Multiparameter bifurcation problems for ordinary differential equations

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Bifurcation theory is a branch of nonlinear analysis that deals with the appearance of solutions to parameterized equations. Roughly speaking, assuming that there is a known trivial branch of solutions to a parameterized family of problems, find necessary and sufficient conditions for the appearance of nontrivial solutions arbitrarily close to some points (called bifurcation points) of the trivial branch.

These so-called bifurcation points have been used to explain various phenomena discovered and described in the natural sciences over the centuries (e.g., rod buckling, the appearance of vortices in fluids, and the onset of oscillations in electric circuits, among many others). In many applications, the models contain more than one parameter, and consequently, it is crucial to investigate bifurcation when several parameters are changed simultaneously. Bifurcation can arise only at singular points of the linearization at the trivial branch, i.e., points belonging to the trivial branch at which the linearized operator in the normal direction to the branch fails to be invertible.

We are going to present a new method for dealing with this problem for homoclinic solutions of multiparameterized ordinary differential equations. This talk is joint work with Christian Pötzsche (Klagenfurt, Austria).

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