Approximate Optimal Control for Nonlinear Systems with Periodic Event-Triggered Mechanism

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Abstract: This article investigates the approximate optimal control problem for nonlinear affine systems under the periodic event triggered control (PETC) strategy. In terms of optimal control, a theoretical comparison of continuous control, traditional event-based control (ETC), and PETC from the perspective of stability convergence, concluding that PETC does not significantly affect the convergence rate than ETC. It is the first time to present PETC for optimal control target of nonlinear systems. A critic network is introduced to approximate the optimal value function based on the idea of reinforcement learning (RL). It is proven that the discrete updating time series from PETC can also be utilized to determine the updating time of the learning network. In this way, the gradient-based weight estimation for continuous systems is developed in discrete form. Then, the uniformly ultimately bounded (UUB) condition of controlled systems is analyzed to ensure the stability of the designed method. Finally, two illustrative examples are given to show the effectiveness of the method.

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