Stochastic bounded consensus tracking of second-order multi-agent systems with measurement noises based on sampled-data with general sampling delay.


Summary: This paper investigates the stochastic bounded consensus tracking problems of second-order multi-agent systems, where the control input of an agent can only use the information measured at the sampling instants from its neighbors or the virtual leader with a time-varying reference state, the measurements are corrupted by random noises and the signal sampling process induces the general sampling delay. First, the stochastic bounded consensus tracking protocol based on sampled-data with the general sampling delay is presented by using the delay decomposition technique. Second, the augmented matrix method, the probability limit theory and some other techniques are employed to derive necessary and sufficient conditions guaranteeing the mean square bounded consensus tracking. The theoretical results show that the convergence of the proposed protocol simultaneously depends on the constant feedback gains, the network topology, the sampled period and the sampling delay, and that the static consensus tracking error depends on not only the above-mentioned factors, but also the noise intensity and the upper bound of the velocity and the acceleration of the virtual leader. The obtained results cover no sampling delay and the small sampling delay as two special cases. Simulations are provided to demonstrate the effectiveness of the theoretical results.

Keywords: second-order multi-agent systems; stochastic bounded consensus tracking; measurement noises; sampled-data systems; general sampling delay
doi:10.1080/00207721.2013.792973