Lyapunov functions for nonlinear systems by linear optimization

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Lyapunov functions together with contraction metrics are the centerpiece of modern stability theory. Their analytic generation, however, is in general a very difficult and often impossible task. We present the CPA method to compute Lyapunov functions for nonlinear system, that uses linear optimization to parameterize a continuous piecewise affine function on a simplicial complex. The constraints of the linear programming problem assure that the computed function is a Lyapunov function for the system at hand on the whole domain of the simplicial complex.