Nonlinear normal modes and spectral submanifolds in mechanical vibrations

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Abstract:
Nonlinear normal modes have received considerable attention in structural vibrations because of their potential for serving as reduced-order models of multi-degree-of-freedom oscillations. Despite major progress in this area, the approximate construction of nonlinear normal modes has largely remained an operational procedure, carried out without a priori mathematical guarantees for convergence or uniqueness. Here we discuss simple but exact mathematical conditions from which the existence and uniqueness properties of nonlinear normal modes can a priori be inferred, without formal expansions or numerical experiments. These conditions also serve as guides for constructing reduced-order models.

Short bio:
George Haller received his Ph.D. in Applied Mechanics at the California Institute of Technology, and held tenured faculty positions at Brown University in Applied Mathematics and at MIT in Mechanical Engineering. While still a professor at MIT, he became the first director of Morgan Stanley's Mathematical Modeling Center in Budapest, which he headed for three years. He then served as chair of the Department of Mechanical Engineering at McGill University prior to joining ETH Zurich, where is currently Professor of Nonlinear Dynamics and head of the Institute for Mechanical Systems.