Poster

The Interplay of Dyadic and Triadic Interactions in Frustrated Stochastic Kuramoto Oscillator System

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The study of collective synchronization phenomena in a coupled oscillatory system is widely researched and essential for various natural and engineered systems [1]. Previous studies on synchronization analysis in the presence of phase lag in 1 and 2-simplex interactions show a dilated onset of synchronization [2]. Additionally, the order parameter diminishes when a low level of noise is introduced into the system [3]. In our study, we investigate how the interplay between phase lag and noise affects the synchronization phenomenon in coupled Kuramoto oscillatory systems. We use the generalized Fokker-Planck equation [4], which describes the evolution of the probability density function of the phases over time, to gain a deeper understanding of the system's collective behavior. We analyze the collective dynamical behavior of coupled Kuramoto oscillators in the presence of phase lag and noise analytically and numerically. The results of our study offer deeper insights into the mechanisms driving synchronization in complex systems. Understanding the influence of phase lag and noise will enable us to design more effective control systems based on coordinated activity.

Keywords: Kuramoto oscillators, Synchronization, Stochasticity, Bistability

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