A Novel Robust Control Strategy for Interval Plants Using The Two Loop MFC and CDM

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Abstract

The important issues of robust control are that the controller must perform satisfactorily not just for one plant, but for a family of plants and the controller should ensure stability and performance despite the disturbances and modeling uncertainties. In this context, we propose a novel robust control method for interval plants that gives robustness against wide variations of plant parameters. The method is based on the combined merits of the two loop Model Following Control (MFC); see Åström and Wittenmark (2006) and the Coefficient Diagram Method (CDM); see Manabe (1998). The MFC structure offers two degree freedom of control and design flexibility to tackle tracking and disturbance rejection separately; see Skoczowski et al. (2005). CDM is one of the recently developed controller design methods using algebraic approach. In our proposed method, we modify the two loop control structure in accordance with the CDM. The controller is designed using CDM to satisfy the desired performance specifications. We establish mathematically the conditions that provide robustness to the system. We apply the proposed control strategy to two examples of interval plants from the existing literature and find the results to support the derived mathematical analysis. We also determine the parametric stability margins for both the examples using bounded phase condition; see Bhattacharyya et al. (1995).

References

Åström, K. J. and B. Wittenmark. *Adaptive Control*, Pearson Education, Second Edition, 2006.

Bhattacharyya, S. P., H. Chapellat and L. H. Keel. In Thomas Kailath, editor, *Robust Control:The Parametric Approach*, Prentice Hall, New York, USA, 1995.

Manabe, S. Coefficient Diagram Method. *Proc. 14th IFAC Symposium on Automatic Control in Aerospace*, August 1998. Seoul, Korea.

Skoczowski, S. Domek, K. Pietrusewicz and B. Broel-Plater. A Method for Improving the Robustness of PID Control. *IEEE Trans. on Industrial electronics*, 52:1669–1676, 2005.