Topic ID: 142-ARI-EN-02

Robust Spectral Shaping for Time-Delay Systems

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Abstract:

Time delay systems in technological and other processes are assumed to contain delays - or latencies, in inner feedback loops, and not only in the input-output relationship. Such systems belong to the infinite-dimensional class, having an infinite number of characteristic roots (poles). By considering a designed control system with a controller, including a finite number of free (tunable) parameters, one has to cope with the problem of the suitable placement of the decisive part of the feedback. Robustness of such an assignment represents a significant point of view to this issue. This often leads to interesting optimization problems - with or without constraints, where the cost function might be non-smooth and/or non-convex, or even non-Lipschitz. Especially, neutral delayed systems can have very sensitive eigenvalues loci.

This dissertation thesis should be focused on the implementation of some known, as well as recent, universal or “ad hoc” algorithms to (partial) eigenvalue assignment for time-delay systems with the emphasis to robustness. Known methods should be accompanied by some original ideas, approaches or algorithms. It is expected to utilize optimization techniques, such as the Nelder-Mead algorithm, SOMA, PSO, ACO, etc. The theoretical results ought to be verified by using laboratory experiments.

Literature:

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