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Multiple neuronal spike trains observed in a short-time window

Information obtained in experiments in which the spikes are recorded, usually from a single neuron or from quite limited number of them, is fundamentally different from that which a neuron receives from the network of interconnected neurons. In the experiments, a spike train is recorded for a relatively long period of time and the properties of the firing are deduced. If the type of the investigated firing is transient, like in the stimulated activity, then the extensive length of the record is replaced by repetitions assuming that these are identical and independent copies of the same phenomenon. In natural conditions, neuron receives a large number of spike trains, up to several thousands, and the information has to be deduced in short-time intervals. This creates a discrepancy between what can be read from the experiments and how real neurons perform. To estimate the firing frequency in the parallel neuronal data is rather simple task even if the time window available for the observation is very short. In paper 1 we showed how to estimate the coefficient of variation of interspike intervals under the scenario with the short-time window. Several nonparametric methods for estimation of the cumulative distribution function of the interspike intervals under the same restriction posed on the observation appear in our recent paper 2. The aim of the present contribution is summarize the results and to show furter development in studying the problem.

References

[1] Pawlas Z., Klebanov L.B., Prokop M., Lansky P. (2008) Parameters of spike trains observed in a short time window. Neural Computation, 20 1325-1343.
[2] Pawlas Z., Lansky P. (2011) Distribution of interspike intervals estimated from multiple spike trains observed in a short time window. Physical Review E, 83 Art. No. 011910.