Nonlinear Sciences > Chaotic Dynamics

Global stability analysis of birhythmicity in a self-sustained oscillator

R. Yamapi, G. Filatrella, M.A. Aziz-Aloui

(Submitted on 21 Jan 2010)

We analyze global stability properties of birhythmicity in a self-sustained system with random excitations. The model is a multi-limit cycles variation of the van der Pol oscillatorintroduced to analyze enzymatic substrate reactions in brain waves. We show that the two frequencies are strongly influenced by the nonlinear coefficients α and β. With a random excitation, such as a Gaussian white noise, the attractor's global stability is measured by the mean escape time τ from one limit-cycle. An effective activation energy barrier is obtained by the slope of the linear part of the variation of the escape time τ versus the inverse noise-intensity 1/D. We find that the trapping barriers of the two frequencies can be very different, thus leaving the system on the same attractor for an overwhelming time. However, we also find that the system is nearly symmetric in a narrow range of the parameters.

Comments:	17 pages, 8 figures, to appear on Choas, 2010
Subjects:	**Chaotic Dynamics (nlin.CD)**; Adaptation and Self-Organizing Systems (nlin.AO); Biological Physics (physics.bio-ph)
Cite as:	**arXiv:1001.3818v1 [nlin.CD]**

Submission history

From: Giovanni Filatrella [view email]

[v1] Thu, 21 Jan 2010 14:55:52 GMT (191kb)

Which authors of this paper are endorsers?