Synchronization transitions in coupled time-delay electronic circuits

D V Senthilkumar[1,4], K Srinivasan[2], K Murali[3], M Lakshmanan[2], & J Kurths[1,5]

[1] Potsdam Institute for Climate Impact Research, 14412 Potsdam, Germany
[2] Centre for Nonlinear Dynamics, Department of Physics, Bharathidasan University, Tiruchirapalli - 620 024, India
[3] Department of Physics, Anna University, Chennai - 600 025, India
[4] Centre for Dynamics of Complex Systems, University of Potsdam, 14469 Potsdam, Germany
[5] Department of Physics, Humboldt University, 12489 Berlin, Germany

skumarusnld@gmail.com

We have investigated the synchronization transitions from anticipatory to lag synchronization via complete synchronization [Physical Review E **71** 016211 (2005)] and their inverse counterpart [Chaos **19** 023107 (2009)] in unidirectionally coupled time-delay systems with excitatory and inhibitory time-delay couplings, respectively. The transition between different types of synchronization can be realized, for a fixed set of parameters, as a function of the coupling delay τ_2 along with a suitable stability condition following the Krasovskii-Lyapunov theory. We demonstrate the experimental realization of the above synchronization transitions in coupled time-delay electronic circuits with a threshold nonlinearity.