Disguised toric dynamical systems

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We study families of polynomial dynamical systems inspired by biochemical reaction networks. We focus on complex balanced mass-action systems, which have also been called toric. They are known or conjectured to enjoy very strong dynamical properties, such as existence and uniqueness of positive steady states, local and global stability, persistence, and permanence. We consider the class of disguised toric dynamical systems, which contains toric dynamical systems, and to which all dynamical properties mentioned above extend naturally. By means of (real) algebraic geometry we show that some reaction networks have an empty toric locus or a toric locus of Lebesgue measure zero in parameter space, while their disguised toric locus is of positive measure. We also propose some algorithms one can use to detect the disguised toric locus.

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References

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