Seminário de sistemas dinâmicos e estocásticos

Departamento de Matemática - IMECC - UNICAMP

Periodic orbits in the restricted three-body problem and Arnold"s J^+ invariant

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Resumo:

The restricted three body Problem describes the movement of a massless particle attracted by two masses according to Newtons law of Gravitation. For example one could imagine a satellite attracted by the earth and the moon, the moon attracted by the earth and the sun, or a planet in a double star System. The trajectory of the massless particle is usually immersed except for collisions with one of the masses or a phenomenon which is referred to by Hill as a moon of maximal lunarity. By the theorem of Whitney-Graustein the rotation number is a complete invariant for immersed loops in the plane up to homotopy. In a generic homotopy three disasters can occur - triple intersection, inverse and direct self tangencies. Arnold's J^+ invariant is unchanged under the first two disasters but is sensible to direct self tangencies. For families of periodic orbits in the restricted three body problems two additional disasters can occur - occurence of cusps in the case of a moon of maximal lunarity and collisions. We show how the theory of Arnold's J^+ invariant can be modified to obtain invariants for families of periodic orbits in the restricted three body problem.

This is joint work with Kai Cieliebak and Otto van Koert [$arXiv$: 1704.08568].

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