Abstract for Dynamics Days Crete 2006
Topic: Chaos Control

Time-delayed feedback control of fixed points with variable phase-dependent coupling

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During the last decade time-delayed feedback methods have been successfully used to control unstable periodic orbits as well as unstable steady states [1]. In most of the theoretical analysis, this control method is considered in the realization of diagonal coupling, i.e., the control force applied to the i-th component of the system is a function of exclusively the same component. Although diagonal coupling is suitable for a theoretical investigation, it is often not feasible for an experiment. Therefore we consider the more general case where control is effected by a nondiagonal coupling matrix. Specifically, we investigate the time-delayed feedback scheme for a rotational coupling matrix parametrized by a variable phase. We present an analysis of the domain of control for simple time-delay autosynchronization (TDAS) as well as for multiple time extended feedback (ETDAS). We demonstrate the application to optical systems [2, 3] where the optical phase is an additional degree of freedom.

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[2] V. Z. Tronciu, H.-J. Wünsche, M. Wolfrum, and M. Radziunas, Phys. Rev. E **73**, 046205 (2006).

[3] S. Schikora, P. Hövel, H.-J. Wünsche, E. Schöll and F. Henneberger, submitted (2006).