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Multiplicity of periodic orbits and homoclinics for Hamiltonian systems in \mathbb{R}^4

Due to the conservation of energy, one usually restricts the study of a Hamiltonian system in \mathbb{R}^4 to a fixed 3-dimensional energy level. Moreover, the existence of a global surface of section in such a level provides additional reduction of the flow to an area-preserving surface map. In case global sections do not exist or they are unlikely to be found, one may still search for the so called systems of transversal sections. These systems are singular foliations of the energy level so that the singular set is formed by finitely many periodic orbits and the regular leaves are transverse to the Hamiltonian vector field. The Hamiltonian flow may determine transition maps between some regular leaves of a system of transversal sections and valuable information about the dynamics, such as the multiplicity of periodic orbits and homoclinics, may be obtained by means of standard tools in 2-dimensional discrete dynamics. This is a work in progress with Pedro A. S. Salomão (University of São Paulo).