

عنوان مقاله:

Optimal Impedance Voltage-Controller for Electrically Driven Robots

محل انتشار:

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نویسندگان:

Mohsen Jalaeian-F - *Department of Electrical and Robotic Engineering, Shahrood University of Technology, Shahrood, Iran*

Mohammad Mehdi Fateh - *Department of Electrical and Robotic Engineering, Shahrood University of Technology, Iran*

Morteza Rahimiyan - *Department of Electrical Engineering, Shahrood University of Technology, Shahrood, Iran*

خلاصه مقاله:

This paper presents a novel optimal impedance voltage-controller for Electrically Driven Lower Limb Rehabilitation Robots (EDLR). To overcome the dynamical complexities, and handle the uncertainties, the proposed method employs an expected forward model of the actuator. The difference between this model's output and the actual output represents the existing value of lamped uncertainty. A voltage-controller is designed based on this uncertainty estimator, which compensate for the uncertainties. Parameters of the controller have been optimized using genetic algorithms. Key contributions of this paper are I) estimation of the uncertainty by the expected model's output, II) overcoming the changes in motor parameters, III) introducing a class of closed-loop system termed as "Repeatable", and IV) designing an optimal impedance voltage-controller that is non-sensitive to the parameter variations. Significant merits of the approach are swift calculations, efficiency, robustness, and guaranteed stability. Furthermore, the simplicity of design, ease of implementation and model-free independent joint structure of the approach are noticeable. The method is compared with an adaptive robust sub-controller and a Taylor-series-based adaptive robust controller, through simulations in passive range of motion and active assistive rehabilitation exercises. The results show the superiority of the proposed method in tracking performance and the time of calculations.

کلمات کلیدی:

Electrically Driven Robots (EDR), Voltage-based control, rehabilitation robots, impedance control, Model-Free Tracking Control

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