

Collective taxi and car-sharing systems in MATSim

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Overview

- Dissertation/KTI project
- Introducing collective taxi and car-sharing in MATSim

Car-sharing & Collective taxi

Car-sharing (CS) : A program in which participating individuals are allowed to use vehicles from a fleet on an hourly basis

Diffusion: Increasing but still minority

Collective taxi (CT): An intermediate form of public transport, between regular service route and highly and personalized transport services offered by traditional taxis

Diffusion: Limited to special services (disable persons) or particular areas (sparsely populated)

Main idea

„The combined use of car sharing and collective taxi at a large scale might mitigate traffic problems substituting a consistent part of private car use“

Large scale use: motivations

Car sharing:

Some evidences of benefits (reduction of parking needs and car travel, more PT, better land use, compact development, ...) but too small scale

Collective taxi:

Many studies of potential benefits (reduction of car travel) but also too small scale

Mobility/ white project

Mobility: Swiss car-sharing operator, biggest car sharing operator in the world with more than 2.000 cars and 80.000 customers in Switzerland. Expanding in neighborhood countries (Austria, Italy, Germany), planning to sell the technology worldwide.

white project: Swiss association aiming to introduce a new collective taxi system. Objective for 2016: 1600 taxi in the metropolitan area of Zurich. Use of advanced low emissions vehicles.

KTI project

KTI: Design and evaluation of potential for a large scale system integrating CT and CS in the Zurich agglomeration

MATSim for KTI

- Forecast the demand for CS and CT
- Evaluate the social cost of a scenario
- Evaluate the effect of different policies

KTI for MATSim

- Three years full financing for two Ph.D. students
- Students Important step to a fully agent-based representation of the simulated world
- Opportunity to become a standard for car-sharing (Mobility international)

Questions

Is the large scale use of car-sharing and collective taxi

Feasible?

- Technical
- Management

Desirable?

- Social costs

Realistic?

- Modal shift

Introducing FTS in MATSim

Issues:

- Define operator agents
- Enhance vehicles representation
- New mode choice
- New utility function
- Changes in the simulation?
- ...

General Framework for Supply Side Agents

Supply Agent



Services

- Type
- Attributes
- Price

Location choice methodology

- Facility location problem

Objective function

- Number of customers
- Turnaround
- Market share

Knowledge

- Customers
- Competitors
- Legislation

Modeling Collective Taxi

- Number of ranks and their distribution and size
- Fleet composition
- Pricing scheme

Modeling Car-Sharing

- Number of stations and their distribution and size
- Fleet composition
- Pricing scheme
- Management of imbalances (cars taken from one station and left in another one).

New Mode Choice

- Replanning
- Monetary costs
- Subtour / Stage level
- Parking

Social Costs

Evaluation of social costs:

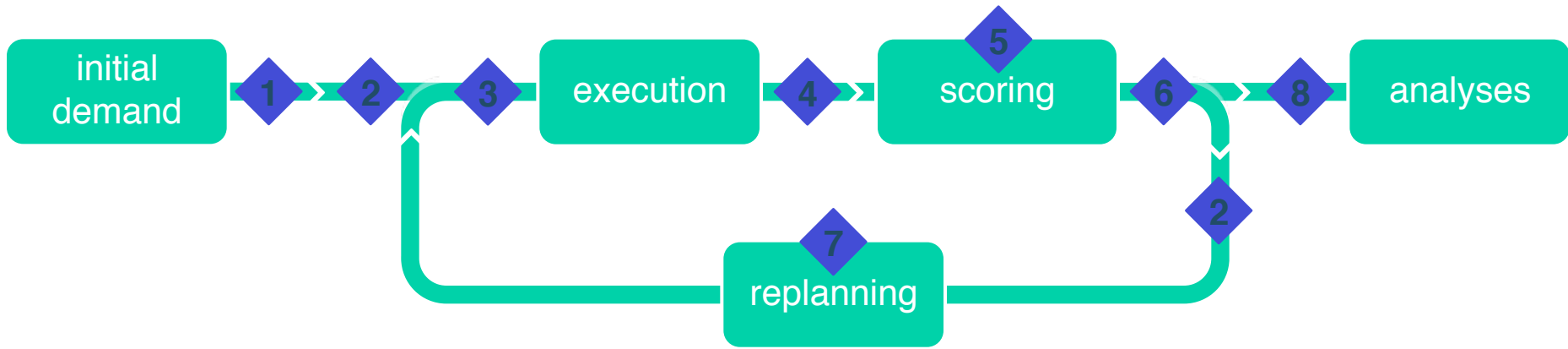
Internal costs:

- Costs for users
- Costs for operators

External costs:

- Noise
- Air pollution
- Accidents
- Climate change

MATSim Framework



- Scoring procedure
- Replanning
- Analyses

Simulation experiments

Issues:

Stability of the simulation

Criteria for the joint optimization (response surface?)

Policy responsiveness of the model

Policy examples:

Road pricing, new parking price policy, subsidy levels for the new systems, ...

Multi-Day replanning?

Diffusion of the system

- Learning process
- Communication among users
- Visibility of an innovation
- Advertising
- Modification of car ownership rate
- ...



Financial Scheme

Summary

Practical feasibility of the CT/CS

Dimension it might/should reach in order to maximize benefits

Social costs evaluation

Effect of different policy measures on the results



Support the design of an implementable system

Challenges:

- Introduce a fully agent-based representation of the simulated world
- Get reasonable results from a multi-type agent simulation

Velolib

Bike Sharing system in Paris

Some figures after 1 year activity:

- 1'500 stations
- 20'000 bikes
- 200'000 regular users
- 26'000'000 trips



Lesson: When a large system is introduced effects may be also large

Masdar 2011



Firenze 2008



Suggestions?

Remarks?

Questions?