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Simultaneous estimation of noise level and distinction between addtitive and dynamical noise in chaotic time series

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Measuring a signal from a physical system and looking for the optimal model of dynamics of the system under observation, one always face the problem of noise. Depending on the way in which the noise contaminate the dynamical system one can distinct between the additive (measurement) and the dynamical noise. The case of the measurement noise, as independent of internal dynamics of dynamical system, is relatively simple. Unfortunately, the case of dynamical noise is much more complicated. Therefore, a method of discriminating of the two types of noise could be useful for modelling of real dynamical systems. In this presentation we focus on the class of deterministic models of dynamics based on the embedding procedure. We propose a simple method of estimation of noise level in chaotic time series that is based on scaling properties of the correlation entropy. Using the method, we can distiguish source of noise in a given time series. Namely, having a signal and assuming that the source of the signal can be modelled as low-dimensional dynamical system, we can check whether we deal with dynamical or additive noise. Tests of our method with two known dynamical systems are also presented.