

Basin stability for updating system uncertainties

Dawid Dudkowski and Tomasz Kapitaniak

We propose a new application of the basin stability tool which allows to update the information on the system properties under uncertainties. The concept is presented using classical mechanical setup of coupled pendula, exchanging the energy via the supporting structure. Depending on the support parameters, the model can exhibit different types of co-existing synchronous patterns, as well as remain desynchronized. We calculate basin stability maps of particular behaviours and combine them with prior parameters distributions using Bayesian inference. The obtained posterior results, based on the attractors occurrence, update our knowledge on the system properties in the terms of probabilities.

References

- [1] P. J. Menck, J. Heitzig, N. Marwan, and J. Kurths, *How basin stability complements the linear-stability paradigm*, Nat. Phys. 9, 89–92 (2013)
- [2] K. Czołczyński, P. Perlikowski, A. Stefański, and T. Kapitaniak, *Why two clocks synchronize: Energy balance of the synchronized clocks*, Chaos 21, 023129 (2011)

First Author: Dawid, Dudkowski
Affiliation: *Division of Dynamics, Lodz University of Technology
Stefanowskiego 1/15, 90–537 Lodz, Poland*
e-mail: dawid.dudkowski@p.lodz.pl

Second Author: Tomasz, Kapitaniak
Affiliation: *Division of Dynamics, Lodz University of Technology
Stefanowskiego 1/15, 90–537 Lodz, Poland*
e-mail: tomasz.kapitaniak@p.lodz.pl