Locating Bike-Sharing Station Locations in Hybrid Mobility Systems

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Bike-sharing systems (BSS) have gained significant popularity in recent years due to their potential contribution to sustainable urban development. They have become the most widespread implementation of the concept of Mobility-as-a-Service (MaaS) (Vallez et al. 2021). BSS offer numerous benefits including emission and congestion reduction, improved public health, and enhanced traffic systems. Furthermore, bike-sharing can also be a good first- or last-mile solution and enhance user's connection with public transport (PT) allowing the creation of hybrid mobility systems. These are systems where users travel through multimodal-trips (Zhang and Zhang 2018 ; Caggiani et al. 2020). Despite the growing interest in hybrid systems, the current literature lacks a methodology to optimize the integration of BSS and PT. One of the most crucial factors for the successful implementation of these systems is the strategic placement and capacity of the bike-sharing stations in relation to the PT-network. Poorly located bike-sharing stations compromise the success of the overall system. Therefore, in this research, we design a BSS given a PT-network, in order to fully optimize the benefits of their integration. In this talk, we will present an optimization model (MILP) designed to determine the optimal location of bike-sharing stations, taking into account an existing fixed PT-network. This model combines strategic decisions (i.e. location and capacity of bike-sharing stations) with operational considerations (i.e. relocation of the bikes). The approach considers an area divided into multiple zones, and demand (i.e. number of requested trips) between these zones. The aim is to design a bike-sharing network that complements the existing public transport system, maximizing the demand coverage. The goal is to fulfill as many requested trips as possible through bike-sharing, PT or a combination of both modes, considering a specified budget.