Bevorzugter Zitierstil

Axhausen, K.W. (2011) Leveraging GIS-data: The case of transport modeling, 12th GITEX conference, Singapore, May 2011.

Leveraging GIS-data: The case of transport modeling

KW Axhausen

IVT
ETH
Zürich

May 2011

FUTURE CITIES LABORATORY

Institut für Verkehrsplanung und Transportsysteme
Institute for Transport Planning and Systems

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

What is the question for transport plannning ?

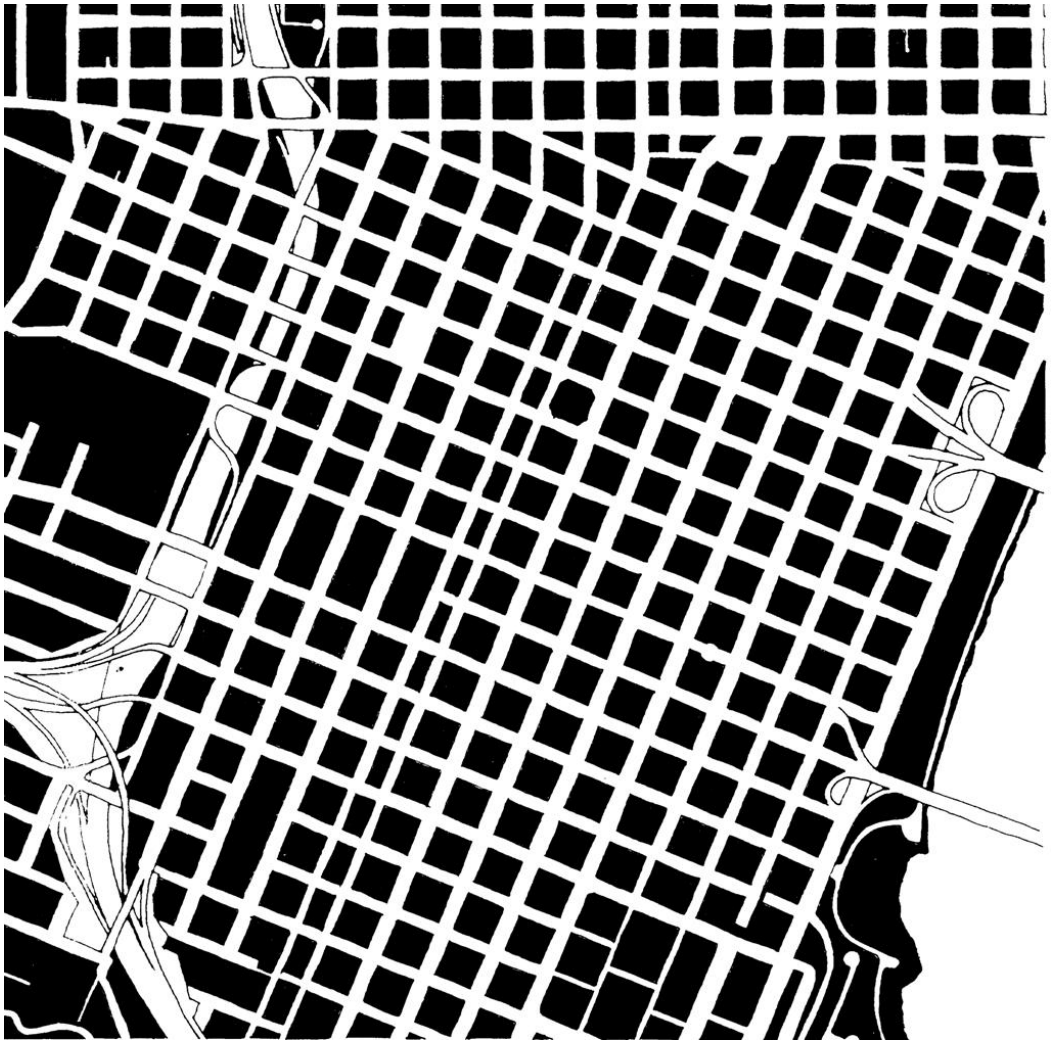
Which network ? What grammars ?

Ahmedabad

Source: Jacobs, 1993

Which network ? What grammars ?

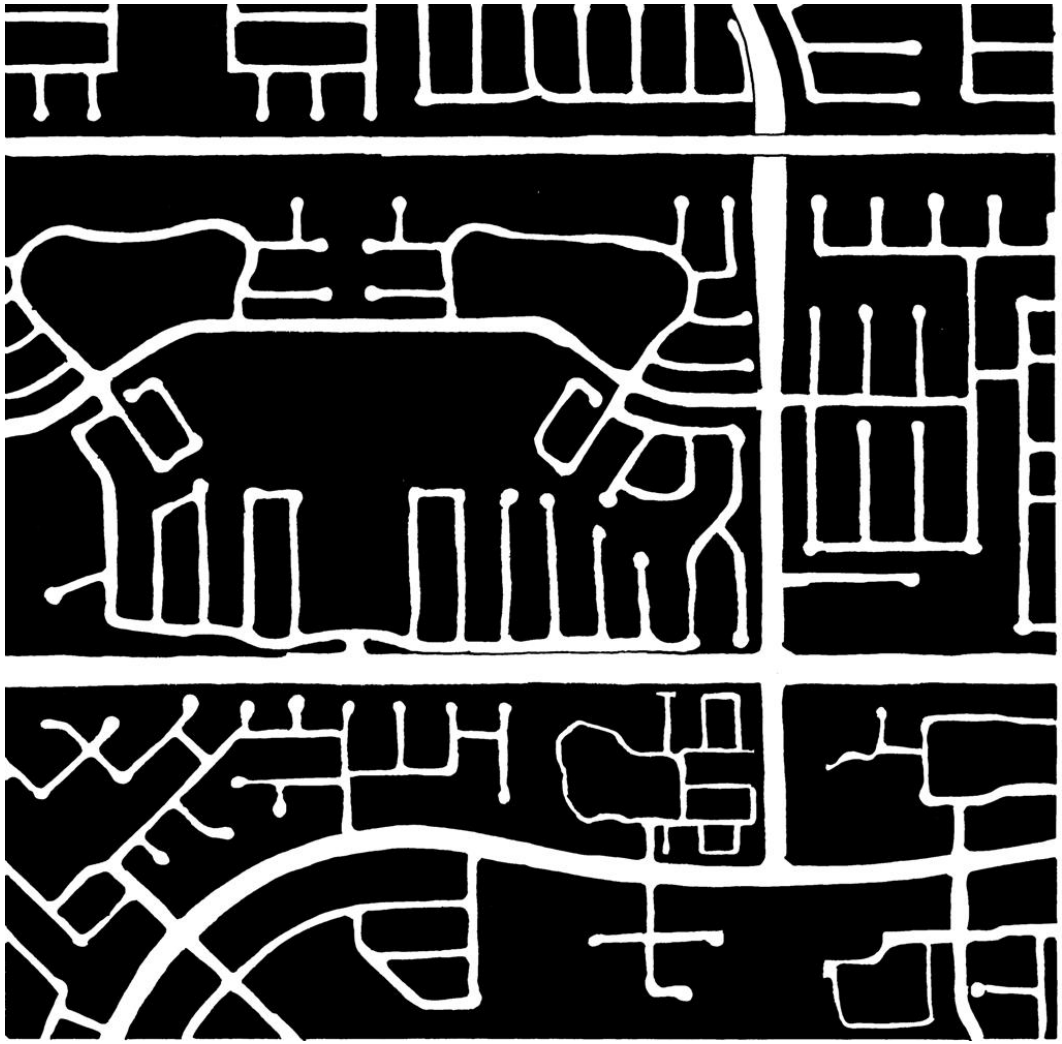
Portland, OR



Source: Jacobs, 1993

Which network ? What grammars ?

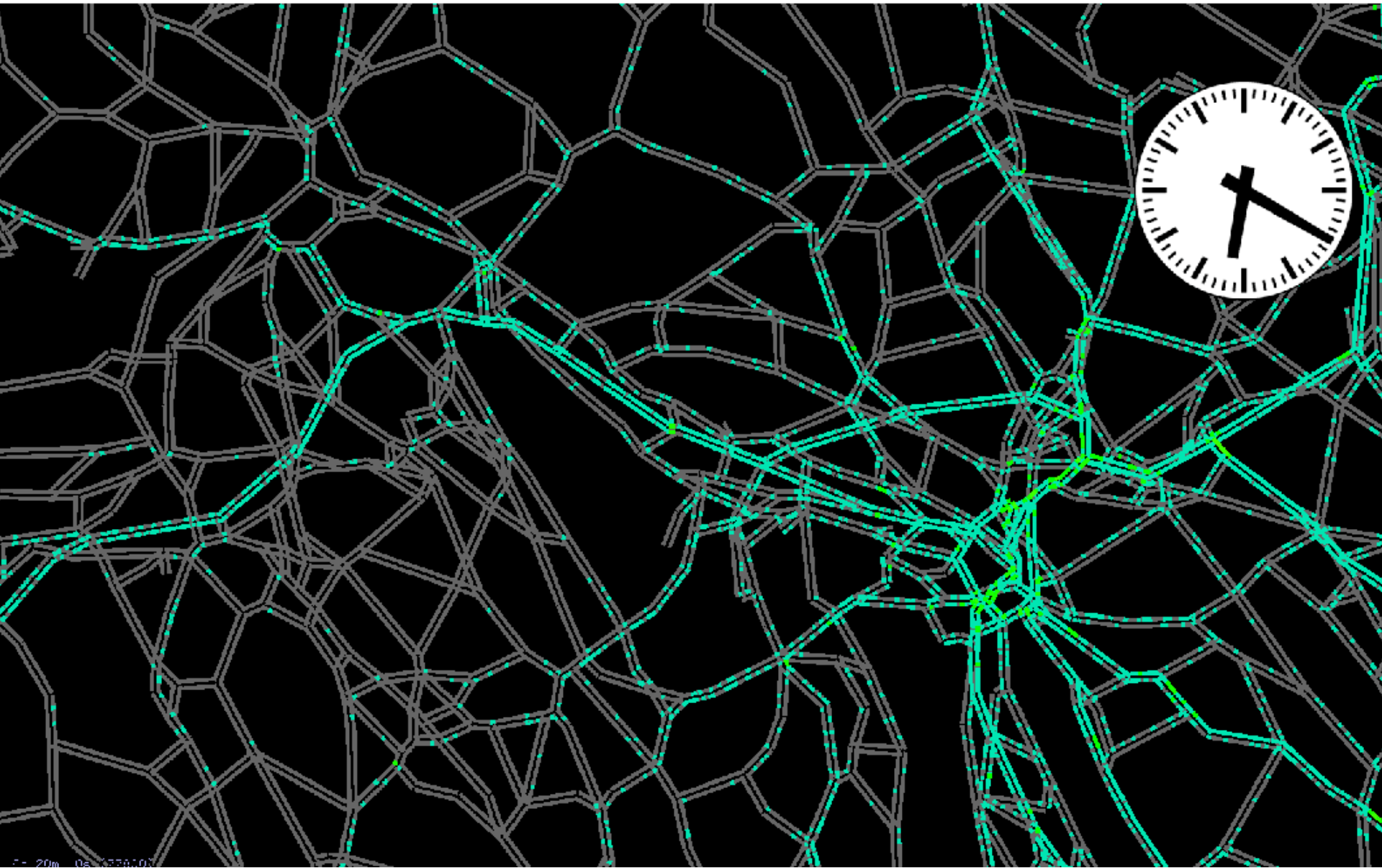
Irvine



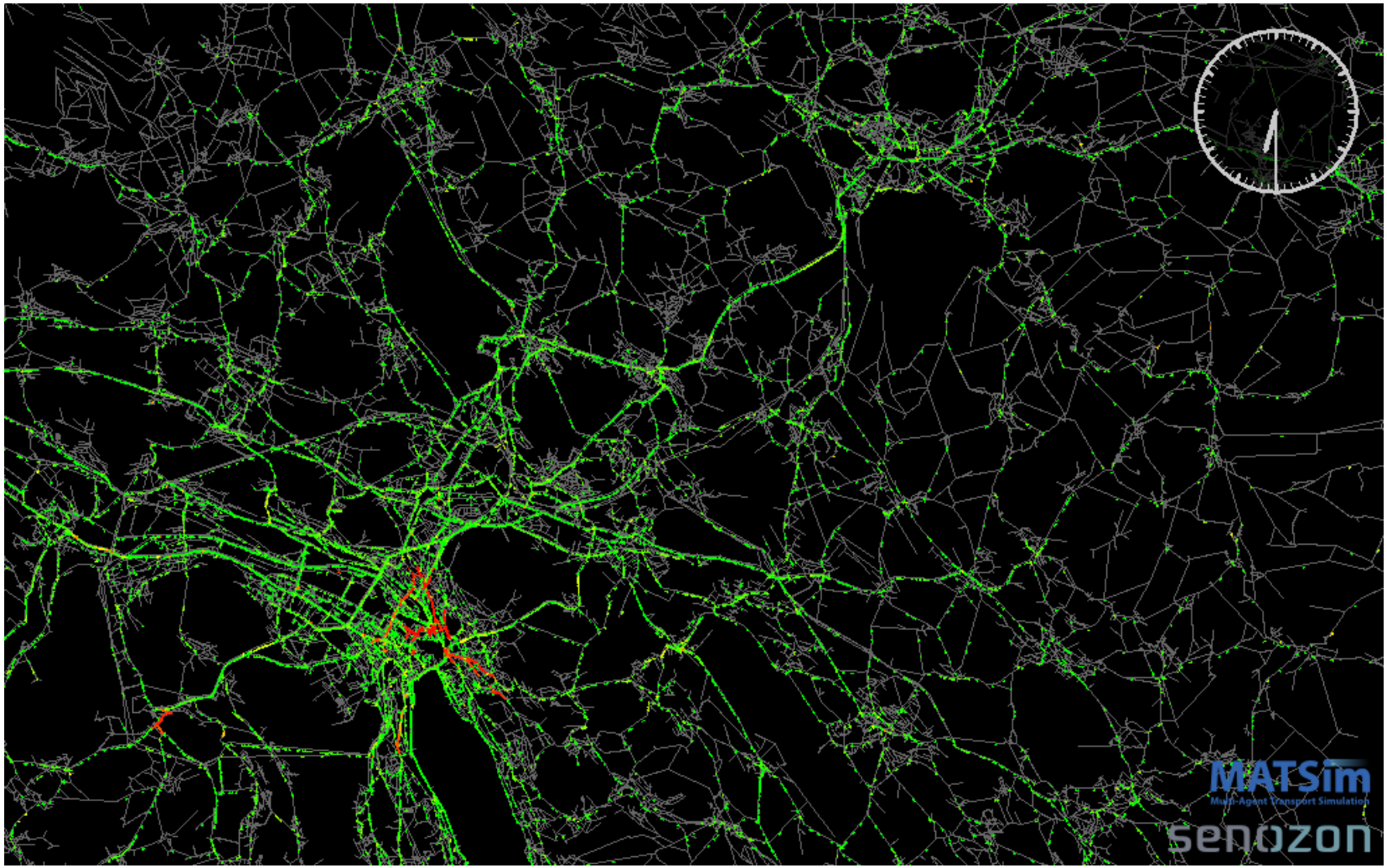
Source: Jacobs, 1993

What task does transport planning have as a science ?

Who, were, when, why, and how ?



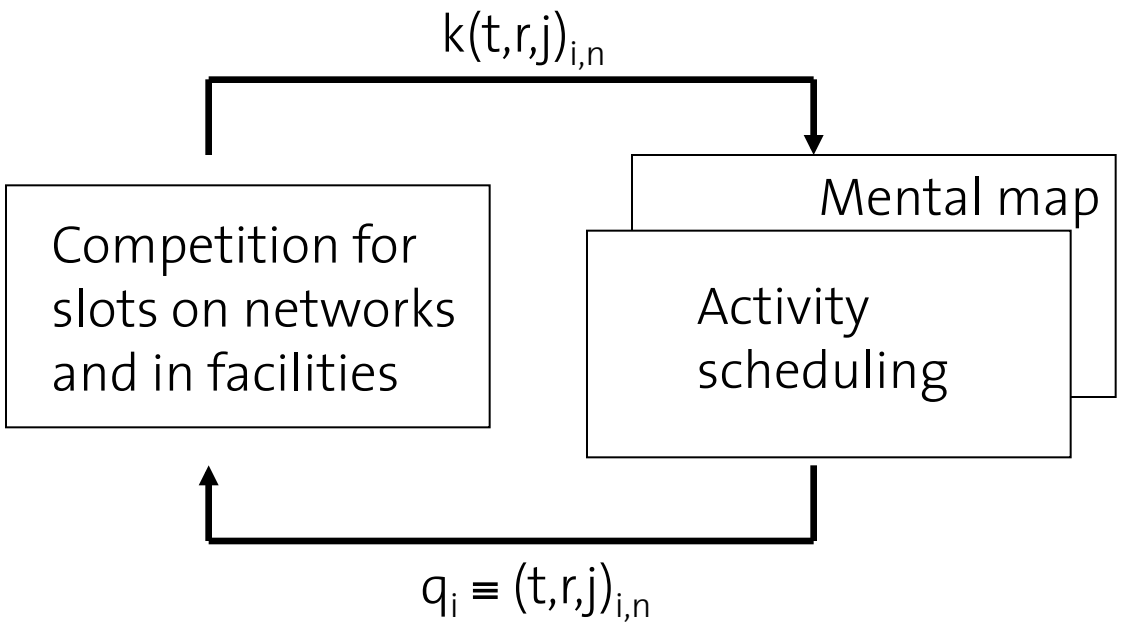
and with an even higher spatial resolution



Visualisation courtesy senozon AG, Zürich

Starting point

Learning approach of the generic transport model



One approach: MATSim

MATSim evolutionary process

Read scenario
Generate initial demand (schedules)

Do until convergence

- Select schedule to execute with a biased random approach
- Execute schedules (traffic flow simulation)
- Score all executed schedules
- Add a new schedule to a random subset of the agents
- Delete worst schedule, if necessary

MATSim in Switzerland: Initial demand

Population: Census-based (sample); Through traffic from surveys

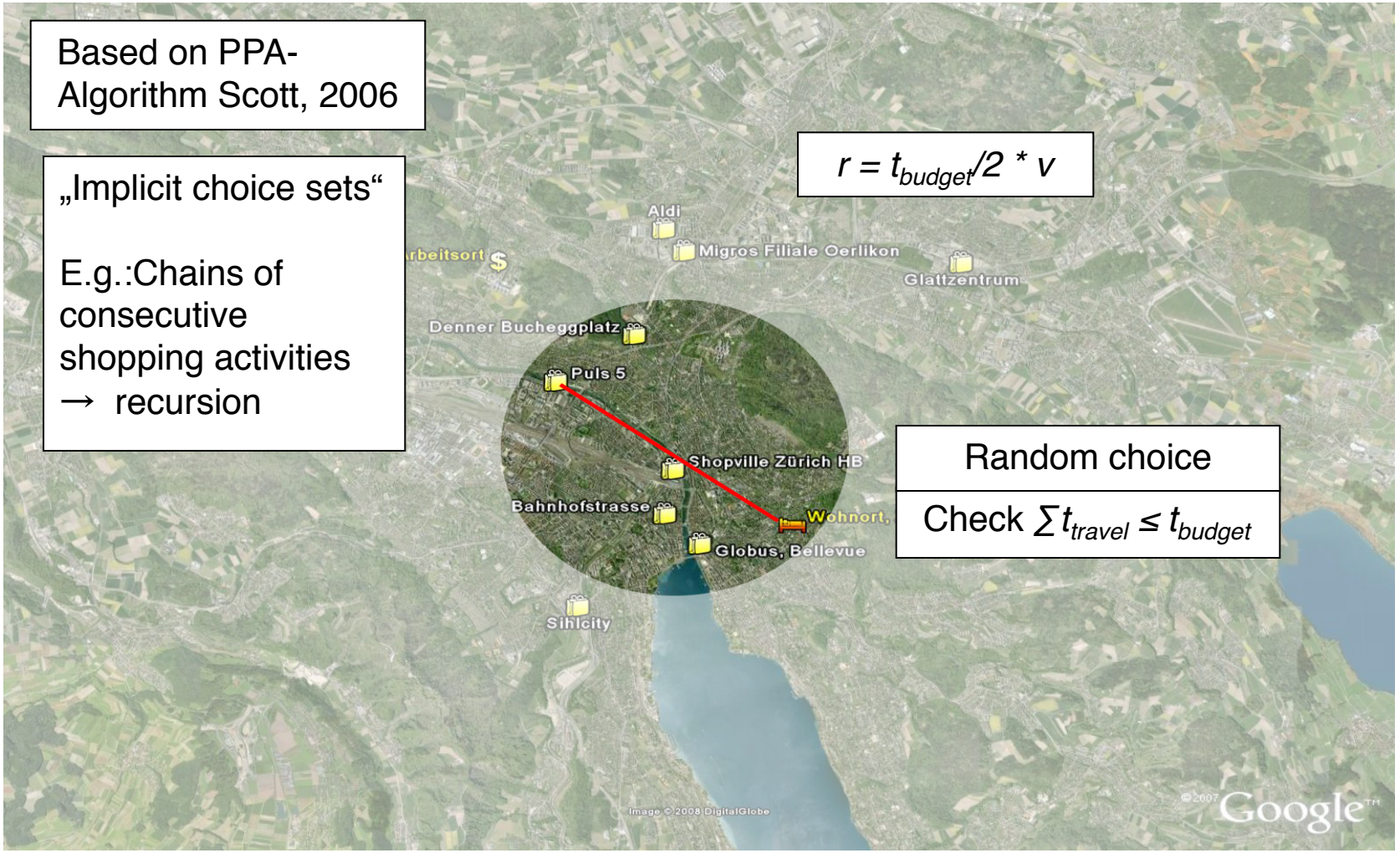
Number, type, sequence and duration of activities:

- Conditional random draw from observed categorised MZ 2000-2005 distributions by person type

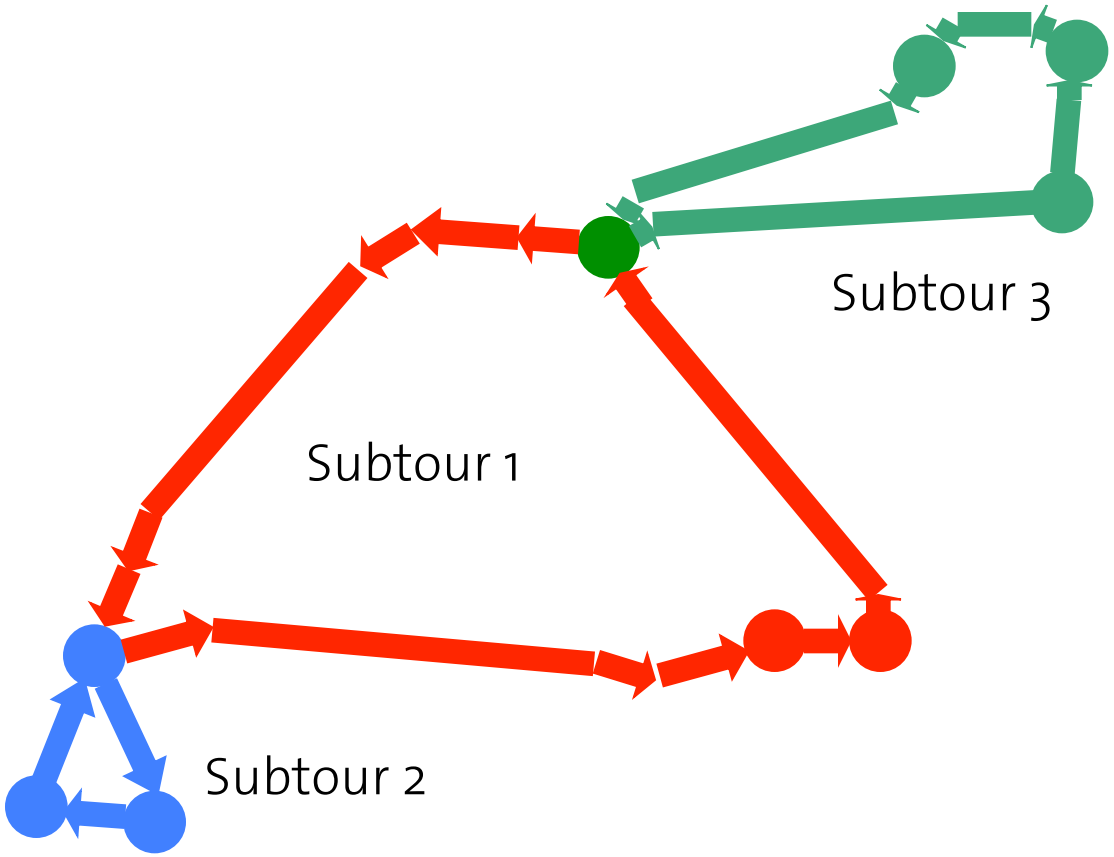
- Location of work/school activity:
  - Census commuter matrix
- Location of secondary activities:
  - Random constrained selection or
  - Capacity-constrained MNL within a time-space prism

  - Mode choice:
    - MZ-based subtour MNL
  - Route choice:
    - Improved A* shortest path

Capacity constrained MNL with time-space prism



Mode choice: Subtour



MATSim in Switzerland: Iteration

Number and type of activities
Sequence of activities

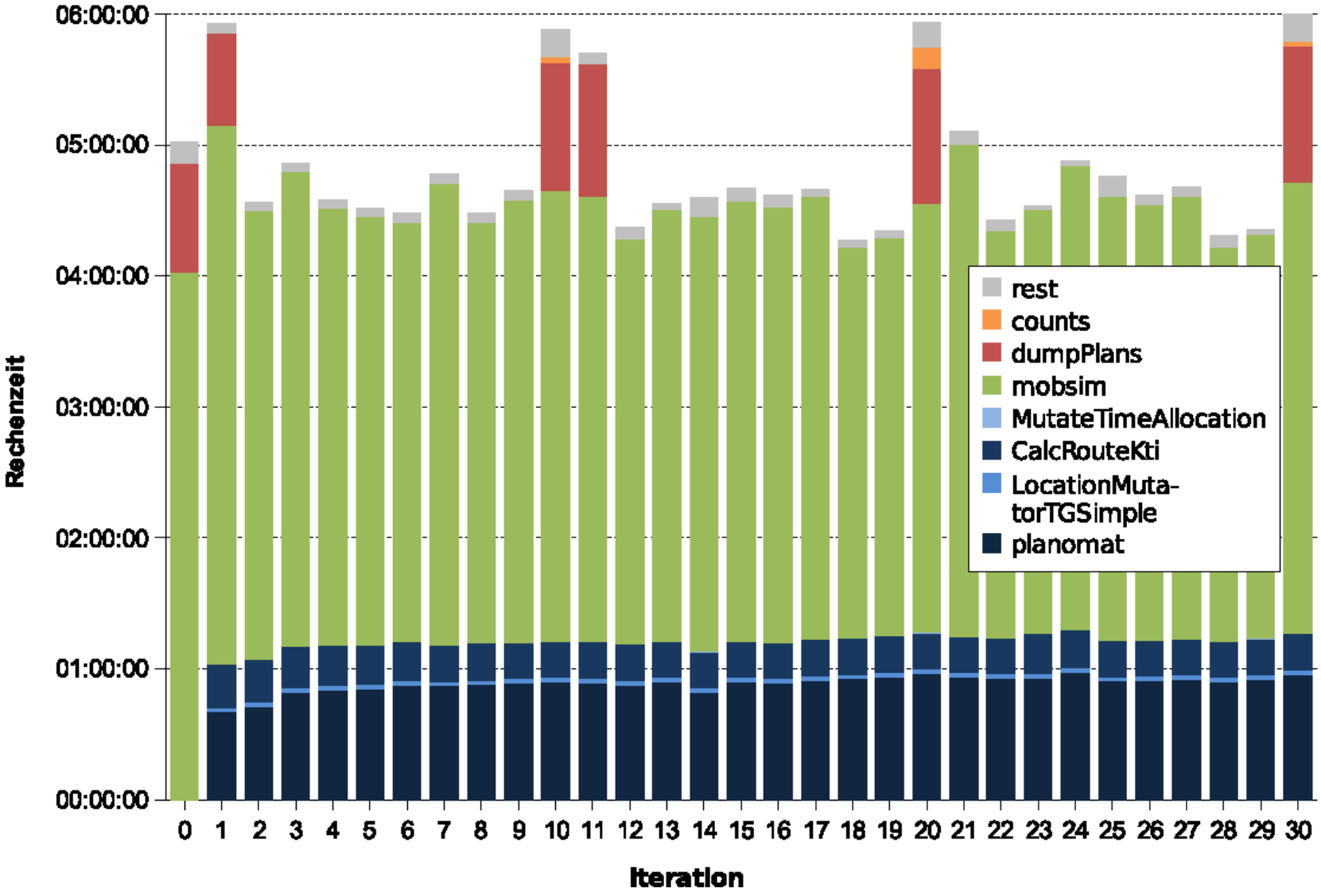
- Start and duration of activity
  - Random mutation
  - Planomat: GA optimiser
- Composition of the group undertaking the activity
- Expenditure division
- Location of the activity

  - Location of access and egress from the mean of transport
    - Parking type
  - Vehicle/means of transport
  - Route/service
  - Group travelling together
  - Expenditure division

MATSim in Switzerland: Traffic flow simulation

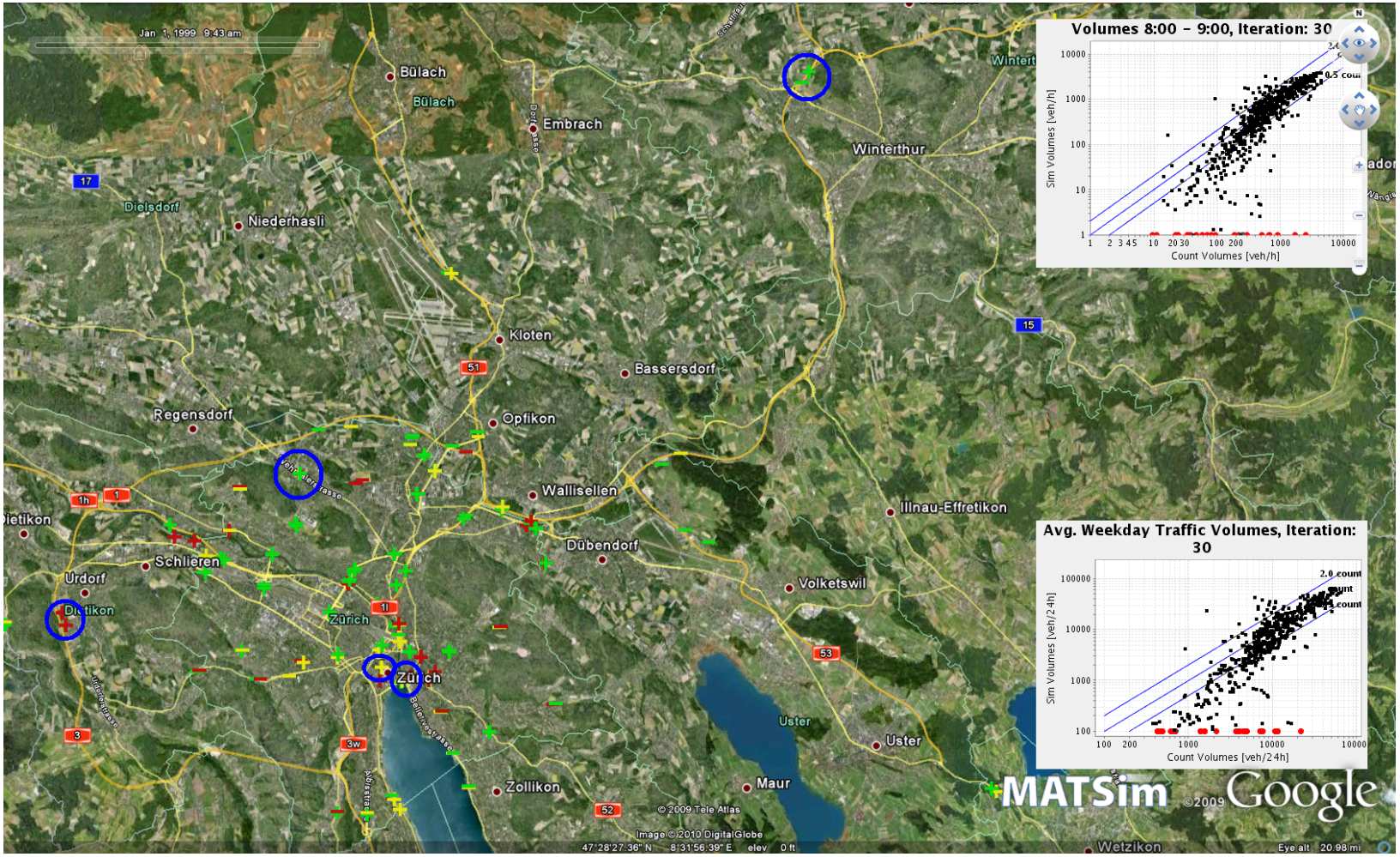
- Disaggregate simulation of car traffic
  - (Detailed signal control)
  - Detailed parking facilities
  - Detailed recharging facilities for electric vehicles
- Disaggregate simulation of public transport
- Disaggregate simulation of cyclists
- Disaggregate simulation of pedestrians

2009 MATSim Switzerland: 10^6 agents, links and facilities

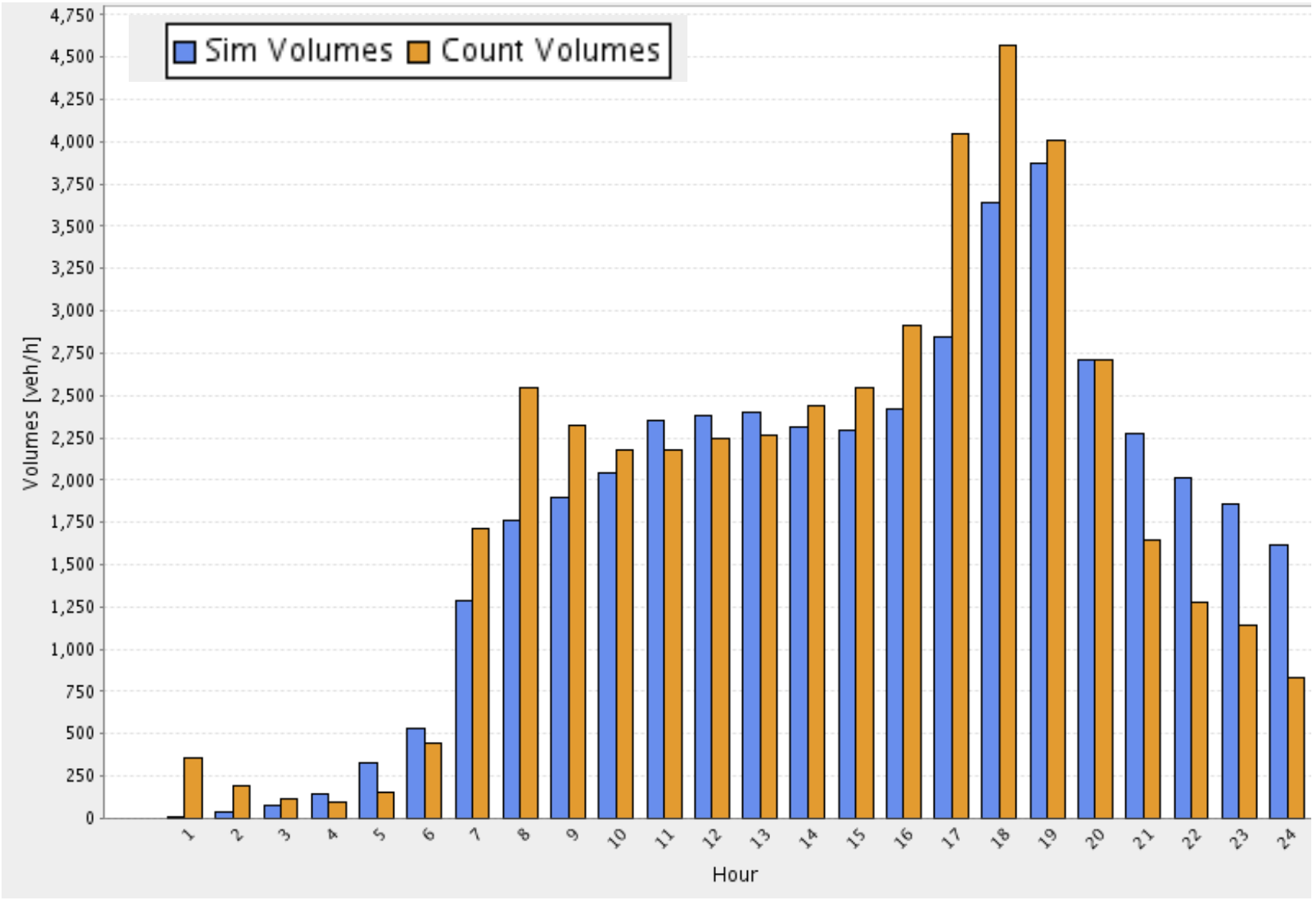


Balmer, 2009

Quality of the results: Overall counts



Quality of the results: A1 at Winterthur (no transit traffic)

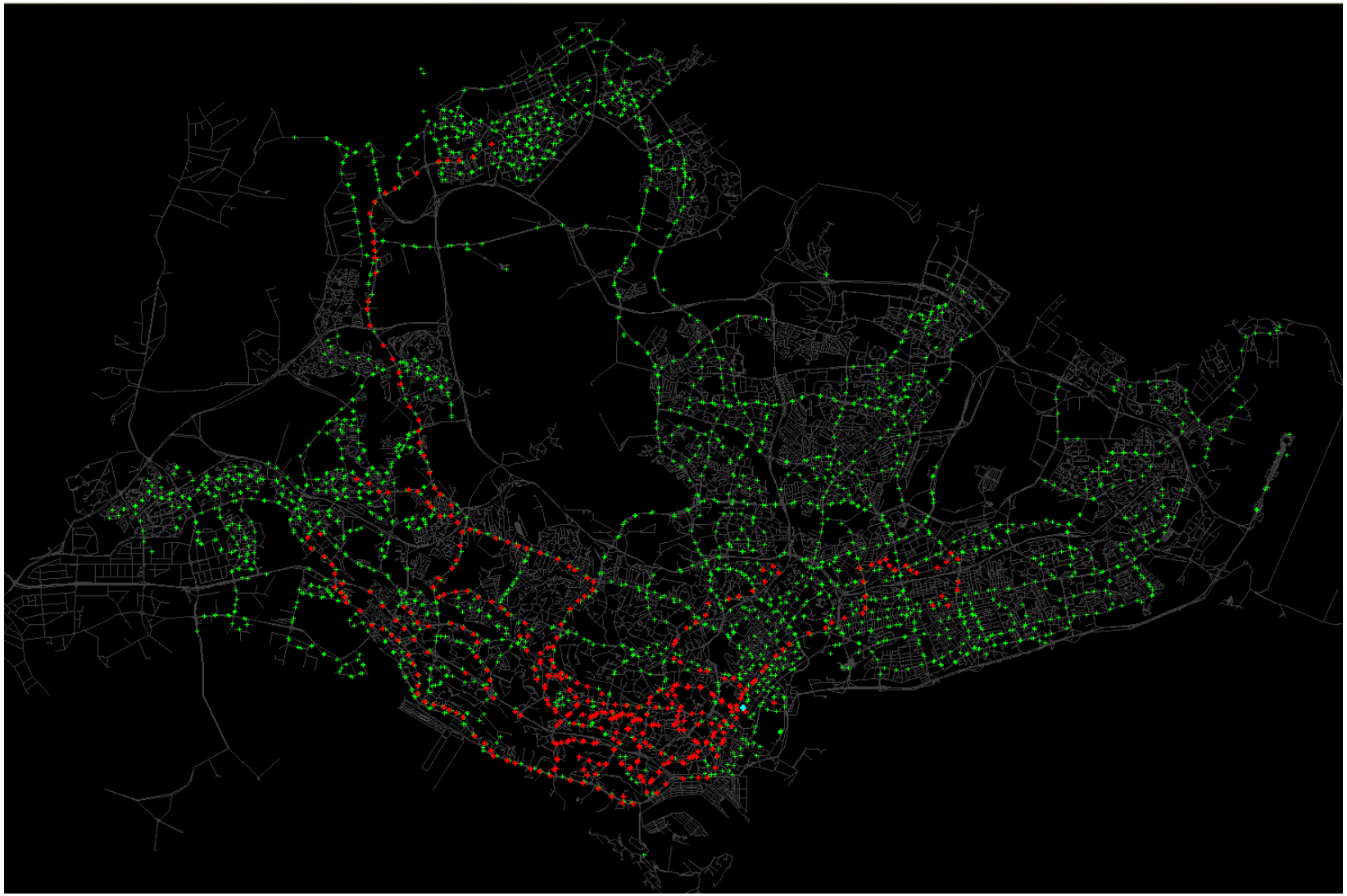


Next steps in Singapore for “Future Cities Laboratory”

Module VIII: Mobility and transport

- **Implementing MATSim for Singapore**
  - **Networks**
  - **Facilities**
  - **Behaviour**
- New methods
  - Optimal pricing
  - Longer term choices and supply responses
  - Social networks and their impacts
    - Based on a new survey in Singapore

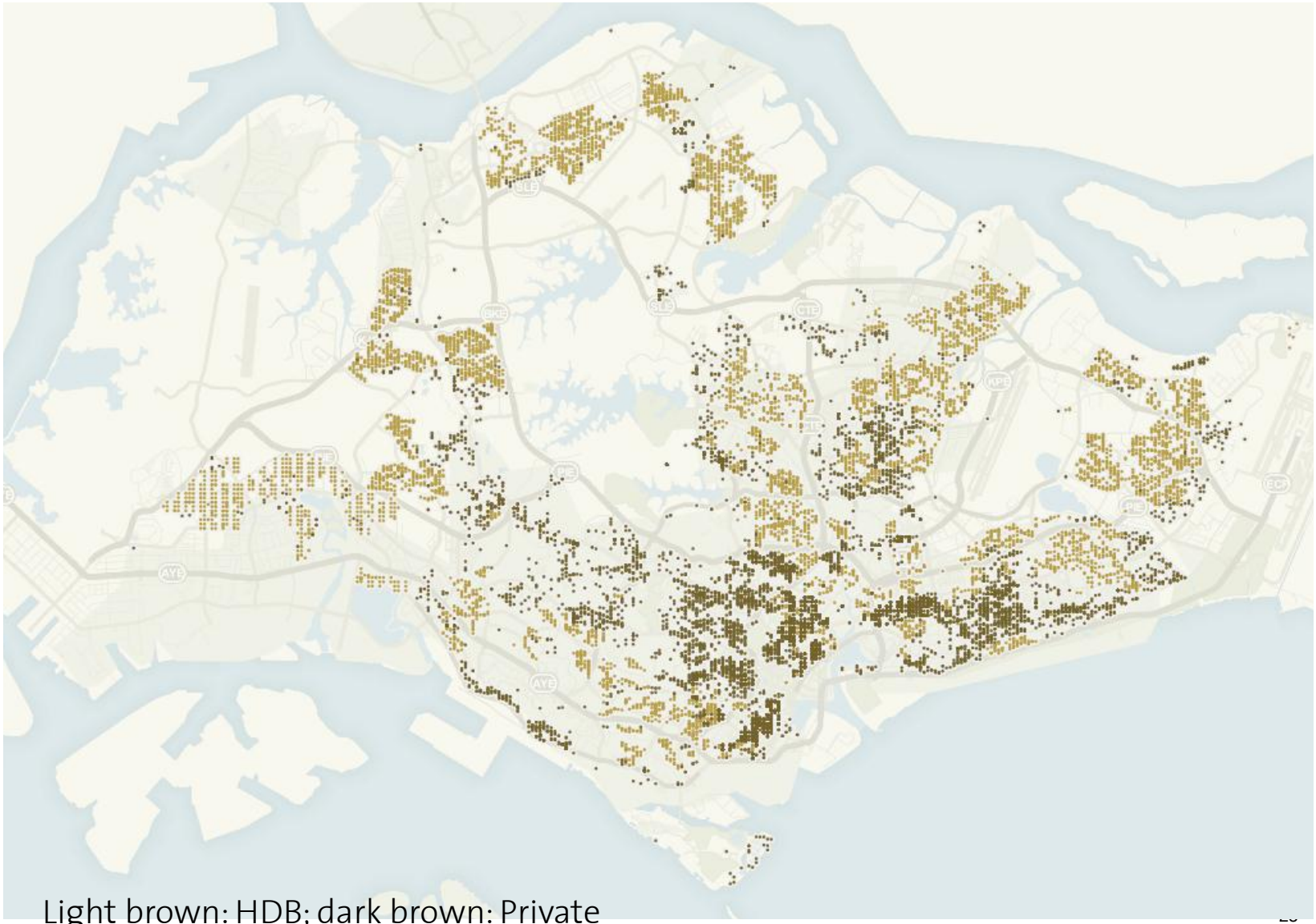
Implementing MATSim: Access with 1/without transfer



Data: Google feed

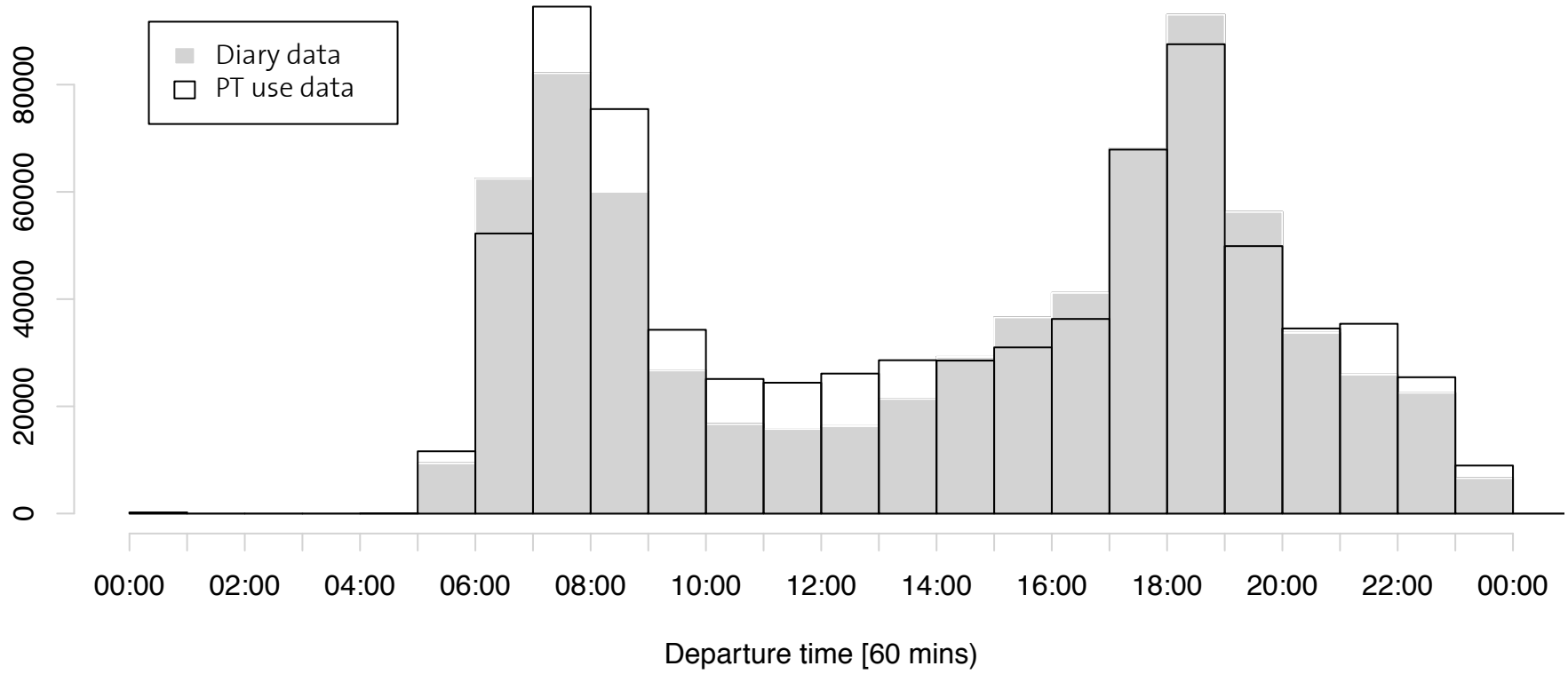
Red: Direct from Treasury Auditorium; Green: 1 transfer

Implementing MATSim: HDB and private housing



Light brown: HDB; dark brown: Private

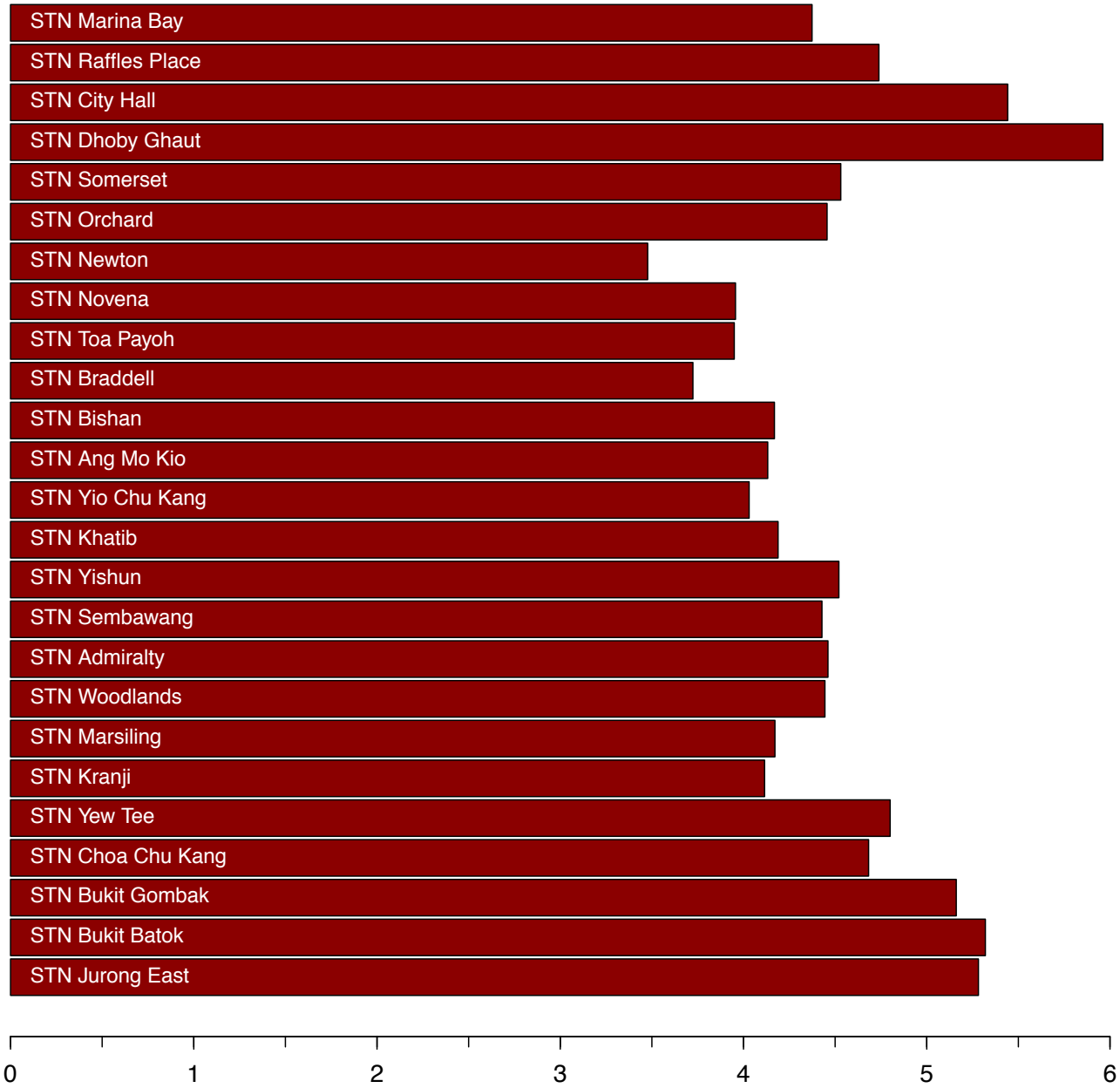
Implementing MATSim: Comparing the daily patterns



Trips involving bus and LRT or MRT

Data: travel diary 2008; public transport for one day in 2010

Implementing MATSim: Derived “waits” [min]; NS line



Data: Public transport usage data for one day in 2010,

Challenges for the Singapore implementation

- Further data enrichment, e.g.
  - Population distribution
  - School catchment areas
  - Fuller description of the destinations
  - Full day - diary
  - Freight traffic

- New capabilities, e.g.
  - Mode and destination choice under ERP
  - Longer term demographics of families (and firm)
  - Residential choice
  - Optimal pricing (ERP, public transport, parking)

Challenges for MATSim

- Content:
  - Integration of social networks
    - Their location
    - Their interaction
  - Supply side responses beyond pricing
  - Fully stage-based implementation

- Computation
  - Reduction of computation times
  - Parallel multi-modal flow simulation
  - Non-equilibrium updating

www.matsim.org@ (ETH) Zürich, TU Berlin, Singapore

Dr. Michael Balmer
Dr. David Charypar
Dr. Nurhan Cetin
Artem Chakirov
Yu Chen
Francesco Ciari
Christoph Dobler
Dr. Alexander Erath
Dr. Matthias Feil
Dr. Gunnar Flötteröd
Pieter Fourie
Dr. Christian Gloor
Dominik Grether
Dr. Jeremy K. Hackney
Andreas Horni
Johannes Illenberger
Gregor Lämmel
Nicolas Lefebvre
Konrad Meister
Manuel Moyo
Kirill Müller
Andreas Neumann
Thomas Nicolai
Benjamin Kickhöfer
Sergio Ordonez
Dr. Bryan Raney
Dr. Marcel Rieser
Dr. Nadine Schüssler
Dr. David Strippgen
Michael Van Eggermond
Rashid Waraich
Michael Zilske

More information

www.matsim.org

www.ivt.ethz.ch