Dissertation title: Intelligent Logistics for bike sharing through "dynamic pricing"

Description of work:

Automatic bicycle rental systems, called "bike-sharing systems," recently established themselves in many cities around the world as an environmentally-friendly, public transport. The latest generation of bike-sharing through the Integration of e-bikes and mobile web technology could become a real alternative to private cars, at least in urban areas.

A big problem with this system, however, is that the periodic relocation of bikes, bike need to be removed from full stations where more arrival are expected, while empty stations need to be filled up again. This causes high costs and CO2 emissions, partly offsetting the positive impacts of the system.

The problem could be solved or reduced by a dynamic pricing system which would take into account such imbalances. At the Automatic Control Laboratory at ETH, an algorithm dealing with the problem has been developed. However, the algorithm has been applied only under the assumption that demand is static, which is not realistic. With the agent-based simulation MATSim, developed at the IVT, one can model the demand for bike sharing based on the attributes of the system. The coupling of these two approaches is, however, on various levels a challenge.

The aim of the work is to simulate bike sharing demand with MATSim and test various pricing systems, including dynamic pricing, trying to find out how the redistribution problem could be solved or at least mitigated.

Candidates should have prior experience in operations research and have substantial programming skills.

Minimum size: 24 credits