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Model-Based Iterative Learning Control for the Trajectory Tracking of Disturbed Robot Manipulators

Chems Eddine Boudjedir [1*], Djamel Boukhetala [1] and Mohamed Bouri [2]

[1] *Laboratory of Process Control (LCP), Ecole Nationale Polytechnique (ENP), 10 Rue des Freres OUDEK, El-Harrach 16200, Algiers, Algeria.*
[2] *Labs of Biorobotics (BIOROB) and Translational Neural Engineering (TNE), Ecole Polytechnique Federale de Lausanne (EPFL), Station 9, Lausanne CH-1015, Switzerland.*

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Abstract: This paper proposes a model-based iterative learning control (ILC) for the trajectory tracking problem of robot manipulators performing repetitive tasks and subjected to external disturbances. The proposed scheme consists of a model-based controller to compensate as much as possible the coupled robot dynamics, a PD-type ILC to improve the tracking performances through the repetitive trajectory as well as a robust term to reject the effects of the disturbances. The convergence analysis is driven using Lyapunov theory. It is shown that the tracking error converges to zero when the iteration number increases to infinity. Simulations are performed on the parallel Delta robot to demonstrate the feasibility of the proposed approach and to highlight its tracking performances. A comparative study between the proposed ILC, the conventional PID controller, and the traditional PD plus PD-type ILC is conducted to point out the effectiveness of the model-based ILC.

Keywords: *iterative learning control; model-based control; Lyapunov theory; delta robot.*

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* Corresponding author: mailto:chemseddine.boudjedir@g.enp.edu.dz