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Dynamical chaos in Hamiltonian systems with three degrees of freedom

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Abstract: It will be considered a new bifurcation approach to the analysis of solutions of Hamiltonian systems with three degrees of freedom, which implies the construction of an approximating extended two-parameter dissipative system whose stable solutions (attractors) are arbitrarily exact approximations to solutions of the original Hamiltonian system. It will be shown on the basis of numerical experiments for several Hamiltonian systems with three degrees of freedom such as Yang-Mills-Higgs and generalized Mathieu-Magnitskii systems that, in these systems, transition to chaos takes place not through the destruction of two-dimensional or three-dimensional tori of the unperturbed system in accordance with KAM (Kolmogorov-Arnold-Moser) theory, but, conversely, through the generation of complicated two-dimensional and three-dimensional tori around cycles of the extended dissipative system and through an infinite cascades of bifurcations of the generation of new cycles, tori and singular trajectories in accordance with the universal bifurcation FShM (Feigenbaum-Sharkovskii-Magnitskii) theory.

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