

Multi-Agent Transport Simulations and Economic Evaluation

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Summary

Tolls are frequently discussed policies to reduce traffic in cities. However, road pricing measures are seldom implemented due to high investments and unpopularity. Transportation planning tools can support planning authorities by solving those problems if they take into account the following aspects:

- Demographic attributes like income and time constraints
- Time reactions to the policy
- Schedule changes of population's individuals during the whole day

Our approach uses multi-agent simulations to model and simulate full daily plans. Each of our agents has a utility function that appraises the performance of a typical, microscopically simulated day. The sum of all utility changes to a policy change can be interpreted as the change in the system's welfare thus the economic evaluation of a measure straightforward.

The approach is tested with travel behavior of the Zurich metropolitan region in Switzerland. Several tolling schemes are investigated. It is shown that the simulation can be used to model travelers' reactions to time-dependent tolls in a way most existing transportation planning tools are not able to do. It is demonstrated that route adjustment only, as is done in many traditional transport planning packages, results in no economic gains from the tolls. As time-dependent tolls are a much-debated subject in transportation politics, the ability to fully model such tolls and the reactions of travelers may help to find better toll schemes. In a world where individuals have more and more freedom to schedule their daily plans, agent-based simulations offer an intuitive way to research complex topics with lots of interdependencies.