

Tytuł: **Simplicial Multivalued Maps and the Witness Complex for Dynamical Analysis of Time Series**
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Based on a paper by Z.Alexander, E.Bradley, J.D.Meiss and N.F.Sanderson (2015).

Topology-based analysis of time-series data from dynamical systems is powerful: it potentially allows for computer-based proofs of the existence of various classes of regular and chaotic invariant sets for high-dimensional dynamics. Standard methods are based on a cubical discretization of the dynamics and use the time series to construct an outer approximation of the underlying dynamical system. The resulting multivalued map can be used to compute the Conley index of isolated invariant sets of cubes. In this paper we introduce a discretization that uses instead a simplicial complex constructed from a witness-landmark relationship. The goal is to obtain a natural discretization that is more tightly connected with the invariant density of the time series itself. The time-ordering of the data also directly leads to a map on this simplicial complex that we call the witness map. We obtain conditions under which this witness map gives an outer approximation of the dynamics and thus can be used to compute the Conley index of isolated invariant sets. The method is illustrated by a simple example using data from the classical Henon map.