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CONVERGENCE FOR SINGULARLY PERTURBED CONTROL SYSTEMS IN DISTRIBUTIONAL TOPOLOGY

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Abstract. Singularly perturbed control systems have been widely studied during past decades. In this paper, the limiting behavior of the solution of singularly perturbed control systems is discussed in distributional sense when ε tends to zero. Some improved conditions are proposed based on the existing results, under which the solution of linear time invariant (LTI) singularly perturbed systems converges to that of the limiting system in distributional sense.

Keywords. Singularly perturbed system, distributional solution, boundary layer, convergence problem, limiting behavior.

AMS (MOS) subject classification: This is optional. But please supply them whenever possible.

1 Introduction

Singularly perturbed control systems have been widely investigated during the past decades. Most prior work such as that of Kokotovic[1], Khalil[2], Naidu[3], Gajic'[6], Du[5], Glizer[7] and the reference therein focused on the problem of analyzing and constructing ε-free controllers for singularly perturbed systems.

In practice, many applications require a more comprehensive analysis in the boundary layer of singularly perturbed systems, in which the solutions are permitted to be distributions[9,16]. In such cases, the convergence problem, i.e., when ε tends to zero, the problem to judge whether the solution of singularly perturbed systems converge to that of its limiting systems is of much interests. It is well-known that the models of limiting systems have the form of singular system, and there exist impulsive terms in their solution in the distributional sense[14]. The singular systems have been investigated