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Impulsive Synchronization of Periodically Forced Complex Duffing's Oscillators

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Abstract : Synchronization is an important phenomenon commonly observed in nature. A system of periodically forced complex Duffings oscillators was introduced and shown to display chaotic behavior and possess strange attractors. Such complex oscillators appear in many problems of physics and engineering, as, for example, nonlinear optics, deep-water wave theory, plasma physics and bimolecular dynamics. In this paper, we study the remarkable phenomenon of chaotic synchronization on these oscillator systems, using impulsive synchronization techniques. We derive analytical expressions for impulsive control functions and show that the dynamics of error evolution is globally stable, by constructing appropriate Lyapunov functions. This means that, for a relatively large set initial conditions, the differences between the drive and response systems vanish exponentially and synchronization is achieved. Numerical results are obtained to test the validity of the analytical expressions and illustrate the efficiency of these techniques for inducing chaos synchronization in our nonlinear oscillators.

Keywords : complex nonlinear oscillators, impulsive synchronization, chaotic systems, global exponential synchronization
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