

Collective rotational-flips and explosive synchronization in coupled nonlinear oscillators

Contributed
Talk

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Synchronization is one of the fascinating manifestations of collective dynamics of self-organization and adaptation that nature uses to orchestrate and regulate dynamical processes optimally. Questions about the onset synchrony or loss of synchrony and their characteristics are essential in understanding the workings of physical, chemical, biological, and technological systems. In this work, we present a new dynamical route for the onset of explosive synchronization via rotational flips in a variety of coupled nonlinear oscillators [1]. As a variation of the control parameter, de-synchronous oscillators abruptly flip their rotations to go to a frequency-locked state, imparting the phenomena of explosive synchronization [2]. I will discuss the dynamical and topological conditions under which the collective rotational-flips and explosive synchronization are manifested in various systems. Finally, I will address some potential applications of the phenomenon.

References

- [1] Naveen Kumar Mendola and Thounaojam Umeshkanta Singh. Collective rotation-flips and explosive synchronization in a ring of limit cycle oscillators. *Chaos, Solitons and Fractals* 180, 114588 (2024).
 - [2] Thounaojam Umeshkanta Singh. Explosive synchronization in bipartite networks. *Chaos, Solitons Fractals*, 152:111435, (2021).
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