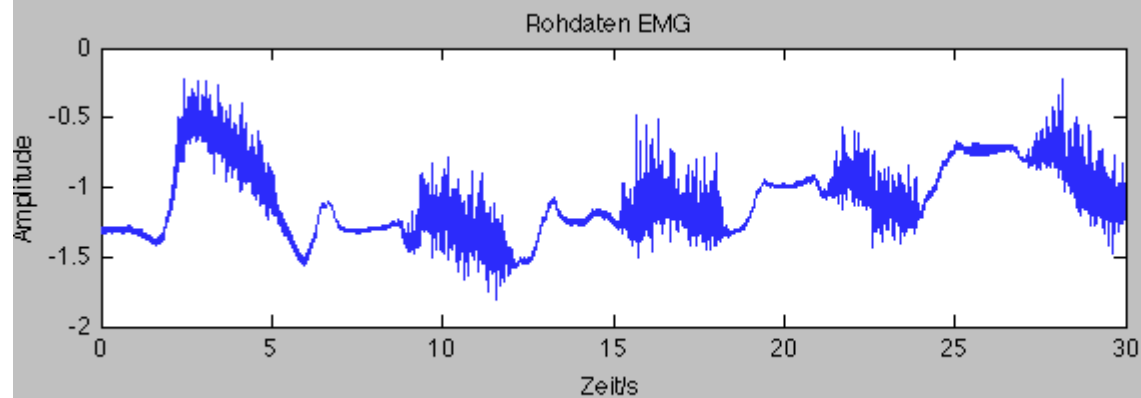
- Digital filtering of a raw EEG signal
- Extraction of alpha, beta, theta, delta waves from a filtered EEG signal
- Computation of STD, AVG and CC
- Implementation in Matlab, if possible with an interactive GUI
 - User should be able to import the raw signal import from a Biopac text export
 - User should be able to enter the sampling frequency
 - User should be able to filter the raw signal
 - User should be able to execute alpha, beta wave, theta, delta wave computation using Fourier or Wavelet transform or digital filtering
 - User should be able to execute STD, AVG, CC computation
 - User should be able to display plots of the raw signal for a given start and end timestamp
 - User should be able to display plots of alpha, beta wave, theta, delta waves over the time for a given start and end timestamp and display the values for STD, AVG and CC



Team Projects

□ **Project 3: Muscle Activity Analyzer**

- Digital filtering of a raw EMG signal
- Computation of rectified EMG from a filtered EMG signal
- Computation of the spectrum of the filtered EMG signal using Fourier transform
- Computation of RMS, ARV
- Implementation in Matlab, if possible with an interactive GUI
 - User should be able to import the raw signal import from a Biopac text export
 - User should be able to enter the sampling frequency
 - User should be able to filter the raw signal
 - User should be able to execute rectified EMG computation
 - User should be able to execute Fourier transform of the rectified EMG for a given start and end timestamp
 - User should be able to execute RMS, ARV computation for a given start and end timestamp
 - User should be able to display plots of the raw EMG, rectified EMG, EMG Fourier transform for a given start and end timestamp
 - User should be able to display the values for RMS, ARV for a given start and end timestamp



Panel

Load

Filter

Rectify

Sampling frequency

200

Resample

Start

8

FFT

End

13

RMS

1.35146

AVR

53.416