

Introduction to Chimera States

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Chimera states are an intriguing example of partial synchronization patterns emerging in networks of identical oscillators. They consist of spatially coexisting domains of coherent (synchronized) and incoherent (desynchronized) dynamics, i.e., seemingly incongruous parts [1,2] [1,2]. In Greek mythology, the chimera is a fire-breathing mythical creature with a lion's, a goat's, and a snake's head. We show that a plethora of chimera patterns arise if one goes beyond the Kuramoto phase oscillator model, and considers coupled phase and amplitude dynamics, and more complex topologies than a simple one-dimensional ring network, e.g., fractal connectivities or multi-layer structures [3,4,5,6,7]. We review the control of chimera patterns by a subtle interplay of dynamics, topology, and delay. Our focus is in particular on partial relay synchronization in brain networks, and on applications to brain dynamics with empirical connectivities like epileptic seizure and unihemispheric sleep.

References

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