Transportation Research Record 2143 (2010), 67-76

Reliability improvement in short headway transit services - schedule- and headway-based holding strategies

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Improving service reliability is becoming a key focus for most public transport operators. One common operational strategy is holding. Holding vehicles can improve reliability, resulting in shorter travel times and less crowding. In this paper both schedule-based and headway-based holding strategies in short headway services are analyzed. Despite significant attention to holding in the current literature, some important aspects were not previously researched. The main new variables are maximum holding time, reliability buffer time, and, in the case of schedule-based holding, percentile value used to design the schedule. A real line in the Hague (Tram Line 9), Netherlands, and hypothetical lines are analyzed with various levels of running time variability. Headway-based and schedule-based holding have the largest effect if deviations are high. When schedule-based holding is applied with a maximum of 60-s holding time, the optimal value of the percentile value becomes about 65% for all lines analyzed. When no maximum holding time is applied, schedule-based holding is more effective; there is no difference when the maximum holding time is set to 60 s. This research also shows the effect of holding on crowding: an average level of irregularity of 20% could decrease to 15%, enabling either smaller capacity slack or less crowding.

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