Errata: On the State-Space Realization of LPV Input-Output Models: Practical Approaches

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I. Foreword

This document provides the correction of some matrix formatting errors in the published paper [1]. Despite all the efforts of the authors, such an unfortunate mistake has remained unnoticed till the final printing process. In case of other errors or comments, please do not hesitate to contact the corresponding authors.

II. Errors

A. Augmented SS form

In Equation (32) the lower part of matrix $A(p)$ is incorrect. This equation should read as:

$$\left[\begin{array}{c|c} A(p) & B(p) \\ \hline C(p) & D(p) \end{array}\right] = \left[\begin{array}{cccccccc|c} -a_1(p) & \dots & -a_{n_\mathrm{a}-1}(p) & -a_{n_\mathrm{a}}(p) & b_2(p) & \dots & b_{n_\mathrm{b}-1}(p) & b_{n_\mathrm{b}}(p) & b_1(p) \\ 1 & 0 & \dots & \dots & \dots & \dots & \dots & 0 & 0 \\ \vdots & \ddots & \ddots & \ddots & \ddots & \ddots & \ddots & \vdots & \vdots \\ 0 & \dots & 1 & 0 & 0 & 0 & \dots & 0 & 0 \\ 0 & \dots & 0 & 0 & 0 & 0 & \dots & 0 & 1 \\ 0 & \dots & 0 & 0 & 1 & 0 & \dots & 0 & 0 \\ \vdots & \ddots & \dots & \ddots & \ddots & \ddots & \ddots & \vdots & \vdots \\ 0 & \dots & \dots & \dots & \dots & 0 & 1 & 0 & 0 \\ \hline 1 & 0 & \dots & \dots & \dots & \dots & \dots & 0 & 0 \end{array}\right].$$

B. Ho-Kalman based computation of A

Equation (51a) is incorrect as the used Kronecker product introduces a different structure than $\overleftarrow{\mathcal{R}}_j$, the one block left-shifted version of $\mathcal{R}_j$, would require. Note that $\mathcal{R}_{j-1} = [\ \mathcal{M}_1 \quad \dots \quad \mathcal{M}_{j-1}\ ]$ and introduce the following block-wise Kronecker product

$$(I_{1+n_\psi} \circledcirc \mathcal{R}_{j-1}) = \left[\ I_{1+n_\psi} \otimes \mathcal{M}_1 \quad \dots \quad I_{1+n_\psi} \otimes \mathcal{M}_{j-1}\ \right].$$

Then the correct formulation of (51a-b) reads as

$$\overleftarrow{\mathcal{H}}_{ij} = \mathcal{O}_i[\ A_0 \quad \dots \quad A_{n_\psi}\ ](I_{1+n_\psi} \circledcirc \mathcal{R}_{j-1}), \tag{51a}$$

$$= H_1[\ \hat{A}_0 \quad \dots \quad \hat{A}_{n_\psi}\ ](I_{1+n_\psi} \circledcirc \hat{H}_2), \tag{51b}$$

As a consequence, (53) must be replaced by

$$H_1^\dagger \overleftarrow{\mathcal{H}}_{ij} (I_{1+n_\psi} \circledcirc \hat{H}_2)^\dagger = [\ \hat{A}_0 \quad \dots \quad \hat{A}_{n_\psi}\ ]. \tag{53}$$

References

[1] R. Tóth, H. Abbas, and W. Werner, "On the state-space realization of LPV input-output models: Practical approaches," *in print, IEEE Trans. on Control Systems Technology*, 2011.

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