ERRATA

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Two-sided tangential interpolation of real rational matrix functions
New Aspects in Interpolation and Completion Theories,
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We would like to correct an omission in the statement of Lemma 3.7 of [1]. An additional hypothesis is needed. The correct statement of this lemma is given below. The notation and terminology are taken from [1].

Lemma. *Let $\tau_0 = (C, A_\pi; A_\zeta, B : \Gamma)$ be a left Sylvester data set with respect to a symmetric set $\Omega \subseteq \mathbb{C}$ which does not contain the real line $\mathbb{R}$. Assume that τ_0 is similar to its complex conjugate $\bar{\tau}_0 = (\bar{C}, \bar{A}_\pi; \bar{A}_\zeta, \bar{B}; \bar{\Gamma})$. Let λ_0 be a point in $\mathbb{R}$ but not in Ω . Then there exist real matrices $C_0, A_{\pi 0}, A_{\zeta 0}, B_0$ and Γ_0 of appropriate sizes such that the eigenvalues of $A_{\pi 0}$ and $A_{\zeta 0}$ are all in $\{\lambda_0\}$, the set*

$$\tau := \left([C \quad C_0], \begin{bmatrix} A_\pi & 0 \\ 0 & a_{\pi 0} \end{bmatrix}; \begin{bmatrix} A_\zeta & 0 \\ 0 & a_{\zeta 0} \end{bmatrix}; \begin{bmatrix} \Gamma & \Gamma_{12} \\ \Gamma_{21} & \Gamma_0 \end{bmatrix} \right)$$

is a left Sylvester data set, and the matrix $\tilde{\Gamma} := \begin{bmatrix} \Gamma & \Gamma_{12} \\ \Gamma_{21} & \Gamma_0 \end{bmatrix}$ is invertible. Moreover, matrices $C_0, A_{\pi 0}, A_{\zeta 0}, B_0$ and Γ_0 as above exist with the additional property that the size of $\tilde{\Gamma}$ is $(n_\pi + n_\zeta - \text{rank } \Gamma) \times (n_\pi + n_\zeta - \text{rank } \Gamma)$.

Proof: Arguing as in the proof of Theorem 3.4(a) in [1], we see that τ_0 is similar to a left Sylvester data set which consists of real matrices. Thus we can assume that τ_0 itself consists of real matrices. Now apply the same construction as in [2] to prove the lemma.

The Lemma is not true if the condition that τ_0 is similar to $\bar{\tau}_0$ is omitted, as the following example shows.

EXAMPLE. Let $\Omega = \{i, -i\}$,

$$\tau_0 = \left([1 \ 0 \ 0 \ -1]^T, i; i, [1 \ i \ i \ 1]; 0 \right),$$

and $\lambda_0 = 0$. We seek the 4×1 column $C_0 = [c_1 \ c_2 \ c_3 \ c_4]^T$, 1×4 row $B_0 = [b_1 \ b_2 \ b_3 \ b_4]$, and numbers $\Gamma_{12} \neq 0$, $\Gamma_{21} \neq 0$ and Γ_0 such that the equality

$$\begin{bmatrix} 0 & \Gamma_{12} \\ \Gamma_{21} & \Gamma_0 \end{bmatrix} \begin{bmatrix} i & 0 \\ 0 & 0 \end{bmatrix} - \begin{bmatrix} i & 0 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 0 & \Gamma_{12} \\ \Gamma_{21} & \Gamma_0 \end{bmatrix} = \begin{bmatrix} 1 & i & i & 1 \\ b_1 & b_2 & b_3 & b_4 \end{bmatrix} \begin{bmatrix} 1 & c_1 \\ 0 & c_2 \\ 0 & c_3 \\ -1 & c_4 \end{bmatrix} \quad (1)$$

holds. The result of [2] ensures that there are such $C_0, B_0, \Gamma_{12}, \Gamma_{21}$ and Γ_0 with complex entries. We claim that there are no such $C_0, B_0, \Gamma_{12}, \Gamma_{21}$ and Γ_0 with real entries. Indeed, the equation (1) is easily solvable to yield the general solution

$$\Gamma_{12} = ic_1 - c_2 - c_3 + ic_4; \quad \Gamma_{21} = -ib_1 + ib_4; \quad b_1c_1 + b_2c_2 + b_3c_3 + b_4c_4 = 0 \quad (2)$$

from which our claim is evident; indeed, if C_0, B_0, Γ_{12} and Γ_{21} are real and satisfy (2), then we must have $\Gamma_{21} = 0$.

None of the results of [1] (except Lemma 3.7 itself) are affected by this correction (Lemma 3.7 is needed for the proof of Theorem 3.6, but the hypotheses of this theorem contain the additional hypothesis used in the correct statement of Lemma 3.7).

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REFERENCES

- [1] J.A. Ball, I. Gohberg and L. Rodman, Two-sided tangential interpolation of real rational matrix functions, in *New Aspects in Interpolation and Completion Theories* (Ed. I. Gohberg), Operator Theory: Advances and Applications Vol. 64, Birkhäuser-Verlag, Basel, 1993, pp. 73-102.

- [2] I. Gohberg, M.A. Kaashoek and A.C. Ran, Regular rational matrix functions with prescribed null and pole data except at infinity, *Linear Algebra Appl.* 137/138 (1990), 387-412.

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