

Is integrating a non-smooth system harder than integrating a smooth one?

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In this talk we first consider ways to integrate a differential system with discontinuous right-hand-side (DRHS). Then, by considering a smooth planar system having slow-fast motion, where the slow motion takes place near a curve, we explore the idea of replacing the original smooth system with a DRHS system, whereby the DRHS system coincides with the smooth one away from a neighborhood of the curve. After this reformulation, we will obtain sliding motion on the curve, and numerical methods apt at integrating for sliding motion can be applied. We further consider bypassing the sliding motion altogether, and monitor entries (transversal) and exits (tangential) on the curve. Numerical examples illustrate potential and challenges of this approach.

This talk is based on the paper "Smooth to discontinuous systems: a geometric and numerical method for slow-fast dynamics", by L. Dieci, C. Elia. In DCDS-B, 2018.