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Reconfigurable Consensus Achievement of Multi Agent Systems Subject to Actuator Faults in a Leaderless Architecture

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Abstract : In this paper, reconfigurable consensus achievement of a team of agents with marginally stable linear dynamics and single input channel has been considered. The control algorithm is based on a first order linear protocol. After occurrence of a LOE fault in one of the actuators, using the imperfect information of the effectiveness of the actuators from fault detection and identification module, the control gain is redesigned in a way to still reach consensus. The idea is based on the modeling of change in effectiveness as change of Laplacian matrix. Then as special cases of this class of systems, a team of single integrators as well as double integrators are considered and their behavior subject to a LOE fault is considered. The well-known relative measurements consensus protocol is applied to a leaderless team of single integrator as well as double integrator systems, and Gersgorin disk theorem is employed to determine whether fault occurrence has an effect on system stability and team consensus achievement or not. The analyses show that loss of effectiveness fault in actuator(s) of integrator systems affects neither system stability nor consensus achievement.

Keywords : multi-agent system, actuator fault, stability analysis, consensus achievement
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