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**An improvement on the transient response of tracking for the sampled-data system based on an improved PD-type iterative learning control.** (English) Zbl 1293.93709

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Summary: An improvement on the transient response of tracking for the sampled-data system based on an improved proportional difference (PD)-type Iterative Learning Control (ILC) is proposed in this paper. The developed analog ILC method and the high-gain property tracker design methodology are first combined to significantly reduce learning epochs and overcome the initial condition shift problem and discontinuous reference input in the traditional ILC. Besides, the proposed ILC improves the transient response and decreases the rate of weighting matrices $Q$ to $R$ under the traditional linear quadratic tracker design. First, the off-line observer/Kalman filter identification (OKID) is used to determine the appropriate (low-) order system parameters and state estimator for the physical system with unknown system equation, so that the model-based PD-type ILC can be implemented for practical applications. Then, to improve the transient response and decrease the control effort, the (PD-type) ILC algorithm is combined with the high-gain property linear quadratic tracker (LQT) design to construct the high performance tracker for the model-based sampled-data systems. Furthermore, the discrete-time version high performance tracker design for the unknown stochastic sampled-data system via the iterative learning control method is proposed in this paper based on the Euler method and the digital redesign approach. Finally, some examples are given for illustrating the effectiveness of the proposed method.

**MSC:**

93E10 Estimation and detection in stochastic control theory
93E11 Filtering in stochastic control theory
68T05 Learning and adaptive systems in artificial intelligence



**Keywords:**

sampled-data system; PD-type iterative learning control (ILC); off-line observer/Kalman filter identification; state estimator; linear quadratic tracker (LQT); discrete-time version high performance tracker design

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paper as accurately as possible without claiming the completeness or perfect precision of the matching.