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ON STATE-SPACE REALIZATION OF BEZOUT FACTORIZATIONS IN SINGULAR SYSTEMS

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Abstract. Based on reduced-order causal observer-based controllers for singular systems, a new state-space realization of Bezout factorization composed of all proper stable transfer functions is established. The resulting parametrization of all causal properly stabilizing controllers is characterized. The relationships among the Bezout factorization in the present paper and the previous results are also discussed, which give explicit formulae of computing one from another.

Keywords. Bezout factorization, controller parametrization, reduced-order controller, singular systems, state-space realization.

AMS (MOS) subject classification: 34A30.

1 Introduction

It is well-known that the Bezout factorization plays an important role in investigating multivariable systems with the stable fractional approach [1]. As the extension of the work for normal systems, some efforts have been made to develop the state-space realizations of Bezout factorizations for singular systems during the past twenty years. Specifically, as a natural extension of the work in [2] for normal systems, a generalized state-space realization of the Bezout factorization for singular systems was presented by [3]. Moreover, the Bezout factorizations related to proportional and derivative (PD) observer-based controllers were also discussed briefly by [3]. A version composed of all proper stable transfer functions was established by [4] based on singular full-state observer-based controllers. On the basis of normal (or causal) full-order dynamical compensators, a proper stable Bezout factorization was obtained by [5]. The severe limitation of the Bezout factorizations given by [3] related to PD observer-based controllers was pointed out by [6], and the improved results were developed. A general Bezout factorization was proposed by [7] related to an arbitrary properly stabilizing controller, and the detailed results were also derived on bridging the Bezout factorization approaches previously available in the literatures, e.g. see [3, 4, 5] etc.