Fractional Hybrid Optimal Control Problem

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Abstract

Our work aims to provide a comprehensive framework for analyzing and designing control strategies in hybrid systems, including fractional hybrid systems with state jumps. It seeks to demonstrate how these systems can effectively model processes that integrate continuous and discrete dynamics, especially in applications requiring high-level integration between physical effects and control decisions. By utilizing advanced control techniques such as Pontryagin's Maximum Principle and numerical methods like event-driven simulations and gradient-based optimizations, the article aims to enhance performance and stability in hybrid systems. This study contributes to understanding how hybrid systems can be applied in complex fields that demand precise and adaptable control strategies, ensuring seamless integration of diverse dynamics.

Keywords: Hybrid systems, fractional hybrid systems, state jumps, Pontryagin's Maximum Principle, gradient-based optimization, stability.

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