Periodic Solutions in State-Dependent Delay Differential Equations

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Abstract

In this talk, I will present a computer-assisted methodology for constructively proving the existence of periodic solutions to state-dependent delay differential equations. The proof relies on a Newton–Kantorovich framework applied to a carefully formulated zero-finding problem. By combining a detailed analytical study with precise Fourier series estimates, we derive sufficient conditions ensuring the existence of a true solution in a neighborhood of a numerically computed approximation. These conditions can be effectively verified in practice using rigorous numerics. Applications to nontrivial examples will be presented to illustrate the scope and effectiveness of the method. This is joint work with J.B. van den Berg, M. Breden, K. Church and J.P. Lessard.