Robust output/state feedback controllers design for uncertain systems described by interval state-space models

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Résumé

In the last decades, interval transfer functions and interval state-spaces representations have been widely used to model uncertain systems. The main advantage of using interval techniques to model and to design a robust control laws for uncertain systems is the simplicity of modeling the parametric uncertainties just by bounding them. Since the transfer functions are not well adapted to multivariable control systems, several works were focused on modeling the system uncertainties by linear and time-invariant interval state-space models where the robust controllers are designed by means of the closed-loop characteristic polynomial using Routh-Hurwitz stability criterion. However, the previous works addressed only the degree of stability of the closed-loop system and no performances measure was discussed. Furthermore, they are limited to systems with state and input matrices of special structures. In this presentation, we propose to combine the interval techniques and regional eigenvalue assignment approaches to design output/state feedback controllers with standard structures that provide a guaranteed stability margin and ensure the desired performances with low-order controllers. The design of both robust output and state (observer-based) feedback controllers will be highlighted in this presentation. Besides, a simulation results and experimental validation using smart material-based actuators will be provided.

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