
Bifurcation without parameters

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Abstract

We study dynamical systems with manifolds of equilibria near points at which normal hyperbolicity of these manifolds is violated. Manifolds of equilibria appear frequently in classical bifurcation theory by continuation of a trivial equilibrium. Here, however, we are interested in manifolds of equilibria which are not caused by additional parameters. In fact we require the absence of any flow-invariant foliation transverse to the manifold of equilibria at the singularity. We therefore call the emerging theory bifurcation without parameters.

Albeit the apparent degeneracy of our setting (of infinite codimension in the space of all smooth vectorfields) there is a surprisingly rich and diverse set of applications ranging from networks of coupled oscillators, viscous and inviscid profiles of stiff hyperbolic balance laws, standing waves in fluids, binary oscillations in numerical discretizations, population dynamics, cosmological models, and many more.

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