

A COMPUTATIONAL APPROACH TO EXISTENCE VERIFICATION AND CONSTRUCTION OF ROBUST QFT CONTROLLERS

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Horowitz's quantitative feedback theory (QFT) [1] approach to robust control has been gaining popularity in the control literature for design of robust feedback systems. A central problem in QFT is in proving the existence (or non-existence) of a controller solution to a given design problem. In this paper, we propose a novel method based on interval analysis [2] to computationally verify the existence (or non-existence) of a controller solution, for a specified controller structure and an initial domain of controller parameter values. A feature of our proposed method is that it is a constructive existence method, i.e., if a solution of the specified structure exists for the given parameter domain, then all controller solutions lying in the domain are generated with our method. Essentially, the proposed method uses successive partitioning of the parameter domain and controller feasibility tests. We demonstrate the proposed method through a benchmark example.

Keywords : Control Synthesis, Interval Analysis, Quantitative Feedback Theory, Robust Control, Robust Synthesis.

References

- [1] Horowitz, I. M., Quantitative feedback design theory (QFT), QFT Publications, Boulder, Colorado, 1993.
- [2] Moore, R. E., Methods and applications of interval analysis, SIAM, Philadelphia, 1979.