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Nonlinear consensus protocol modified from doubly stochastic quadratic operators in networks of dynamic agents (Article) [\(Open Access\)](#)

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Abstract

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This article explores nonlinear convergence to limit the effects of the consensus problem that usually occurs in multi-agent systems. Most of the existing research essentially considers the outline of linear protocols, using complex mathematical equations in various orders. In this work, however, we designed and developed an alternative nonlinear protocol based on simple and effective mathematical approaches. The designed protocol in this sense was modified from the Doubly Stochastic Quadratic Operators (DSQO) and was aimed at resolving consensus problems. Therefore, we called it Modified Doubly Stochastic Quadratic Operators (MDSQO). The protocol was derived in the context of coordinated systems to overcome the consensus issue related to multi-agent systems. In the process, we proved that by using the proposed nonlinear protocol, the consensus could be reached via a common agreement among the agents (average consensus) in a fast and easy fashion without losing any initial status. Moreover, the investigated nonlinear protocol of MDSQO realized the reaching consensus always as well as DSQO in some cases, which could not reach consensus. Finally, simulation results were given to prove the validity of the theoretical analysis. © 2019 by the authors.

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Nonlinear protocol

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