Event-Triggered Fixed-time Adaptive Fuzzy Control for State-constrained Stochastic Nonlinear Systems Without Feasibility Conditions

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Abstract

The problem of event-triggered fixed-time control for state-constrained stochastic nonlinear systems is discussed in this article. Different from the Barrier Lyapunov Function (BLF)-based and Integral BLF-based schemes which rely on feasibility conditions (FCs), by introducing nonlinear state-dependent functions , the asymmetric time-varying state constraints are handled without FCs .Combining with the fixed-time stable theory and dynamic surface control technique with fixed-time filter, the fixed-time stability in probability of the closed-loop system is ensured and the problems of “explosion of complexity” and “singularity” are overcome. Furthermore, the novel fixed-time error compensation signals are designed to compensate filtering errors, and event-triggered control technique is used to save network resources. Simulations also illustrate the effectiveness of the proposed method.

Full Text

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Figures

Figure 1

Tracking curve under the time-varying constraint.

Figure 2

please see the manuscript file for the full caption

Figure 3

please see the manuscript file for the full caption

Figure 4

please see the manuscript file for the full caption

Figure 5

Control signal.

Figure 6

Time intervals of triggering events.

Figure 7

Tracking curve under the time-varying constraint.

Figure 8

please see the manuscript file for the full caption

Figure 9

please see the manuscript file for the full caption

Figure 10

please see the manuscript file for the full caption

Figure 11

Control signal.

Figure 12

Time intervals of triggering events.