

Sync and anti-sync in a system of coupled oscillators

Larissa Davidova, Szeréna Újvári and Zoltán Neda

Babes-Bolyai University, Department of Physics

str. Kogalniceanu 1, RO-400084, Cluj, Romania

Lomonosov Moscow State University, Faculty of Physics, Leninskiye Gory 1-2,
119991, Moscow, Russia

The dynamics of similar, self-sustained oscillators coupled by a common platform exhibits fascinating collective behavior. Experiments performed with pendulum clocks [1,2] and metronomes [3,4] reported both the absence of synchronization, in-phase synchronization, anti-phase synchronization, beat-death phenomenon, or even chaotic dynamics. Here we present a numerical study on two self-sustained oscillators placed on a common movable platform. As order parameter for synchronization we use the Pearson correlation coefficient between the oscillators coordinates. As a function of the relevant physical parameters of this system we reproduce all the experimentally reported dynamics. We provide conditions for obtaining stable and emergent in-phase or anti-phase synchronization.

[1] M. Kapitaniak, K. Czolczynski, P. Perlikowski, A. Stefanski, and T. Kapitaniak. Physics Reports, vol. 517, 1 (2012).

[2] K. Czolczynski, P. Perlikowski, A. Stefanski, T. Kapitaniak, Physica A 388, 5013 (2009)

[2] J. Pantaleone. Am. J. Phys. , vol. 70, 921000, 2002.

[3] Sz. Boda, Z. Neda, B. Tyukodi and A. Tunyagi, preprint, arXiv:1210.3175