Operational Effects of Variations in Service Level Criteria for the Dial-a-Ride Problem

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A dial-a-ride system is an application of demand-dependent, collective people transportation. Users formulate trip requests, combined with service level requirements [3, 5]. The provider strives for efficient routing schedules which respect these requirements, in addition to vehicle capacity, flow conservation, pairing and precedence constraints. This balancing between human perspectives and costs is particularly required when organizing quality-oriented transportation for users with special needs, such as elderly and disabled [1]. The problem may be approached dynamically, including new requests, cancelations or traffic circumstances in non-executed paths.

This study quantifies the operational effects of variations in two common service level criteria, being the maximum deviation from the user’s preference time and the detour allowed during a trip. A deterministic annealing technique is applied, both on an artificial heterogeneous data set [4], containing 24,400 requests for 473 Flemish providers, and on benchmark data from literature [2, 6]. The magnitude and the pattern of the effect is analyzed, distinguishing between different characteristics of providers and requests. Operational costs are found to decrease if service level criteria are loosened, as more possibilities for request combinations can be exploited. Inter alia, increasing relative advantages are observed for larger providers and during off-peak hours.

References


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