

Dynamical complexity

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Abstract

Different formulations and measures for the complexity of dynamical systems has been put forward by several authors over the years. This formulations depends on the domain on which the dynamical system is to be applied. The tool used in the estimation of complexity, has over the years still remains the entropy; a measure of disorder. Before the introduction of the concept entropy by Claude Shannon in 1948, the term has been in the literature of thermodynamics and statistical physics. The limitation of the Shannon's entropy measure with regards to short and noisy time series, as is always the case with real life data, has been explored. The Lempel-Ziev complexity measure and the permutation entropy considered to be efficient for such short and noisy series are presented. These measures are applied to time series resulting from a Logistic map (1D), Henon map (2D) and the Lorenz system (3D), and their efficiency compared with the measure of Lyapunov exponent(s) of the systems. The research trend of these methods towards providing solutions to real life situations has been put forward.