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Stability analysis of linear time-varying system via flexible polynomial-based functions. (English) Zbl 07472810

Summary: In the last five years, the slack matrices-based function has been widely investigated by constructing appropriate polynomials since it is an appropriate tool to derive tractable stability conditions expressed in terms of linear matrix inequalities (LMIs). However, the inherently complexity of slack matrices has not been considered until now, which is an open problem. In this paper, novel flexible polynomial-based functions (FPFs) are proposed by constructing flexible polynomials. Not only the inherently complex dimensions of the slack matrices but also higher-order time delays and zero components in the existing works are relaxed. Benefitting from FPFs, two representative stability criteria are, respectively, obtained for linear delay systems. According to the two stability conditions, all permutations and combinations of flexible vectors in FPFs can be freely chosen. An example is illustrated to demonstrate the effectiveness of the obtained results.

MSC:
93D20 Asymptotic stability in control theory
93C43 Delay control/observation systems
93C05 Linear systems in control theory

Keywords:
linear time-varying system; stability analysis; flexible polynomial-based functions; flexible vectors; slack matrices

Full Text: DOI

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