Lie-algebraic methods for stability analysis of time-variant systems

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Abstract

We suggest an approach to asymptotic analysis of the flows generated by time-periodic (linear and nonlinear) systems. We utilize the approach - a kind of high-order averaging or homogenization - for studying stability and asymptotic stability of these systems and also for the design of time-variant stabilizers. The computation of the high-order averagings is based on the tools of Lie and chronological algebras. Various examples are arranged in order to illustrate the approach. Those include second- and third-order linear ODE with periodic coefficients, nonlinear ODE under homogeneity assumptions, time-variant stabilizers for bilinear and nonlinear nonholonomic systems.