

Xu, Xiaodong; Dubljevic, Stevan

Output regulation problem for a class of regular hyperbolic systems. (English) Zbl 1332.93155
Int. J. Control 89, No. 1, 113-127 (2016).

Summary: This paper investigates the output regulation problem for a class of regular first-order hyperbolic partial differential equation (PDE) systems. A state feedback and an error feedback regulator are considered to force the output of the hyperbolic PDE plant to track a periodic reference trajectory generated by a neutrally stable exosystem. A new explanation is given to extend the results in the literature to solve the regulation problem associated with the first-order hyperbolic PDE systems. Moreover, in order to provide the closed-loop stability condition for the solvability of the regulator problems, the design of stabilising feedback gain and its dual problem design of stabilising output injection gain are considered in this paper. This paper develops an easy method to obtain an adjustable stabilising feedback gain and stabilising output injection gain with the aid of the operator Riccati equation.

MSC:

93C20 Control/observation systems governed by partial differential equations Cited in 9 Documents
35L02 First-order hyperbolic equations
93B52 Feedback control

Keywords:

regular hyperbolic PDE system; state feedback regulator; stabilising feedback gain; error feedback regulator; stabilising output injection gain; Sylvester equation; Riccati equation

Full Text: [DOI](#)

References:

- [1] DOI: 10.1109/TAC.2012.2228035 · Zbl 1369.93268 · doi:10.1109/TAC.2012.2228035
- [2] DOI: 10.1016/j.automatica.2009.02.017 · Zbl 1166.49033 · doi:10.1016/j.automatica.2009.02.017
- [3] DOI: 10.1109/CDC.2004.1428768 · doi:10.1109/CDC.2004.1428768
- [4] DOI: 10.1016/j.automatica.2012.11.016 · Zbl 1259.49054 · doi:10.1016/j.automatica.2012.11.016
- [5] DOI: 10.1109/TAC.2014.2322435 · Zbl 1360.93250 · doi:10.1109/TAC.2014.2322435
- [6] DOI: 10.1109/9.895561 · Zbl 1056.93552 · doi:10.1109/9.895561
- [7] DOI: 10.1007/978-1-4612-2020-6 · doi:10.1007/978-1-4612-2020-6
- [8] DOI: 10.1007/978-1-4612-4224-6 · doi:10.1007/978-1-4612-4224-6
- [9] DOI: 10.1109/TAC.1976.1101137 · Zbl 0326.93007 · doi:10.1109/TAC.1976.1101137
- [10] DOI: 10.1016/0005-1098(71)90099-9 · Zbl 0223.93023 · doi:10.1016/0005-1098(71)90099-9
- [11] DOI: 10.1016/j.automatica.2011.08.033 · Zbl 1228.93022 · doi:10.1016/j.automatica.2011.08.033
- [12] DOI: 10.1137/0315033 · Zbl 0382.93025 · doi:10.1137/0315033
- [13] DOI: 10.1016/0005-1098(76)90006-6 · Zbl 0344.93028 · doi:10.1016/0005-1098(76)90006-6
- [14] DOI: 10.1137/090757976 · Zbl 1214.93082 · doi:10.1137/090757976
- [15] Immonen E., State space output regulation theory for infinite-dimensional linear systems and bounded uniformly continuous exogenous signals (2006) · Zbl 1099.93011
- [16] DOI: 10.1137/050638916 · Zbl 1123.37052 · doi:10.1137/050638916
- [17] DOI: 10.1109/9.45168 · Zbl 0704.93034 · doi:10.1109/9.45168
- [18] DOI: 10.1109/TAC.1968.1098947 · doi:10.1109/TAC.1968.1098947
- [19] Kato T., Perturbation theory for linear operators 132 (1995) · Zbl 0836.47009
- [20] DOI: 10.1016/0167-6911(83)90035-X · Zbl 0512.93031 · doi:10.1016/0167-6911(83)90035-X
- [21] DOI: 10.1080/00207728408926570 · Zbl 0537.93045 · doi:10.1080/00207728408926570
- [22] DOI: 10.1109/TAC.2014.2326491 · Zbl 1360.93264 · doi:10.1109/TAC.2014.2326491

- [23] DOI: [10.1002/rnc.2920](https://doi.org/10.1002/rnc.2920) · Zbl [1283.93102](https://zbmath.org/?q=ser/1283.93102) · doi:[10.1002/rnc.2920](https://doi.org/10.1002/rnc.2920)
- [24] DOI: [10.1109/TAC.1982.1102887](https://doi.org/10.1109/TAC.1982.1102887) · Zbl [0493.93029](https://zbmath.org/?q=ser/0493.93029) · doi:[10.1109/TAC.1982.1102887](https://doi.org/10.1109/TAC.1982.1102887)
- [25] Salamon D, Control and observation of neutral systems (1984) · Zbl [0546.93041](https://zbmath.org/?q=ser/0546.93041)
- [26] DOI: [10.1137/0321050](https://doi.org/10.1137/0321050) · Zbl [0524.93054](https://zbmath.org/?q=ser/0524.93054) · doi:[10.1137/0321050](https://doi.org/10.1137/0321050)
- [27] DOI: [10.1007/978-3-7643-8994-9](https://doi.org/10.1007/978-3-7643-8994-9) · doi:[10.1007/978-3-7643-8994-9](https://doi.org/10.1007/978-3-7643-8994-9)
- [28] DOI: [10.1016/j.automatica.2014.04.016](https://doi.org/10.1016/j.automatica.2014.04.016) · Zbl [1296.93072](https://zbmath.org/?q=ser/1296.93072) · doi:[10.1016/j.automatica.2014.04.016](https://doi.org/10.1016/j.automatica.2014.04.016)
- [29] DOI: [10.2307/2154655](https://doi.org/10.2307/2154655) · Zbl [0798.93036](https://zbmath.org/?q=ser/0798.93036) · doi:[10.2307/2154655](https://doi.org/10.2307/2154655)
- [30] DOI: [10.1137/0311035](https://doi.org/10.1137/0311035) · Zbl [0259.93012](https://zbmath.org/?q=ser/0259.93012) · doi:[10.1137/0311035](https://doi.org/10.1137/0311035)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.