

iv2plus INFONET

I2V, 4th Call (2010)

BBSS

Balancing Bike-Sharing Systems

It is a major challenge for the operation of bike-sharing systems (BSS) to always provide availability of both bicycles and spaces for incoming bicycles. The project Balancing Bike-Sharing Systems (BBSS) aims at optimizing the necessary redistribution process of bicycles through the use of statistical models for demand estimation and novel optimization algorithms for achieving efficient and sustainable logistics.

In the project Balancing Bike-sharing system (BBSS) automatic methods for redistribution logistics in bike-sharing systems (BSS) are developed and evaluated for the first time. The goal is to facilitate efficient and sustainable logistics (cf. specific program objective 2.5). Not only shall single redistribution trips be made more efficient but under consideration of complex system dynamics, intelligent planning shall reduce the total number of necessary trips. Thus, the total number of trips and (un-)loading events, which have a negative impact on the overall traffic flow, can be reduced. This leads to a more efficient and eco-friendly logistics process emitting less CO₂.

The biggest challenge for BSS is to provide availability of both bicycles and spaces for incoming bicycles. Due to hills, the fact that less public transport is available at night, and other reasons, bicycle flows between stations are not balanced: some stations tend to get empty over time, others full. This causes low availability which has a negative impact on customer satisfaction, leads to fewer customers using the system, and is finally weakening ecomobility (walking, cycling and public transport). Successful operation of a BSS therefore requires countermeasures that limit or even completely avoid availability problems in time. At the time of writing the small trucks or cars with trailers that are used for redistribution are assigned routes manually. However, efficient planning is highly complex since demand varies depending on external factors of influence like season, time of day, weather, or traffic. Thus innovative technical solutions with a focus on sustainable logistics are required to efficiently use available staff and vehicles. Therefore novel optimization algorithms based on innovative models for predicting user demands for bikes as well as available spaces are developed. The project consortium has expertise in stochastic modeling, fleet management, transport logistics, and operations research and is therefore capable of conducting innovative research in the young field of redistribution logistics for BSS.

program line

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Project coordination

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