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NONLINEAR DYNAMIC SYSTEM KERNEL BASED RECONSTRUCTION FROM TIME SERIES DATA

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The problems of nonlinear dynamic system reconstruction using time-series data is closely connected with chaotic processes identification and prediction problem [1]. Such a problem are of a great importance in different applications, namely, signal processing, automatic control, econometrics etc.

The complex dynamic nonlinear mapping recovery using the sample data in the classical framework of parameterized model application leads to the multi-parameter estimation problem which becomes very complicated due to «curse of dimension» difficulties. It's stipulated the expedience of nonparametric methods and intelligent data analysis approaches such as kernel based machine learning. In order the model complexity restriction under short sample conditions, it is desirable to fix the dimension of auxiliary vector used in kernel method along with recurrent version of identification algorithm [2].

A unified approach to recurrent kernel identification algorithms design is proposed. In order to fix the auxiliary vector dimension, the reduced order model kernel method is proposed and proper recurrent identification algorithms are designed. Such an approach leads to a new type of recursive least-square kernel method dynamic system reconstruction algorithm. Finally, the full recurrent version of sliding window regarding to auxiliary variables, is also developed along with suitable sliding kernel matrix updating technique, leads to the identification algorithm which has tracking properties [3].

References

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