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# The on-demand bus routing problem: the importance of bus stop assignment

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## Abstract

Even though public bus transport is still largely bound to fixed routes and fixed timetables, technology would allow for a large-scale shift to on-demand public transport in the near future. In such an on-demand system, buses would drive along routes completely determined by the demand of passengers. To support the routing of on-demand buses we define a new optimization problem: the on-demand bus routing problem (ODBRP), which combines the dial-a-ride problem (DARP) with bus stop selection, introduced in the school bus routing problem. Given a set of requests for transportation, indicating a passenger's departure and arrival location, as well as his/her preferred arrival time, the aim of the problem is to (1) assign each passenger to a departure and arrival bus stop within walking distance, and (2) develop a set of bus routes, picking up passengers at their departure stop and delivering them to their arrival stop before their preferred arrival time. The first decision is called bus stop assignment. The goal is to group customers so that the bus can avoid extra stops and detours. This way there is more flexibility for the routing and the efficiency of the system increases. In this talk, we present the ODBRP and we investigate the positive impact of bus stop assignment on the solution quality, using a straightforward heuristic. Further, we determine the parameters (number of requests, fleet size, number of stations, etc.) most influencing this impact.

**Keywords:** Public transport, Metaheuristics, Vehicle routing

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