AN APPLICATION TO THE STUDY OF POLYNOMIAL AUTOMORPHISMS VIA A NONUNIFORM GLOBAL STABILITY PROBLEM

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Abstract. Firstly, we introduce a nonautonomous nonuniform Markus-Yamabe Conjecture, namely, a global problem on nonuniform asymptotic stability for time-varying systems, whose restriction to the autonomous case is related to the classical Markus–Yamabe Conjecture, which states that if the time-invariant system

$$\dot{x} = f(x), \tag{1}$$

where $f\colon \mathbb{R}^n \to \mathbb{R}^n$ of class C^1, $f(0) = 0$ and is a Hurwitz vector field, that is, the eigenvalues of the Jacobian matrix of f have negative real part at any $x \in \mathbb{R}^n$, or equivalently $Jf(x)$ is a Hurwitz matrix for any x, then the origin is globally asymptotically stable. Secondly, we propose a couple of definitions of injectivity for a parametrized family of maps and study its link with the above stated nonautonomous conjecture. This relation allow us to study a particular family of parametrized polynomial automorphisms and to prove that they have polynomial inverse for certain parameters, which is reminiscent to the Jacobian Conjecture.

References

[1] Álvaro Castañeda, Ignacio Huerta, Gonzalo Robledo, An application to the study of polynomial automorphisms via a nonuniform global stability problem, https://arxiv.org/abs/2108.06416 (preprint).

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