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OUTPUT-FEEDBACK CONSENSUS CONTROL OF LINEAR MULTI-AGENT SYSTEMS: A FIXED TOPOLOGY

Xu Wang[1], Long Cheng[1], Zhi-Qiang Cao*, Chao Zhou
Min Tan and Zeng-Guang Hou

Key Laboratory of Complex Systems and Intelligence Science
Institute of Automation
Chinese Academy of Sciences
Beijing 100190, P. R. China
{ xu.wang; long.cheng; chao.zhou; min.tan; zengguang.hou }@ia.ac.cn
*Corresponding author: zhiqiang.cao@ia.ac.cn

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Abstract. *The consensus problem of linear multi-agent systems is addressed in this paper, and a consensus protocol based on the output information of neighbor agents is proposed. The sufficient conditions on the system consensus with a fixed topology are then given. Moveover, the consensus of the linear multi-agent systems with measurement noise is analyzed. The satisfactory performance of the proposed protocol is testified by simulation.*

Keywords: Linear multi-agent systems, Output-feedback, Consensus, Measurement noise

1. **Introduction.** Nowadays, the multi-agent based methods have been widely applied to many fields, such as facility location problem [1, 2], sensor fusion [3], self adaption and learning [4, 5, 6], etc.

As one critical issue of multi-agent systems, the consensus control has become a hotspot [7]. Based on local information, the consensus control enables all agents to reach an agreement on certain quantities of interest, and many scientific and engineering problems can be solved in this theoretical framework, such as flocking [8], vehicle formation control [9], etc. A lot of consensus protocols have been proposed in the literatures. In [10], the consensus algorithm based on the "nearest neighbor rule" is first proposed and rigorously analyzed by non-negative matrix and algebraic graph. The average consensus protocol is presented under the balanced directed graph topology, and the communication delays are also considered [11]. In [12], a necessary and sufficient topology condition on the consensus is derived for networks of single-integrator agents. Extensions to the double-integrator agents have been done in [13].

L. Moreau has studied the consensus problem of a group of coupled discrete-time nonlinear systems under the convexity assumption [14]. Counterpart of the continuous-time case has been taken into account [15]. M. Cao et al. give the asynchronous consensus protocol [16] and the consensus problem with noised communication is analyzed [17]. The cases that the communication is noisy with randomly varying topologies and packet loss are considered in [18, 19], respectively.

It is noted that most papers on the consensus problem focus on the agent with single-integrator or double-integrator dynamics. The consensus control of networks of agents with the general linear dynamics is more attractive in both the theory and the practice.

[1]X. Wang and L. Cheng make equal contributions to this work and share the first authorship.