Data formats and structures in EEGBase portal

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Neuroinformatics Research group

- Department of Computer Science and Engineering, Faculty of Applied Science, University of West Bohemia
- Since 2008
- Nearly 20 active members
- Coordinator of the Czech National Node for Neuroinformatics
- Laboratory equipped with professional hardware/software as well as with own solutions including driving simulator, hardware stimulator or acoustic shielded chamber
- Cooperation with a number of universities, with the University Hospital in Plzen and also with the commercial subjects
- [http://neuroinformatics.ntis.zcu.cz](http://neuroinformatics.ntis.zcu.cz); [neuro@ntis.zcu.cz](mailto:neuro@ntis.zcu.cz)
Long-time experience in

• Research into normal and abnormal behavior of the brain, such as
  – Driver’s attention
  – Motor disorders in children
  – Rehabilitation based on BCI
• Development of assistive technology
• Measurement, long-term storage and evaluation of big medical data
• Annotation and sharing of EEG/ERP data in data store according to international standard
Infrastructure for Electrophysiology Research and EEGBase

- Infrastructure
  - EEGBase
  - Personal EHR System
  - Workflows
  - Stimulator
- EEGBase (http://eegdatabase.kiv.zcu.cz/)
  - To store, manage, share, download and search data and metadata
  - Interfaces
    - Web based user interface
    - Web service API for a mobile client, a library for analytical tools, odML client
    - Semantic web interface for automatic reasoners
  - Registered in NIF
  - Mobile client
Two databases (relational and noSQL) solution

• Relational DB model
  – Portal data (e.g. access rights)
  – Demography
  – Experimental data in BrainVision format (binary .eeg, technical metadata .vhdr, time marks .vmrk)

• NoSQL Database (Elasticsearch)
  – Experiment metadata (e.g. SW/HW information, environmental condition etc.)
  – Quickly reflects variable set and structure of metadata

• Binding between DBs on the application layer

• Export is realized in form of a folder structure containing data (BV format), metadata (XML) and protocol (Presentation, XML, ... )
  – HDF5 export under development
Implementation of HDF5

• HDF5 Manager - a standalone .NET application
• Wraps experiment protocol, metadata and raw data into HDF5
• Application parses ASCII files (header file and marker file)
• EEGBase implementation under developments

EEGBase mobile and odML

• For offline usage
• Allows metadata template creation or re-usage
• Metadata sets are synchronized when internet connection is accessible
• OdML for synchronization between mobile client and server is used – EEGBase provides odML client through web service API
Personal EHR system

- Based on openEHR framework
  - Data are described by reference models and archetypes
- Similar approach as in case of EEGBase
  - Relational database for the static data structures: e.g. demography
  - NoSQL for the variable data structures
- New archetypes serves as the modules from which the persistent storage (indices in Elasticsearch) and GUI is generated
- EEG/ERP domain archetypes are under development
- Main openEHR ideas/features
  - Specific part of domain is modelled above static generic model
  - Binding with ontologies/terminologies
  - Localization support