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WaveSolution: a software for analyzing brain signals derived by multielectrodes

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The use of electrodes with multiple recording contacts for deriving brain electrical activity is becoming more and more widespread. It allows the experimenter to examine signals from several sites in the same time. Thus, a software dedicated to analyzing multielectrode recordings and exploiting the potentials in this method is of high importance. The two main types of brain activity that can be recorded from within the cortex are local field potentials (LFP), and single or multiunit activity (SUA, MUA). For SUA analysis, WaveSolution includes a spike sorting pack that contains several methods allocating spikes to single cells. For the analysis of LFP waves the software offers several signal manipulation methods such as epoching, averaging, Fourier transform, spectrogram; and other functions profiting from the multielectrode technique, like cross-correlation, coherence, or current source density analysis. In order to determine the instantaneous phase of an oscillation, WaveSolution calculates the Hilbert transform of the signal and allows the sorting of cycles by amplitude and length. These methods are primarily designed for the analysis of sleep slow oscillation. Another useful method is the peri-event time histogram that shows the timing of events (e.g. spikes) in relation to another event (e.g. external stimulus, or special phases of oscillation). Altogether, the collection of these methods was proven to be helpful in the analyses of brain activity detected by multielectrodes.