

Integration of quantitative EEG analysis into clinical workup of epilepsy surgery candidates

Supervisor: Dr. Christian Rummel

Institutions: Support Center for Advanced Neuroimaging (SCAN) | Institute of Diagnostic and Interventional Neuroradiology, Inselspital Bern

Examiner: Prof. Dr. Volker Koch

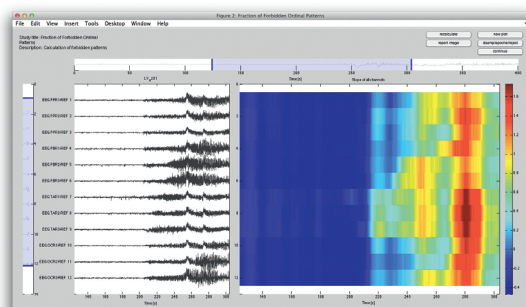
In clinical evaluation of electroencephalographic signals (EEG) visual analysis by clinical experts remains the gold standard. To assist observers, different quantitative EEG (qEEG) analysis methods were developed which offer more objective criteria for assessment. To integrate qEEG methods into clinical routine a MATLAB toolbox qEEGsuite was developed which gives clinical experts with limited or even without programming skills access to different qEEG algorithms.

Introduction

In the last 20 years different quantitative EEG (qEEG) analysis methods were developed to assist clinical experts by the visual analysis of EEG signals. qEEG analysis methods offer more objective criteria for assessment and may indicate subtle signal changes.

Examples are high frequency components, signal interactions, nonlinear properties or driver-responder relationships. With regard to the EEG of epilepsy patients, two key applications of qEEG analysis methods are early detection or even prediction of seizures and the localisation of ictogenic tissue, which can be targeted by epilepsy surgery.

Although qEEG is more objective and often more sensitive than visual EEG analysis, it is still only little used in clinical routine. The reason is that current qEEG tools require profound programming skills, which only few clinical experts have.



The scroll plot shows on the left side a peri-ictal EEG signal. On the right side the absolute slope of the EEG

Master Thesis Proposal

The present master thesis provides a tool to integrate qEEG methods into clinical routine workup of candidates for epilepsy surgery. In the thesis proposal it was requested to assort algorithms that highlight complementary diagnostic information in a routine way. The aim is to maximise the added value of qEEG and promote the acceptance of these modern methods by clinicians.

Results

EEGLAB is an interactive MATLAB toolbox for processing continuous and event-related EEG, which is widely spread among clinical experts. To be able to benefit from the full functionality of EEGLAB, an add-on for this toolbox was developed in the present master thesis, which was called «qEEGsuite». It gives clinical experts with limited or even without programming skills access to different qEEG algorithms. qEEG results are always displayed together with the raw data, clinicians are familiar with. For advanced programmers qEEGsuite provides a structure that allows straight forward inclusion of additional algorithms. qEEGsuite is developed in an object oriented structure to allow straightforward enhancement.

Discussion

After a literature research a concept of the program was built. In expert interviews this concept was refined, to develop the program afterwards. The program qEEGsuite defines a base to create new qEEG methods. After a test phase in a selected board the program can be published and further augmented.

References

C. Rummel, R. G. Andrzejak, and K. Schindler. Quantitative analysis of peri-ictal multi-channel EEG. Epileptologie 2012, 29:99113, 2012.



Manuel Weibel