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GROWTH ESTIMATE FOR THE NUMBER OF CROSSING LIMIT CYCLES IN PLANAR PIECEWISE POLYNOMIAL VECTOR FIELDS

Motivated by the classical Hilbert's Sixteenth Problem, we investigate the growth of the maximum number of crossing limit cycles, denoted by $\mathcal{H}_c(n)$, in piecewise polynomial planar vector fields of degree n. The best known general lower bound for $\mathcal{H}_c(n)$ is $2n-1$. We adapt the recursive construction of Christopher and Lloyd to show that, within the piecewise polynomial Hamiltonian framework, $\mathcal{H}_c(n)$ grows at least as fast as $n \log n$. Moreover, in the more general setting of piecewise polynomial systems, we prove that $\mathcal{H}_c(n)$ grows at least as fast as n^2, thus improving the previously known linear asymptotic behavior. Inspired by recent results, we also establish that $\mathcal{H}_c(n)$ is a strictly increasing function whenever it is finite, and that in such cases it can be realized by piecewise polynomial vector fields possessing only hyperbolic crossing limit cycles. These results extend to discontinuous systems the advances previously obtained for the Hilbert number in smooth polynomial vector fields. This work is being developed in collaboration with Luana Ascoli.