



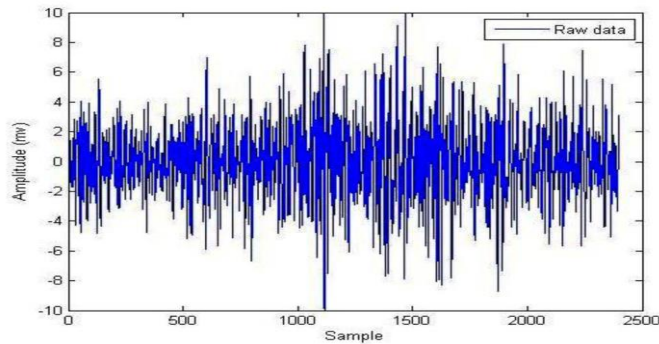
In silico models of coupled biological systems

Part I

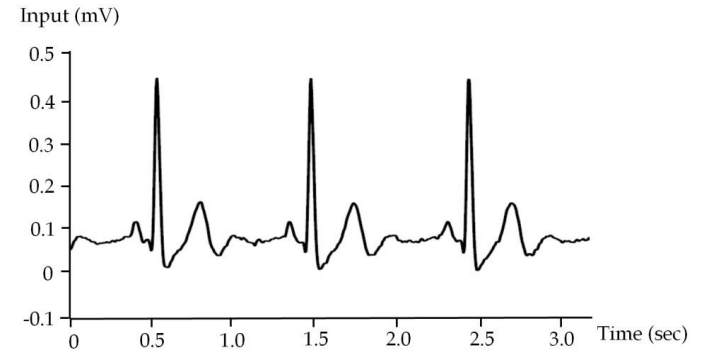
Modellierung und Simulation von Biosignalen



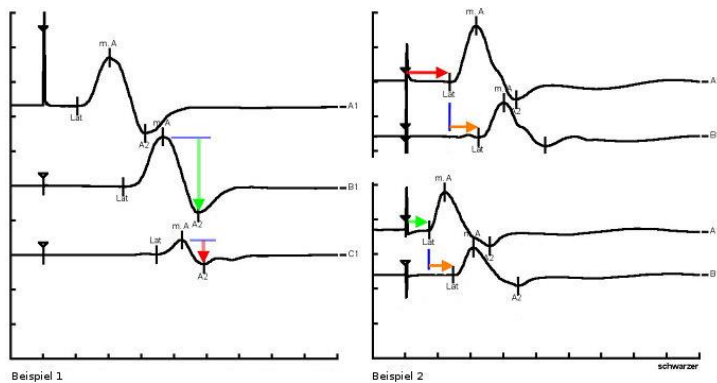
Biosignals



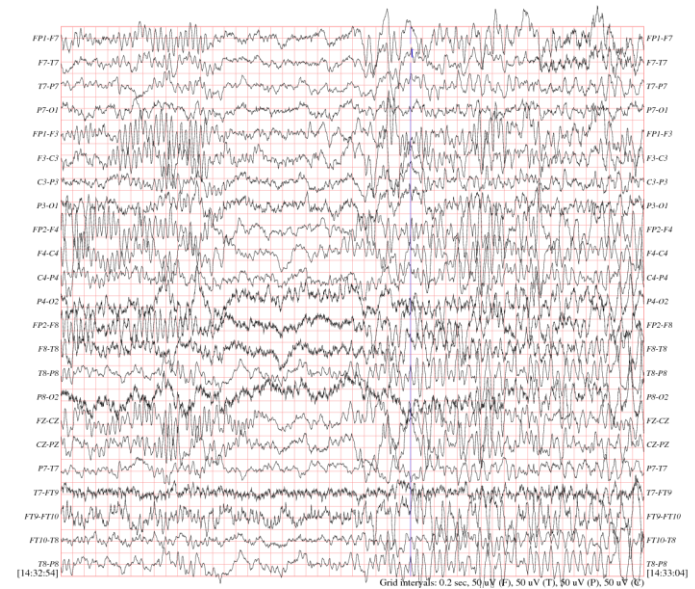
EMG Signal



EKG Signal



ENG Signal

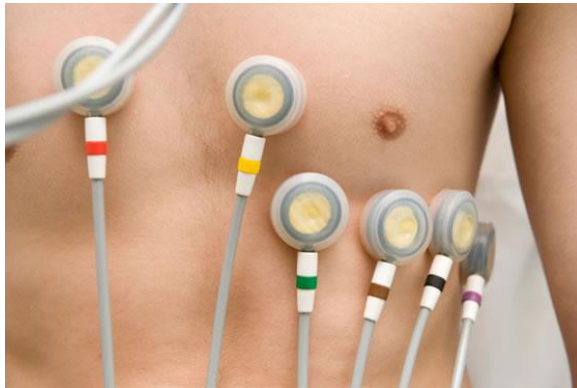


EGG Signal



■ ECG (Electrocardiography)

Recordings of the electrical activity of the heart

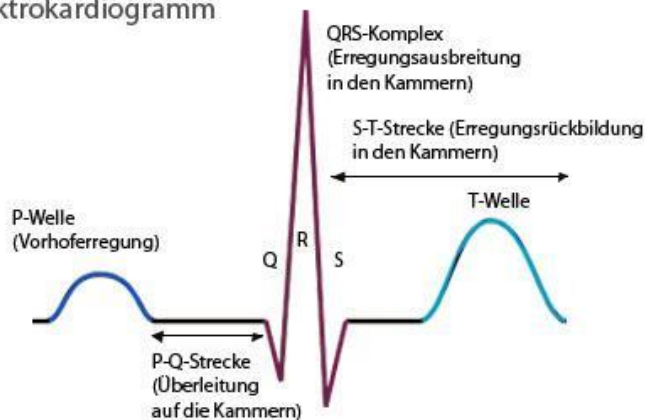


[<http://www.apotheken-umschau.de/multimedia/73/124/85/15764414481.jpg>]

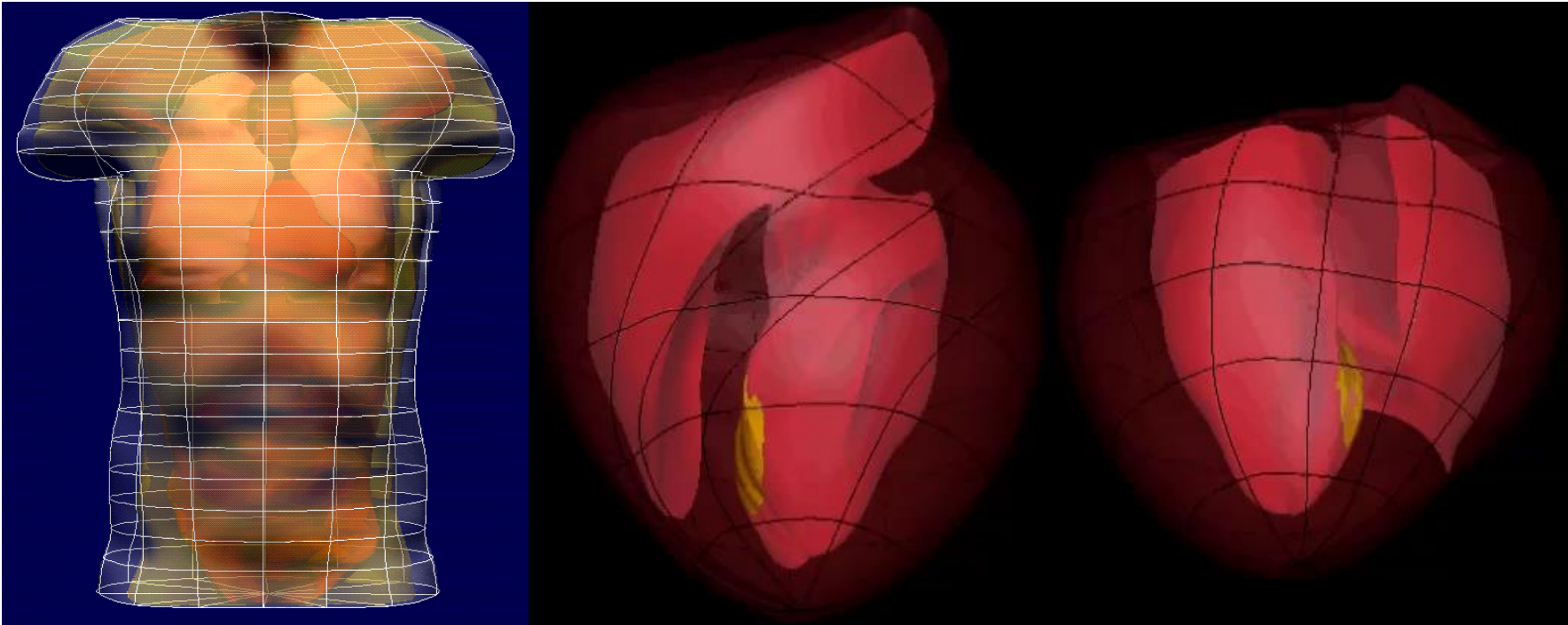


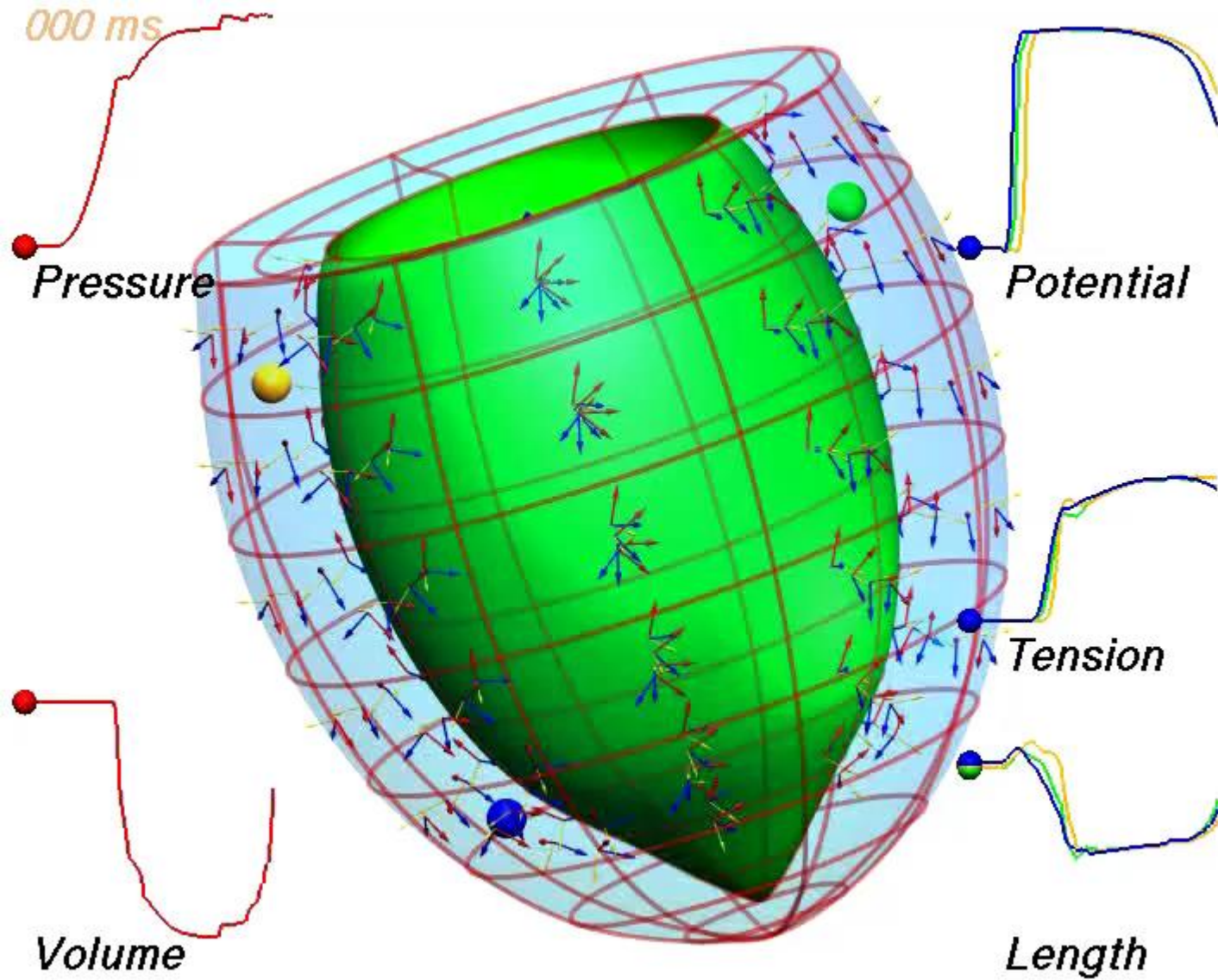
[<http://upload.wikimedia.org/wikipedia/commons/d/df/Narkosemonitor.jpg>]

Elektrokardiogramm



[http://s.ndimg.de/image_gallery/new_netdoktor/73/id_71369_101073.jpg]

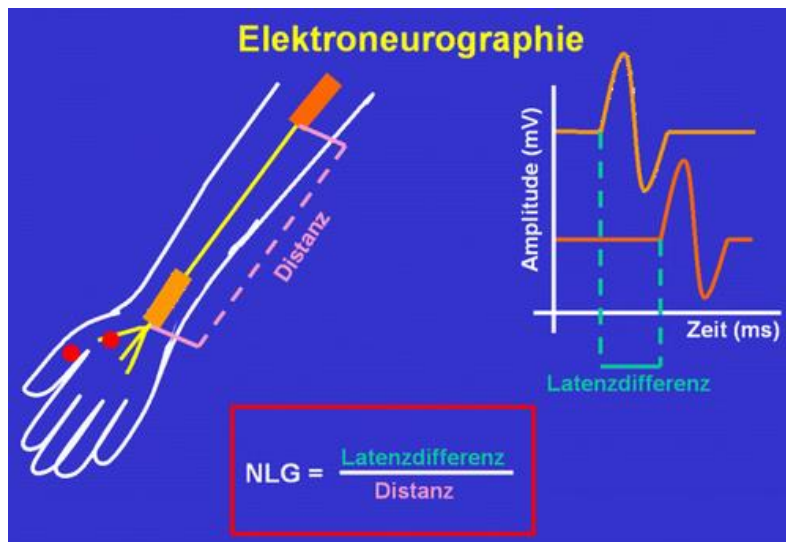






■ ENG (Electroneurography)

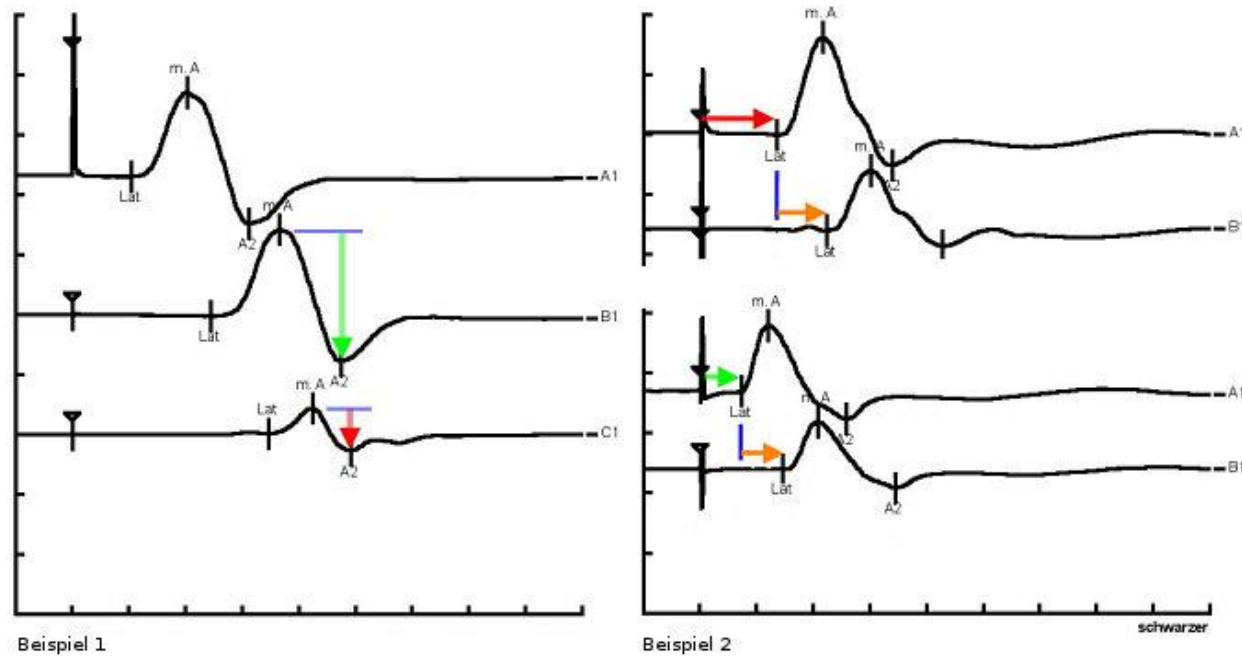
Recording of the electrical activity of peripheral nerves



[http://www.kk-bottrop.de/images/ib_p014_0_1_4278.png]



[http://neurologie-stiefken.de/tl_files/stiefken/images/fotos/leistungen_elektro-neurographie.jpg]



Example 1: Use case for a NLG-examination. Drop-foot syndrome. The NLG-examination highlights the blocked nerve conduction in the fibula nerves (N. peroneus) at the fibula head. green: Full response, in red: blocked response

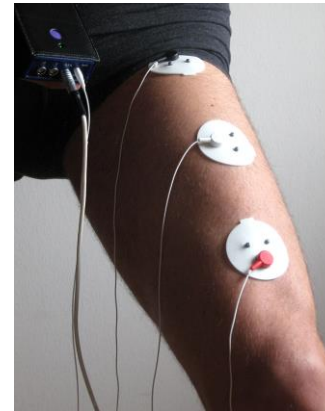
Example 2: Use case for a NLG-examination. Patient reports on numbness in the first three fingers and pain in his hand at night. The conduction along the median nerve (N. medianus) towards the hand is slowed down. The muscle contraction is delayed. (upper right picture, red line is extended. The nerve is pinched, i.e. a suspected carpal tunnel syndrome. The lower two curves show the healthy case. The conduction velocity is nearly the same in the healthy and diseased case. Problem: Additional nerves are recorded as well with this method.



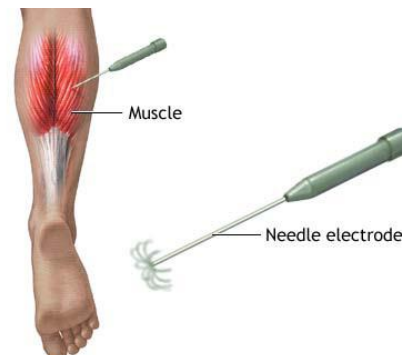
■ EMG (Electromyography)

Recording of the electrical activity of the muscles

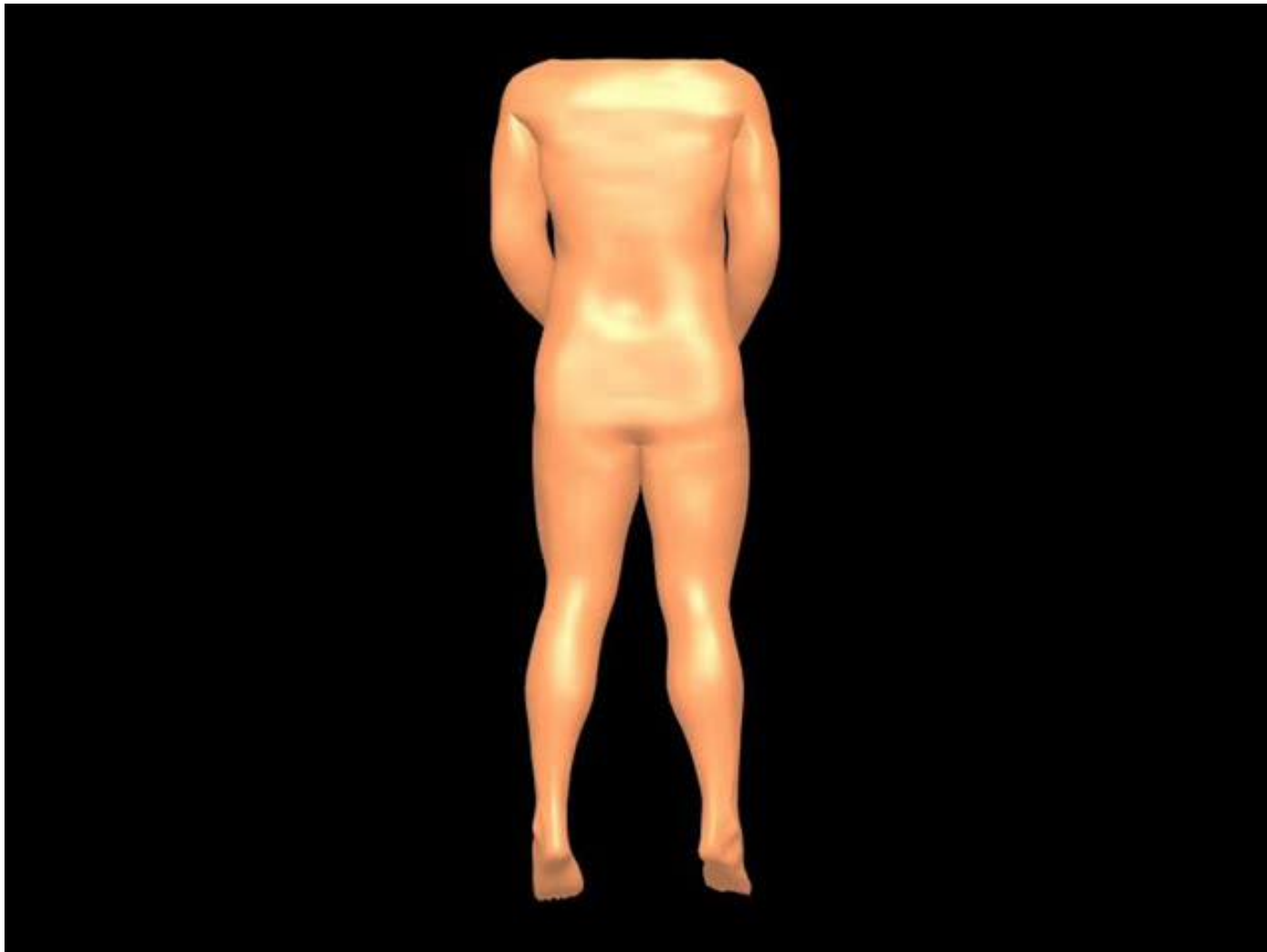
- Surface electrodes



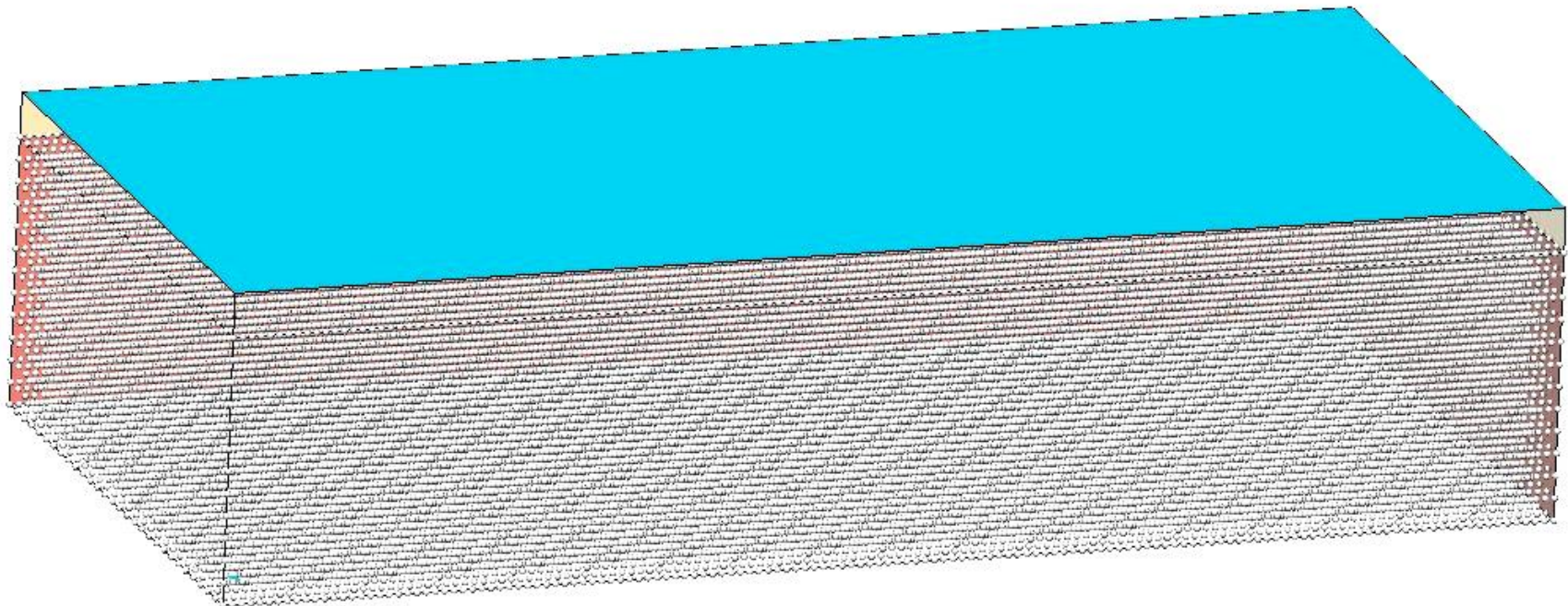
- Needle Electrodes



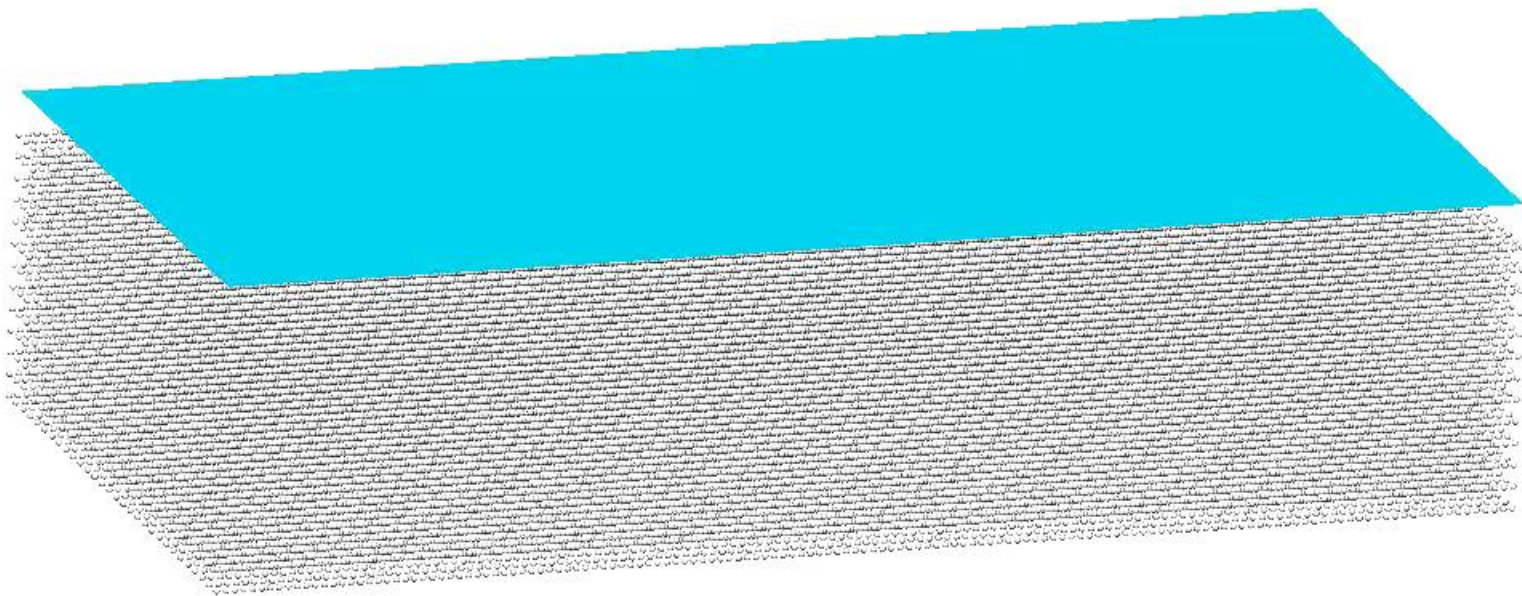
[<http://painmd.tv/wp-content/uploads/2011/04/emg-1.jpg>]



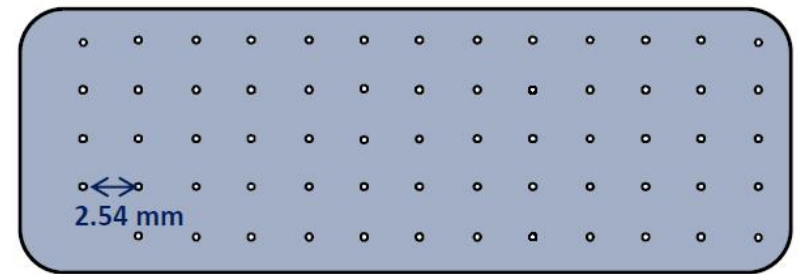
Simulated EMG



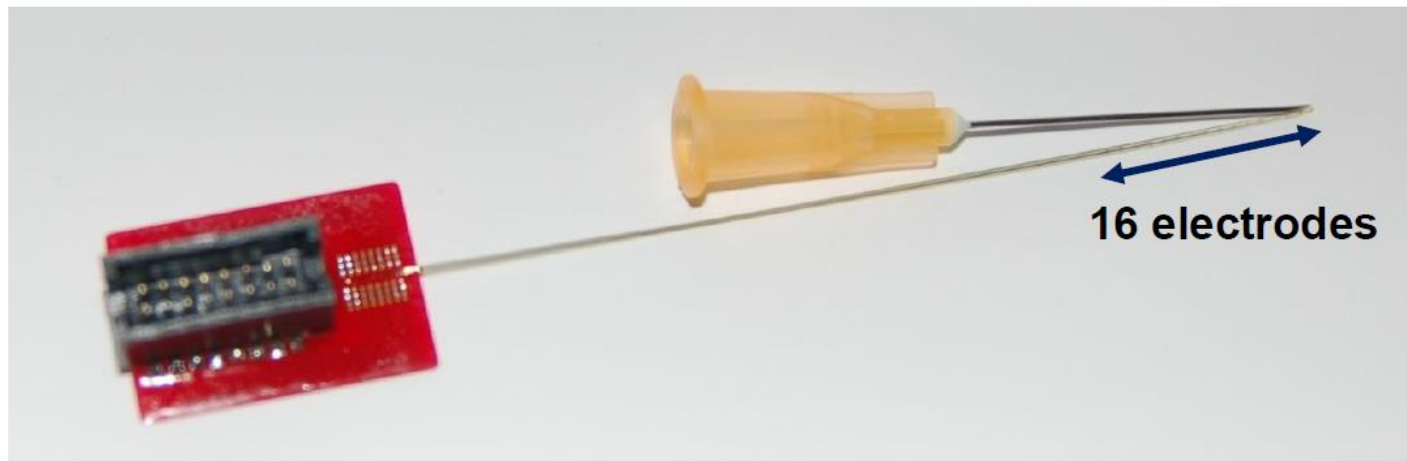
Simulated EMG



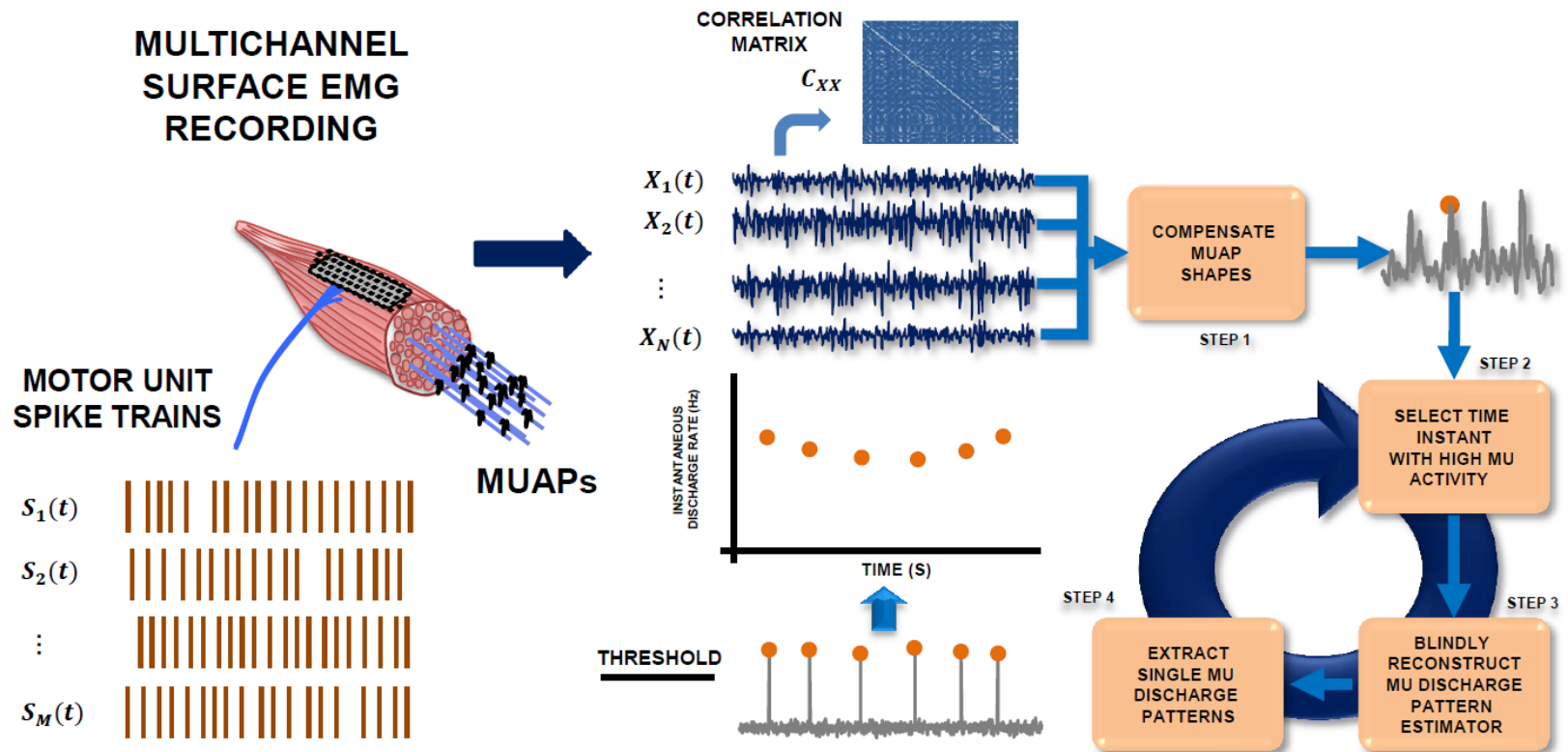
Multichannel EMG recordings



13 x 5 electrodes



High-Density EMG



CKC Algorithm
Holobar & Zazula 2007

Photo
credits to A. Holobar

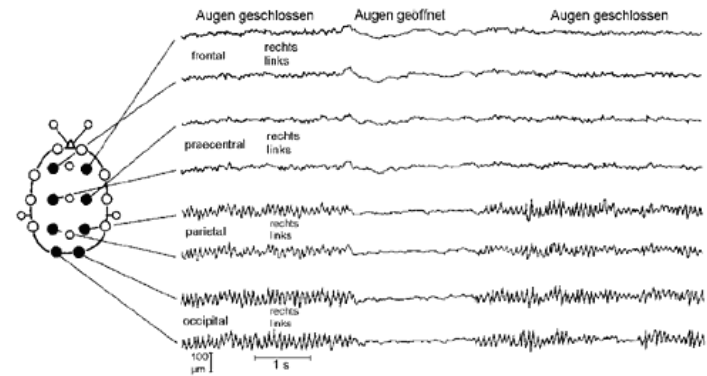


EEG

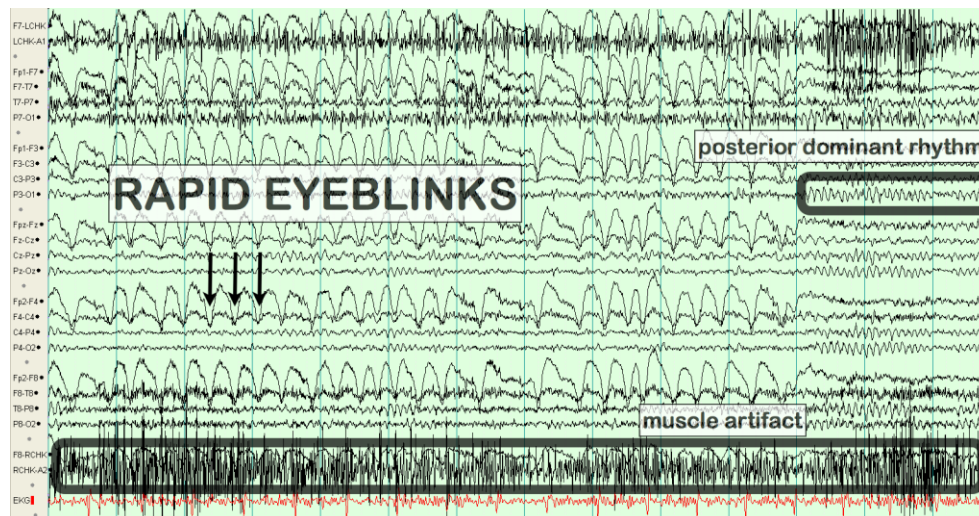
Recordings of the electrical activity of the brain



[http://www.neurologie.ukw.de/fileadmin/uk/neurologie/images/kliniksbilder/neurophysiologie/EEG/EEG_1.jpg]



[<http://neurotransconcept.com/img/cont/EEG02.gif>]



[<http://eegatlas-online.com/myapplications/images/eeg0056/eeg0056on.png>]