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Design and optimisation of restricted complexity controller: a modal approach for reduced-order controllers. (English) [Zbl 1293.93127](#)

Eur. J. Control 9, No. 1, 39-47 (2003).

Summary: This article presents a new powerful design technique for reducing an initial high-order controller. For this, the initial closed-loop behavior is studied by modal analysis. Then, this behavior will be reproduced to a desired level of precision by redesigning the controller using the Robust Modal Control. The leading closed-loop eigenstructure of the system is assigned and the dynamic of the reduced-order controller is extracted from the relevant dynamic of the initial controller. This leads to a low-order controller, with a closed-loop behavior similar to the initial one.

MSC:

[93B11](#) System structure simplification

[93B35](#) Sensitivity (robustness)

[93B60](#) Eigenvalue problems

Cited in **2** Documents

Keywords:

dominant eigenstructure; frequency constraint; reduced-order controller; robust modal control; time constraint

Software:

QDES; Robust Modal Control; RMCT

Full Text: [DOI](#)

References:

- [1] Website:http://iawwww.epfl.ch/news/EJC_benchmark.
- [2] Alazard, D.; Apkarian, P., Exact observer based structures for arbitrary compensators, Int J robust nonlinear control, 9, 2, 101-118, (1999) · [Zbl 0919.93015](#)
- [3] Anderson, B.D.O.; Liu, Y., Controller reduction: concepts and approaches, IEEE trans autom control, 34, 802-812, (1989) · [Zbl 0698.93034](#)
- [4] Berstein, D.S.; Hyland, D.C., The optimal projection equations for fixed-order dynamic compensation, IEEE trans autom control, 1034-1037, (1985), AC-29: · [Zbl 0555.93069](#)
- [5] Berstein, D.S.; Hyland, D.C., Optimal projection/maximum entropy stochastic modeling and reduced-order design synthesis, (1985), IFAC workshop on model errors and compensation Boston
- [6] Boyd, S.P.; Barratt, C.H., Linear controller design. limits of performance, (1991), Prentice Hall Englewood Cliffs, NJ · [Zbl 0748.93003](#)
- [7] Chiappa, C.; Magni, J.F.; Le Gorrec, Y., A modal multi- model approach for controller order reduction and structuration, () · [Zbl 0900.93120](#)
- [8] Enns D. Model reduction for control system design. PhD thesis, Stanford University 1984.
- [9] Enns, D., Model reduction with balanced realizations: an error bound and frequency weighted generalization, ()
- [10] Ferreres, G.; Fromion, V., H_2 control for a flexible transmission system, Eur J control, 5, 2-4, 185-192, (1999)
- [11] Gugercin, S.; Antoulas, A.C., A comparative study of 7 algorithms for model reduction, () · [Zbl 1159.93318](#)
- [12] Karimi, A.; Landau, I.D., Controller order reduction by direct closed loop identification (output matching), (2000), 3rd Rocond IFAC Prague
- [13] Landau, I.D.; Constantinescu, A.; Karimi, A., Direct controller order reduction by identification in closed loop applied to an active suspension, () · [Zbl 1293.93128](#)
- [14] Landau, I.D.; Constantinescu, A.; Loubat, P.; Rey, D.; Franco, A., A methodology for the design of feedback active vibration control systems, (), 1571-1576
- [15] Landau, I.D.; Karimi, A., A unified approach to closed- loop plant identification and controller reduction, (), 1780-1785
- [16] Landau, I.D.; Karimi, A.; Constantinescu, A., Direct controller order reduction by identification in closed loop, Automatica,

37, 1689-1702, (2001) · [Zbl 1013.93009](#)

- [17] Landau, I.D.; Loranzo, R.; M'Saad, M., *Adaptative control*, (1997), Springer London
- [18] Liu, Y.; Anderson, B.D.O., *Controller reduction via factorization and balancing*, *Int J control*, 44, 2, 507-531, (1986) · [Zbl 0604.93020](#)
- [19] Madelaine B. *Determination d'un modele dynamique pertinent pour la commande: De la reduction a la construction*. PhD thesis, ENSAE 1998.
- [20] Madelaine, B.; Alazard, D., *Flexible structure model construction for control system*, (), 1165-1175
- [21] Magni, J.F., *Multimodel eigenstructure assignment in flight-control design*, *Aerospace sci technol*, 3, 3, 141-151, (1999) · [Zbl 0946.93507](#)
- [22] Magni, J.F., *A toolbox for robust multi-model control design (rmct)*, ()
- [23] Magni, J.F., *Robust modal control with a toolbox for use with MATLAB*, (2002), Kluwer Academic/Plenum Publishers Dordrecht
- [24] Magni, J.F.; Chiappa, C.; Le Gorrec, Y., *A multimodel based approach to robust and self-scheduled control design*, (), 3009-3014
- [25] Magni, J.F.; Le Gorrec, Y.; Chiappa, C.; Alazard, D., *Flexible structure control by eigenstructure assignment*, (), 99-104, vol. 2
- [26] Skelton., R.E.; Hu, A., *Modelreductionwithweightedmodal cost analysis*, ()

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