An LNS-based heuristic for optimizing on-demand transportation services in a hybrid mobility system

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Mobility-as-a-Service (MaaS) transforms mobility systems into more flexible and efficient ones by integrating different transportation modes. In this research, the focus lies on the integration of timetabled public transport (PT), dial-a-ride (DAR) services, and walking, allowing passengers to travel by a combination of these three modes. From the perspective of the provider, the exploitation of such a hybrid mobility system leads, among others, to challenging routing and scheduling problems on the operational level. The ultimate aim is to generate efficient real-time solutions in response to all user requests by optimally combining and aligning the available transport modes with each other, while minimizing the operational costs and the total trip times of the users.

Therefore, in this talk, an optimization problem is introduced which involves decisions on the combination of modes for each request and the routing and scheduling of the DAR vehicles. The focus lies specifically on a network in which users commute between a rural and an urban area. A heuristic algorithm based on Large Neighborhood Search (LNS) is proposed. To incorporate the trade-off between the operational costs and service level, a tailored scheduling sub-procedure is presented which minimizes the sum of the users' trip durations for a given route. Lastly, a sensitivity analysis is carried out on small-scale artificial instances gaining more insight into the problem-specific parameters.