Bistable Chimera Attractors on a Triangular Network of Oscillator Populations

Erik Andreas Martens

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We study a triangular network of three populations of coupled phase oscillators with identical frequencies. The populations interact nonlocally, in the sense that all oscillators are coupled to one another, but more weakly to those in neighboring populations than to those in their own population. This triangular network is the simplest discretization of a continuous ring of oscillators. Yet it displays an unexpectedly different behavior: in contrast to the lone stable chimera observed in continuous rings of oscillators, we find that this system exhibits \emph{two coexisting stable chimeras}. Both chimeras are, as usual, born through a saddle node bifurcation. As the coupling becomes increasingly local in nature they lose stability through a Hopf bifurcation, giving rise to breathing chimeras, which in turn get destroyed through a homoclinic bifurcation. Remarkably, one of the chimeras reemerges by a reversal of this scenario as we further increase the locality of the coupling, until it is annihilated through another saddle node bifurcation.

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