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Discounted-cost Linear Quadratic Regulation of Switched Linear Systems

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Research Article

Keywords: Switched linear systems, Linear quadratic regulator, Discountedcost, Switching signal, Riccati equation

Posted Date: February 22nd, 2021

DOI: https://doi.org/10.21203/rs.3.rs-174205/v1

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Abstract

In this paper, we will investigate the design of discounted-cost linear quadratic regulator for switched linear systems. The distinguishing feature of the proposed method is that the designed discounted-cost linear quadratic regulator will achieve not only the desired optimization index, but also the exponentially convergent of the state trajectory of the closed-loop switched linear systems. First, we adopt the embedding transformation to transform the studied problem into a quadratic-programming problem. Then, the bang-bang-type solution of the embedded optimal control problem on a finite time horizon is the optimal solution to the original problems. The bang-bang-type solutions of the embedded optimal control problem is to be shown the optimization solution of the studied problem. Then, the computable sufficient conditions on discounted-cost linear quadratic regulator are proposed for finite-time and infinite-time horizon case, respectively. Finally, an example is provided to demonstrate the effectiveness of the proposed method.

Full Text

This preprint is available for download as a PDF.

Figures



Figure 1

State trajectories





Input trajectories



Figure 3

The switching signal $\sigma(t)$



Figure 4

State trajectories



Figure 5

Input trajectories