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Rigorous numerics for periodic orbits of piecewise-smooth systems: a functional analytic approach based on Chebyshev series

In this talk, we introduce a rigorous computational method for proving existence of periodic orbits of continuous and discontinuous (Filippov) piecewise-smooth differential equations. The computer-assisted proofs are obtained by combining a functional analytic approach based on Chebyshev series together with a Newton-Kantorovich type argument (the radii polynomial approach). Using this approach, we prove existence of crossing periodic orbits in a model nonlinear Filippov system and in the Chua's circuit system. This is joint work with Marcio Gameiro (USP, Brazil) and Jean-Philippe Lessard (Université Laval, Canada).