X Workshop on Dynamical Systems
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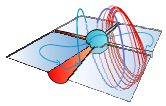

The ghosts of departed quantities in switches and transitions

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Abstract: Transitions between steady dynamical regimes in diverse applications are often modeled using discontinuities, but doing so introduces problems of uniqueness. No matter how quickly a transition occurs, its inner workings can affect the dynamics of the system significantly. Here we discuss the way transitions can be reduced to discontinuities without trivializing them, by preserving so-called hidden terms. We review the fundamental methodology, its motivations, and where their study seems to be heading. We derive a prototype for piecewise-smooth models from the asymptotics of systems with rapid transitions, sharpening Filippov's convex combinations by encoding the tails of asymptotic series into nonlinear dependence on a switching parameter. We present a few examples that illustrate the impact of these on our standard picture of smooth or only piecewise-smooth dynamics.