Bistability in Coupled Oscillators Exhibiting Synchronized Dynamics

O. I. Olusola, ,A. N. Njah and J. A. Olowofela
Department of Physics, University of Agriculture, PMB 2240, Abeokuta, Ogun State, Nigeria

U. E. Vincent
Department of Computer Science, University of Agriculture, PMB 2240, Abeokuta, Ogun State, Nigeria

Abstract

We report some new results associated with the synchronization behavior of two coupled double-well Duffing oscillators (DDOs). Some sufficient algebraic criteria for global chaos synchronization of the drive and response DDOs via linear state error feedback control are obtained by means of Lyapunov stability theory. The synchronization is achieved through a bistable state in which a periodic attractor co-exists with a chaotic attractor. Using the linear perturbation analysis, the prevalence of attractors in parameter space and the associated bifurcations are examined. Subcritical and supercritical Hopf bifurcations and abundance of Arnold tongues — a signature of mode locking phenomenon are found.