Title:

Sun-Jupiter-Saturn system may exist: a verified computation of quasiperiodic solutions for the planar three body problem

Abstract:

In this talk, we present evidence of the stability of a simplified model of our Solar System, a flat (Newtonian) Sun-Jupiter-Saturn system with realistic data, that is, with masses of the Sun and the planets, their semi-axes, eccentricities and precessions of the planets close to the real ones. The evidence is based on convincing numerics that a KAM theorem can be applied to the Hamiltonian equations of the model to produce quasi-periodic motion, that lies in an invariant torus, with the appropriate frequencies.

To do so, first KAM schemes to compute translated tori are used to continue from the Kepler approximation (two uncoupled two-body problems) up to the actual Hamiltonian of the system, for which the translated torus is invariant tori. Second, KAM schemes for invariant tori are used to refine the solution of the invariant equations giving the invariant torus. Last, the convergence of the KAM scheme for the invariant torus is (numerically) checked by applying several times a KAM iterative lemma, from which we obtain that the final torus (numerically) satisfies the existence conditions given by a KAM theorem.

This is a joint work with Jordi-Lluís Figueras (Uppsala University).