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High-order $\mathcal{D}^{\alpha}$-type iterative learning control for fractional-order nonlinear time-delay systems. (English) Zbl 1263.93099

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Summary: This paper presents a high-order $\mathcal{D}^{\alpha}$-type Iterative Learning Control (ILC) scheme for a class of fractional-order nonlinear time-delay systems. First, a discrete system for $\mathcal{D}^{\alpha}$-type ILC is established by analyzing the control and learning processes, and the ILC design problem is then converted to a stabilization problem for this discrete system. Next, by introducing a suitable norm and using a generalized Gronwall-Bellman Lemma, a sufficient condition for the robust convergence with respect to the bounded external disturbance of the control input and the tracking errors is obtained. Finally, the validity of the method is verified by a numerical example.

MSC:

93C15 Control/observation systems governed by ordinary differential equations

68T05 Learning and adaptive systems in artificial intelligence

34A08 Fractional ordinary differential equations

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Keywords:

fractional-order; nonlinear time-delay system; iterative learning control; generalized Gronwall-Bellman lemma

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