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CONTROLLABILITY OF INTERVAL SYSTEMS AND DESCRIPTOR INTERVAL SYSTEMS [1]

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Abstract. In this paper, a necessary and sufficient condition for an interval matrix to have full column rank has been established. Necessary and sufficient conditions for a descriptor interval system to be regular or *C*-controllable and sufficient condition for a descriptor interval system to be *I*-controllable are given by estimating the rank of some special interval matrices. Numerical examples show the results are more effective than some existing results [2, 5].

Keywords. Descriptor interval systems, Regularity, Interval systems, Controllability, Interval matrices.

AMS (MOS) subject classification:93A30.

1 Introduction

Due to various types of errors, system matrices can not be exactly obtained when a dynamical system is modelled, but the bounds of these parameters can possibly be estimated. In this case,viewing system matrices as interval matrices is a valid method to deal with the uncertainty of the system[1, 3, 4, 6, 10]. When the system is modelled at $\dot{x}(t) = Ax(t) + Bu(t)(A, B$ are in adapted orders), paper [4] gave a necessary and sufficient condition for this system to be stable by using the method of dividing an interval matrix into subinterval matrices; paper [5] gave a necessary and sufficient condition for a system with one input and the system input matrix B is a common matrix (not an interval matrix) to be controllable based on the same method of division of interval matrices. When the issue switches to a descriptor system $E\dot{x}(t) = Ax(t)+Bu(t)$ (system matrices E, A, B, C are in adapted orders), it becomes very involved due to the uncertainty in the system matrix E which may cause the change of the rank of E. Paper [2] established necessary and sufficient conditions for a descriptor interval system with system matrix A being an interval matrix and system matrix E being a common matrix (not an interval matrix) to be regular, and C- R- I- controllable. But the condition guaranteeing the target system is R-controllable in the paper seems not correct.