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# Distributed consensus of large-scale multi-agent systems via linear-transformation-based partial stability approach<sup>☆</sup>

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## Abstract

This paper investigates the consensus problem of large-scale multi-agent systems (MASs) with a directed communication topology, especially for the MAS whose topology contains little strongly connected components. A sufficient and necessary consensus criterion is proposed through the combination of two methods. Firstly, a communication searching algorithm is utilized to make sure that each agent obtains the local topology information of strongly connected component where it is located. Secondly, a state-linear-transformation decomposes the consensus problem into a group of stability problems based on the strongly connected components. The corresponding consensus criterion reduces the computational complexity. Moreover, according to the consensus criterion, a distributed design procedure of gain matrices is proposed based on the homotopy method.

*Keywords:* consensus, multi-agent systems, state-linear-transformation, partial stability

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