An analytical model for controlling disruptions on a metro line

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Abstract

A control framework is developed that regulates a Metro-type rail line in the presence of disruptions while taking into account the tradeoff between user and operator (energy consumption) costs. Unlike approaches based solely on computational intensive optimization models, the proposed methodology is based on three eminently solvable analytical models. These formulations sequentially apply train holding and speed control strategies with the objective of reducing social cost. In the initial phase immediately following a disruption, one of the holding models determines the magnitude of the holds to be imposed on each train on the line. Once the trains are moving again and the recovery period begins, the other holding model and the speed control model take over, defining respectively the train holdings at each of the stations and the train speeds between them. Simulation results demonstrate that the framework's performance is similar to that of an optimization model applying overall control to the entire system. The methodology can also be used to reveal the effects of different relevant parameters on the control decisions to be taken.

Palabras clave

Palabras clave de autor: Disruptions; Speed control; Train holding; Real-time control; Transit operations

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