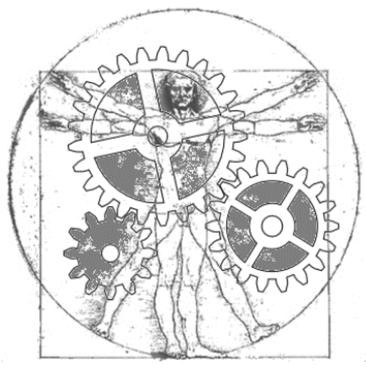
nano-tera.ch
swiss scientific initiative in health / security / environment systems

BodyPoweredSenSE RTD 2013

FNSNF



http://BodyPoweredSenSE.ch

Energy-Aware Software for Wearable Medical Sensors

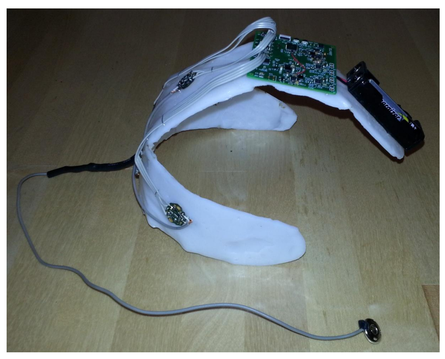
Ivana Unković, Stephan Koster, Dennis Majoe, Thomas Gross

ETH Zurich

ETH Zurich
LST Laboratory for Software Technology

BPS EEG Sensor

- Solar + TEG 6 Dryode sensor
- Long-term capture, process and transmission of EEG signals
- Clinical cases:
  1. Epilepsy in children
  2. Mild Cognitive Decline (MCD) in older people

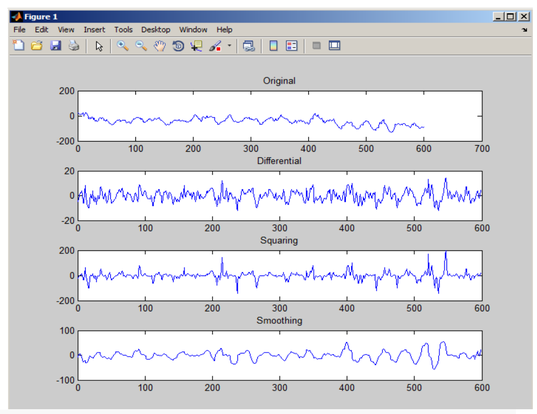


Clinical Algorithms

1. **Spike density** biomarker extraction for diagnosis of Epilepsy using two spike detection algorithms with different diagnostic power and power consumption

   "Spike detection algorithm automatically adapted to individual patients…", A. Nonclercq, M. Foulon, D. Verheulpen, C. De Cock, M. Buzatu, P. Mathys, P. Van Bogaert

   "Cluster based spike detection algorithm adapts to interpatient", A. Nonclercq, M. Foulon, D. Verheulpen, C. De Cock, M. Buzatu, P. Mathys, P. Van Bogaert
2. **Alpha wave** abnormalities of EEG signal as a biomarker of subjects with MCD. Algorithms for only a portion of frequency range (e.g. Goerzel algorithm) with a goal to achieve 19 electrode setup compatibility.

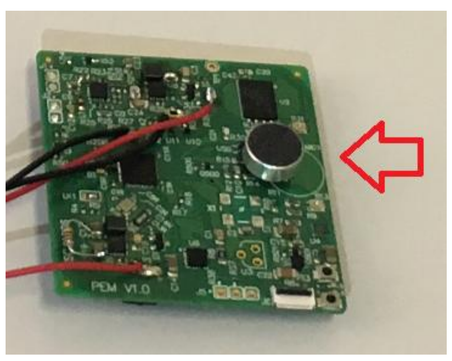


Pre-processing real-life data from Kinderspital Zurich

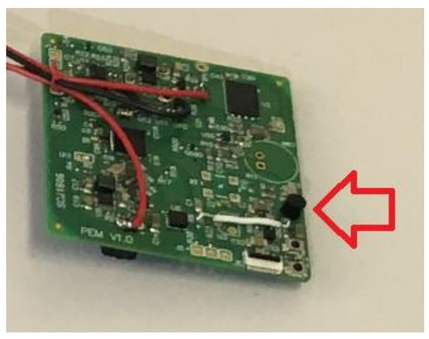
6 electrode setup

Personal Environment Monitor - PEM

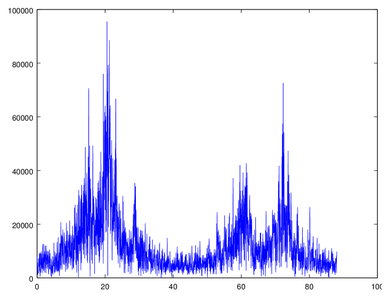
- Monitor the environment through camera, microphone and accelerometer
- Deduce situation (E.g. tram stop, home, school, sport)
- Use this as context for medical events (epileptic fit or emotional anxiety)
- Solar cell: Less dependence on batteries
- No pictures and sounds are stored, only the situation



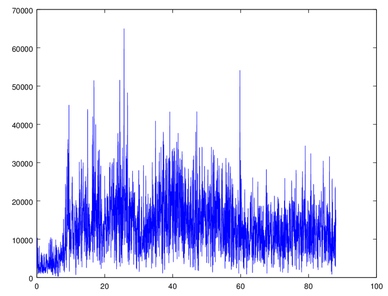
PEM Microphone



PEM Camera



Friends Chatting



Many voices in a hallway