

Detecting Invariant Manifolds, Attractors, and KAM Tori in Aperiodically Forced Mechanical Systems

Presenter: Dr. Alireza Hadjighasem

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Date & Location:

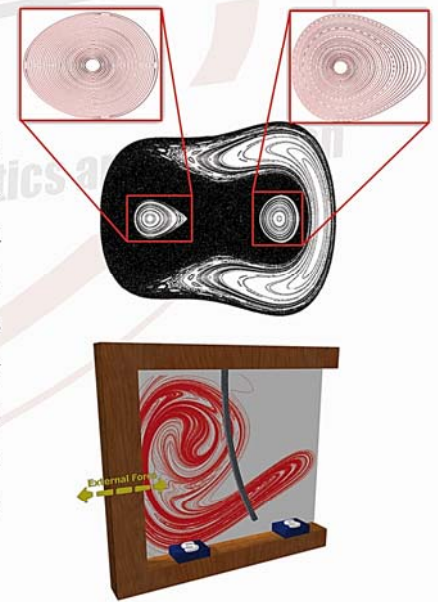
Sunday 1395/09/28, 13-14:30 pm,

**School of Mechanical Engineering (old building) Amphitheater,
College of Engineering, University of Tehran**

We show how the theory of geodesic transport barriers, originally developed for fluid flows, can be used to uncover key invariant manifolds in externally forced, one-degree-of-freedom mechanical systems. Specifically, Invariant sets in such systems turn out to be shadowed by minimal geodesics of the Cauchy-Green (CG) strain tensor, which can be computed from the CG tensor invariants. This approach enables the finite-time visualization of generalized stable and unstable manifolds, attractors and generalized KAM curves under arbitrary forcing, when Poincaré maps are not available.

About the Speaker:

Dr. Alireza Hadjighasem received his B.Sc. degree in Aerospace Engineering from Khajeh Nasir Toosi University of Technology (Tehran, Iran) in 2010. He then shifted his academic focus towards Mechanical Engineering and began his graduate studies in nonlinear dynamics under the supervision of Prof. George Haller at McGill University (Montreal, Canada). His Master thesis focused on developing a method for detecting invariant manifolds in aperiodically forced mechanical systems. In 2013 he moved to Switzerland, where he continued his research as a Ph.D. student in George Haller's nonlinear dynamics group at ETH Zurich. His doctoral thesis involved developing novel Lagrangian methods to study transport processes in geophysical flows.



The new Lagrangian methods that are being developed provide a means to generate a simplified and clear picture of the most important transport events occurring in a given domain over a given time interval, supporting simplified and more efficient operational decision-making. In August 2016, Alireza joined the Massachusetts Institute of Technology (MIT) as a postdoctoral associate to participate in a multi-institution project led by his mentors Profs. Peacock and Lermusiaux. The research objectives of the project are to leverage recent advances in the mathematics of dynamical systems to improve operational support for hazard scenarios that unfold in environmental flows. Pertinent examples include oil spill response and search-and-rescue operations in the ocean.

نشانی دفتر انجمن :