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С этого номера мы начинаем публиковать некоторые материалы из монографии Henry D.I. Abarbanel «Tools for analyzing observed chaotic data», любезно предоставленной нам автором. Предполагается перепечатка 1 Introduction , Part 3, Part 4, 5 Summary and Conclusions (см. Contents монографии). Возможно, заинтересованный читатель дополнит этот список и другими разделами. Редакция ждет Ваши предложения.

Редакционная коллегия

TOOLS FOR ANALYZING OBSERVED CHAOTIC DATA

Henry D.I. Abarbanel

Abstract

We present an introduction to the ideas used in nonlinear time series analysis with examples drawn from applications to observed data. The tools are for the analysis of time series,namely measurements at a single spatial point. We will only comment on the extension of the ideas to space-time chaos or chaotic fields. The tools allow one to perform the nonlinear version of the usual signal processing tasks:

- **signal separation**
- **establishing the proper state space for the signal**
- **extracting invariant characteristics of the system from the observed signal - sometimes called system identification**
- **model building in the state space - for prediction and control**

The emphasis in this review will be on finding the appropriate state space and on determining the invariant characteristics of the source of the source of chaotic data, but we will touch on model building as well. The tools we introduce will enable the reader to distinguish between low dimensional dynamical systems and «noise» (high dimensional systems) in a quantitative way using demonstrated, working algorithms.

We utilize in this article a recurrent set of examples on which we apply our tools to demonstrate the broad nature of their applicability. These examples include a computer generated time series and data from laser physics, hydrology, nonlinear circuit dynamics, and turbulent fluid dynamics:

- a time series generated from the Lorenz set of differential equations,
- several data sets from the chaotic intensity fluctuations of a Nd:YAG laser with an intracavity birefringent crystal,
- over one hundred and forty years of biweekly observations of chaotic variations of the volume of a large lake,
- observations from a nonlinear hysteretic circuit, and
- pressure fluctuations along the wall in turbulent boundary layer.

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