ESAM SEMINAR SPEAKER

Converse Symmetry Breaking: Theory and Experiment

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Symmetry breaking -- the phenomenon in which the symmetry of a system is not inherited by its stable states -- underlies pattern formation, superconductivity, and numerous other effects. We have recently established the possibility of converse symmetry breaking, a phenomenon in which the stable states are symmetric only when the system itself is not. In this talk, I will use coupled oscillator networks as a paradigmatic example to present theoretical and experimental demonstrations of this phenomenon. I will show theoretically that, in a broad class of coupled oscillator models, there are scenarios in which complete synchronization is not stable for identically coupled identical oscillators but becomes stable when, and only when, the oscillator parameters are judiciously tuned to non-identical values. Using alternating current electromechanical oscillators, I will show experimentally that there are scenarios in which stabilization of identical frequency synchronization is achieved when the oscillators are tuned to be suitably non-identical, and that this effect persists for a range of noise levels. These results have implications for the optimization and control of network dynamics in a broad class of systems whose function benefits from harnessing uniform behavior.

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