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A novel control strategy for balancing traffic flow in urban traffic network based on iterative learning control

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Abstract

Realistic modeling traffic flow dynamics in urban traffic network remains a big challenge at present due to the complex nonlinear characteristics of traffic flow. In this paper, a novel and model-free iterative learning control (ILC) strategy for balancing traffic flow in urban traffic network is proposed. To tackle the randomly varying trial lengths in the iteration domain of traffic system, an iterative-average operator is introduced in the proposed ILC law for tracking tasks with non-uniform trial lengths, which thus mitigates the requirement on classic ILC that all trial lengths must be identical. The learning convergence condition of the ILC strategy in iteration-average and expectation is derived through rigorous analysis. The performance and the effectiveness of the ILC strategy are analyzed by simulations on a test road network. The results show that the proposed ILC strategy can homogeneously balance the accumulation in the network and improve the network mobility.

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