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# SOME NEW RESULTS ON THE RELIABLE DECOMPOSITION FOR LINEAR PLANTS

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**Abstract.** In this paper, the reliable decomposition problem(RDP) for linear plants is studied based on the reliable stabilization problem(RSP). First, the RSP is discussed and some preliminary results are given. Then we introduce a sufficient condition for a controller being able to be decomposed into two controllers. Furthermore, we present a necessary and sufficient condition for a controller being able to be reliably decomposed into two controllers. Finally some examples are given to illustrate the results.
**Keywords.** Linear plant, reliable control system, reliable stabilization, reliable decomposition.

## 1 Introduction

Reliable decomposition problem(RDP) for linear plants is considered in this paper. RDP is the inverse problem of the reliable stabilization problem(RSP), therefore, it is studied based on the RSP. Reliable stabilization using two controller configuration given in Fig. 1 was discussed in [1-5]. The system $S(P, C_1, C_2)$ given in Fig. 1, where $P$ is the given plant and $C_1$and $C_2$ are two controllers, is a standard unity-feedback system when $C_1$ or $C_2$ fails (*i.e.*, $C_1 = 0$ or $C_2 = 0$). For the system $S(P, C_1, C_2)$, the reliable stabilization problem (RSP) is to find (if it exists) a pair of reliable controllers $(C_1, C_2)$ such that the system $S(P, C_1, C_2)$ is stable when both controllers are acting together and when each controller is acting alone. In this case, the pair $(C_1, C_2)$ is called a reliable controller pair for plant $P$ in the system $S(P, C_1, C_2)$, or we say $(C_1, C_2)$ solves the RSP for short. The RSP was discussed in [1] which showed that every strongly stabilizable plant (*i.e.*, it can be stabilized using a stable controller) can be reliably stabilized. [2] showed that a given plant can be reliably stabilized using two controller configuration as shown in Fig. 1 if and only if the plant is strongly stabilizable in the standard unity-feedback system. In [3], all reliable controller pairs $(C_1, C_2)$ were characterized and a design method to achieve reliable controller pairs