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Modification of the Bayesian approach as applied to reconstruction of dynamic system from time-series: Imperfect model class scenario

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A distinctive feature of *unknown* dynamic system (DS) reconstruction is inevitable discrepancy between the system and any model reconstructed from observed time series (TS). We describe this discrepancy as *dynamic noise*, namely, as a random quantity added to model evolution operator. Correspondingly, the Bayesian (*statistical*) approach seems to be very suitable for solution to the DS reconstruction problem. Unfortunately, as was demonstrated in the recent papers [1,2], being correct in terms of meeting conditions of the underlying theorem, the Bayesian approach to DS reconstruction is hard to realize in the most interesting case of chaotic TS. In this work we consider a modification of the Bayesian approach that can be used for DS reconstruction from TS, including the chaotic one. Bearing in mind the applicability of the modified approach to reconstruction by real experimental data, we discuss a general situation when initial TS is corrupted by both dynamic and measurement noise. We demonstrate efficiency of the modified approach for construction of prognosis of qualitative behaviour (*"prognosis of bifurcations"*) of unknown DS by weekly nonstationary noisy chaotic TS.

References

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