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Scan Session Tool: (f)MRI scan session documentation and archiving

Florian Krause [1] and **Nikos Kogias** [1]

1 Donders Institute for Brain, Cognition and Behaviour, RadboudUMC, Nijmegen, The Netherlands

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Software

- Review
- Repository
- Archive

Editor: Kevin M. Moerman

Reviewers:

- @jsheunis
- @neuroccino

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Summary

Scan Session Tool is a cross-platform (Windows, MacOS, Linux) graphical application for standardised real-time documentation of (functional) Magnetic Resonance Imaging (MRI) scan sessions and automatised archiving of the collected (raw) data. The software allows session information (i.e. metadata, project- and subject-specific notes/documents, as well as a detailed log of acquired MRI measurements) to be entered in a fast and convenient way during a session (see also Figure 1) and to be saved into a human- and machine-readable protocol file (in YAML format) that facilitates both sharing with other researchers and integration into automatised procedures. Scan Session Tool can furthermore use this scan session documentation itself to automatically organise the raw data (i.e. DICOM images) of all acquired measurements, as well as any related logfiles (e.g. stimulation protocols, response time recordings, etc.) into a unified hierarchical folder structure for archiving purposes (see also Figure 2). In addition, the software has (optional) special support for BrainVoyager and (Turbo-)BrainVoyager (which is commonly used for real-time functional MRI measurements). This entails the creation of links to DICOM images using dedicated filename conventions (BrainVoyager and Turbo-BrainVoyager) as well as adapting references to files and data to reflect the archived folder structure (Turbo-BrainVoyager).

Statement of need

There is an urgent need to improve the reproducibility of (functional) MRI research through transparent reporting ("Fostering Reproducible fMRI Research," 2017). Despite large agreement among researchers on the importance of openly sharing not only collected raw data (i.e. MR images and related behavioural/physiological recordings) and their analysis (Nichols et al., 2017), but also the detailed documentation of the data collection process (i.e. notes and data about the scan sessions themselves, Borghi & Van Gulick, 2018; Glover et al., 2012), standardisation in this domain is currently lacking. Most current approaches focus on automatised reproducible analysis (e.g. https://github.com/ReproNim), and shared MR images often only made available after transformation into a derivative data format, such as the Brain Imaging Data Structure (BIDS, Gorgolewski et al., 2016), with a rich ecosystem of tools being available to accomplish this (e.g. Halchenko et al., 2024; Zwiers et al., 2021). Furthermore, to our knowledge, none of the available solutions cover scan session documentation, which currently is often either manually implemented with hand written notes (Meissner et al., 2020), with Electronic Data Capture systems (e.g. https://www.castoredc.com/) or neglected entirely.

Scan Session Tool was written to fill this gap, and to be used by neuroscientists, to help them increase transparency and reproducibility of their MRI research by standardising scan session documentation and raw data archiving. The software has already been successfully used during data collection of several fMRI studies (e.g. Krause et al., 2017, 2019; Krause, Kogias, Krentz, Lührs, et al., 2021; Lührs et al., 2019), and its standardised scan session documentation as well as archiving structure have been made part of openly published data (e.g. Krause, Kogias, Krentz, Luehrs, et al., 2021). The archiving structure is furthermore automatically already recognised by the third-party software BIDScoin (since version 3.7.3, Zwiers et al., 2021), which allows the raw DICOM data archived with Scan Session Tool to be converted to the popular BIDS format if desired (e.g. for standardised preprocessing and analysis). We hope to see further adaptation and increasing integration with other tools and standardised workflows (e.g. quality control pipelines, online data repositories) in the future.

Figures

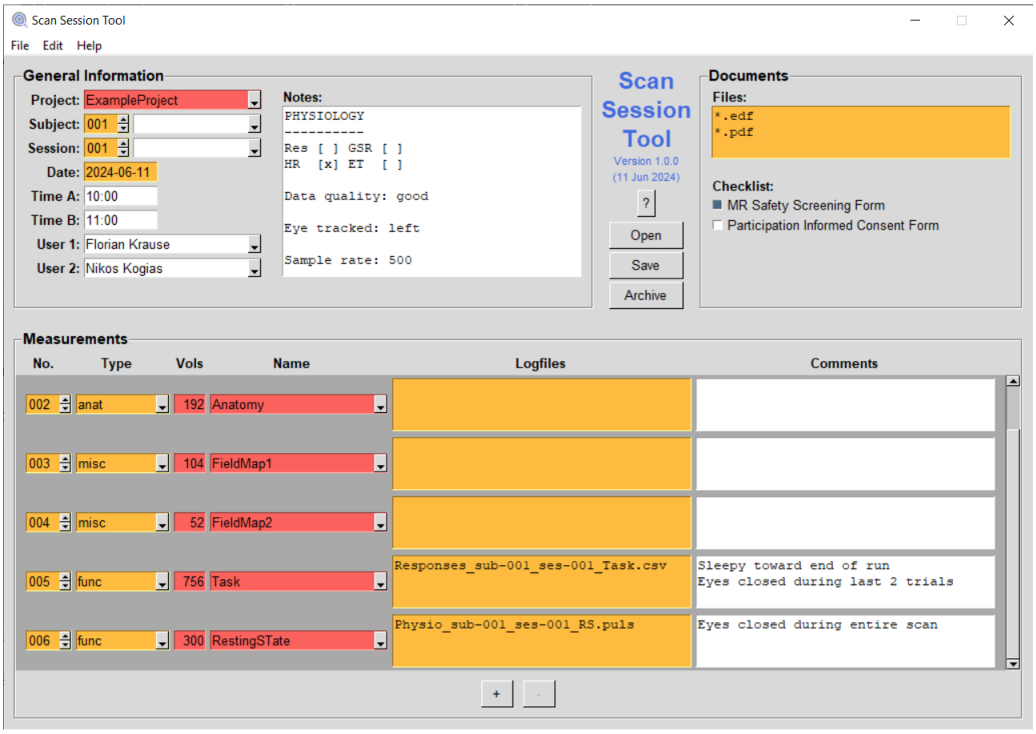

Figure 1: Example of documenting a scan session with Scan Session Tool.

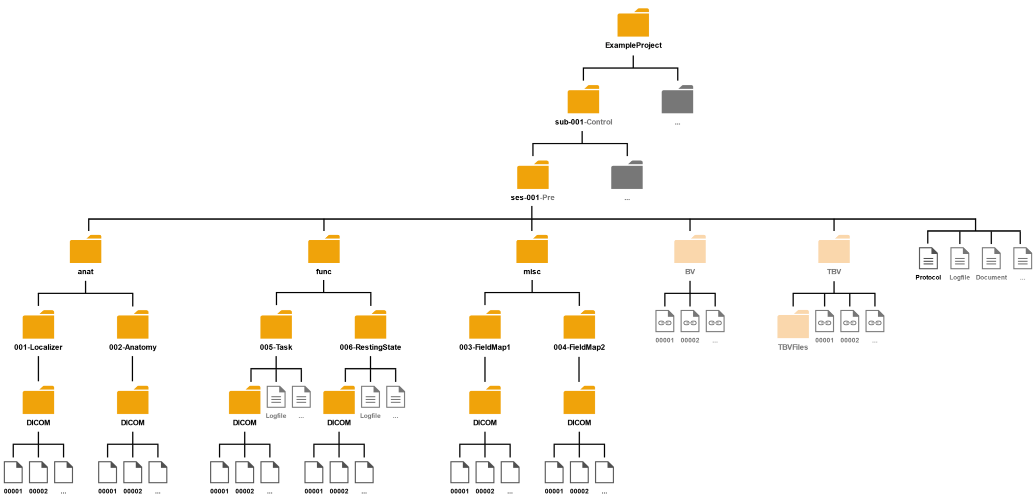

Figure 2: Example of resulting folder structure after archiving data with Scan Session Tool.

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