KAM theory: a journey from conservative to dissipative systems

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Abstract

The announcement of Kolmogorov's theorem in 1954 and the publication of the first proofs by Moser (1962) and Arnold (1963) represented a breakthrough in the theory of stability of nearly–integrable systems, and marked the beginning of the so–called KAM theory. Under very general assumptions, KAM theory provides the persistence under a small perturbation of invariant tori filled by quasi–periodic motions.

The aim of this talk is to present some developments of KAM theory in the context of conservative and dissipative (i.e., conformally symplectic) systems (either maps and flows). A sketch of the proofs, based on a suitable parameterization of the solution and on the implementation of a quadratic iterative scheme, will be included.

I will also pay attention to the applications of KAM theory to several models, ranging from paradigmatic problems like the standard map to more concrete models of interest in physical applications, including, e.g., the spin–orbit coupling and the three–body problem in Celestial Mechanics. In these contexts I will illustrate how a computer–assisted KAM proof may be devised in order to prove the existence of invariant tori for realistic values of the parameters.

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