Corrigendum to "Robust $\mathscr{H}_2$ and $\mathscr{H}_\infty$ control for positive continuous-time uncertain linear systems" [Journal of The Franklin Institute, 359(10):4842–4855, July 2022]

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Abstract

The aim of this note is to rectify incorrect statements made in [1].

In [1], Example 1, in the part concerned with the problem of $\mathscr{H}_2$ decentralized stated feedback control for precisely known positive continuous-time linear systems, the algorithm from [2] was incorrectly reported as infeasible in [1, Table 2]. The LMI problem [2, Equation (14)], that should produce a feasible gain L with decentralized structure as in [1, Equation (12)], was programmed with a block diagonal Q matrix and the extra constraint $Le = 0$, with $e = [0\ 0\ 0\ 0\ 1]'$, resulting in infeasibility. However, as kindly pointed out by the authors from [2] in a personal communication, the correct constraint is

$$Le - he'Qe = 0, \quad h = (D'D)^{-1}D'Ce \tag{1}$$

Using this constraint, a feasible initial decentralized gain is obtained from [2, Equation (14)] (with $\mathscr{H}_2$ cost 5.6930) and, after 21 iterations, [2, Algorithm 1] converges to an $\mathscr{H}_2$ cost of 4.1906, as shown in the corrected Table 2.

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Moreover, contrarily to what was suggested in [1], the linear transformation in matrices A and C (needed in [2, Algorithm 1] whenever $C_z' D_z \neq 0$) does not play a role in the existence (or not) of a decentralized gain.

Table 2: $\mathscr{H}_2$ guaranteed costs (ρ) provided by Algorithm 1 (A1), [2] (DG) and by the methods from [3] (E-(12), E-(13) and E-(14)), considering a state-feedback gain structured as in Eq. (12).

	A1	E-(12)	E-(13)	E-(14)	DG
ρ	4.1807	4.4182	5.693	4.6545	4.1906
$(\rho - \rho_{A1})/\rho_{A1}$ (%)	0	+5.68	+36.17	+11.33	+0.24

References

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