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Global bifurcations in low-dimensional dynamical systems

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We carry out the global bifurcation analysis of low-dimensional polynomial dynamical systems. First, using new bifurcational and topological methods, we solve Hilbert's Sixteenth Problem on the maximum number of limit cycles and their distribution for the 2D general Liénard polynomial system and Holling-type quartic dynamical system. Then, applying a similar approach, we study 3D polynomial systems and complete the strange attractor bifurcation scenario for the classical Lorenz system connecting globally the homoclinic, period-doubling, Andronov–Shilnikov, and period-halving bifurcations of its limit cycles which is related to Smale's Fourteenth Problem.