Presentation Abstract

Program#/Poster#:	680.05/NNN34
Presentation Title:	Monitoring spike train synchrony: SPIKY - A graphical user interface
Location:	Halls B-H
Presentation time:	Tuesday, Nov 12, 2013, 1:00 PM - 2:00 PM
Topic:	++G.07.a. Data analysis and statistics
Authors:	***T. KREUZ**, N. BOZANIC; Inst. For Complex Systems, Sesto Fiorentino, Italy
Abstract:	Recently, the ISI- and the SPIKE-distance [1] have been proposed as parameter-free and time-scale independent measures of spike train synchrony. The key property of both measures is that they are time-resolved since they rely on instantaneous estimates of spike train dissimilarity. This makes it possible to track changes in instantaneous clustering, i.e., time-localized patterns of (dis)similarity among multiple spike trains. The SPIKE-distance also comes in a causal variant which is defined such that the instantaneous values of dissimilarity are defined from past information only so that time-resolved spike train synchrony can be estimated in real-time. For both the regular and the real-time SPIKE-distance, there are several levels of information reduction [2]. The starting point is the most detailed representation in which one instantaneous value is obtained for each pair of spike trains. This results in a matrix of size 'number of sampled time instants' × 'squared number of spike trains'. By selecting a pair of spike trains one obtains a bivariate dissimilarity profile whereas the selection of a time instant yields an instantaneous matrix of pairwise spike train dissimilarities which can be used to divide the spike trains into instantaneous clusters. Another way to reduce the information is averaging. The spatial average over spike train pairs yields a dissimilarity profile for the selected (sub)population, whereas temporal averaging leads to a bivariate distance matrix for the selected interval or the selected trigger points. Finally, application of the remaining average results in one distance value which describes the overall level of synchrony for a group of spike trains over a given time interval. Here we also present the graphical user interface SPIKY [3]. This interactive program facilitates the application of the ISI- and the SPIKE-distance to both simulated and real data. SPIKY includes a spike train generator for testing

purposes, as well as masks for selecting the analysis window and the neuronal subpopulation of interest. Once given a set of spike train data, it calculates the desired measure and allows visualization of all the different representations mentioned above (such as measure profiles and pairwise dissimilarity matrices). It also includes the possibility to generate movies which are very useful in order to track the varying patterns of (dis)similarity.
1. Kreuz T, Chicharro D, Houghton C, Andrzejak RG, Mormann F. Monitoring spike train synchrony. J Neurophysiol 109, 1457-1472 (2013).
2. Kreuz T. SPIKE-distance. Scholarpedia 7, 30652 (2012).
3. Matlab source codes: http://www.fi.isc.cnr.it/users/thomas.kreuz /sourcecode.html.

Disclosures: **T. Kreuz:** None. **N. Bozanic:** None.

Keyword(s):   SYNCHRONY

NEURAL CODING