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Invariant Varieties and Collision-Freeness for Polynomial Systems

Wednesday, 9 March 2022 14:00 (1 hour)

The concept of invariant sets is an important tool to investigate the behaviour of solutions of ODE systems. A set M is called invariant for a specified system if every trajectory of the system that starts in M stays in M for all times. Considering varieties and polynomial ODE systems, we show how Groebner bases provide an algorithmic test for invariance. As an application, we investigate collision-freeness for polynomial ODE systems, which is a structural property in particle dynamics. An ODE system is called collision-free if every trajectory of the system that has distinct components at some initial time has distinct components for all times. We show that this property is closely related to the concept of invariant varieties, which again provides an algorithmic test for collision-freeness.

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