

## **Adaptive Optimal Controller for Uncertain Inverted Pendulum System: A Dynamic Programming Approach for Continuous Time System**

**Authors :** Dao Phuong Nam, Tran Van Tuyen, Do Trong Tan, Bui Minh Dinh, Nguyen Van Huong

**Abstract :** In this paper, we investigate the adaptive optimal control law for continuous-time systems with input disturbances and unknown parameters. This paper extends previous works to obtain the robust control law of uncertain systems. Through theoretical analysis, an adaptive dynamic programming (ADP) based optimal control is proposed to stabilize the closed-loop system and ensure the convergence properties of proposed iterative algorithm. Moreover, the global asymptotic stability (GAS) for closed system is also analyzed. The theoretical analysis for continuous-time systems and simulation results demonstrate the performance of the proposed algorithm for an inverted pendulum system.

**Keywords :** approximate/adaptive dynamic programming, ADP, adaptive optimal control law, input state stability, ISS, inverted pendulum

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