Bevorzugter Zitierstil für diesen Vortrag

Axhausen, K.W. (2011) Wie weiter mit Verkehrsmodellen ?,
Vortrag, Universität Stuttgart, Juli 2012.

Wie weiter mit Verkehrsmodellen ?

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IVT
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Juli 2012

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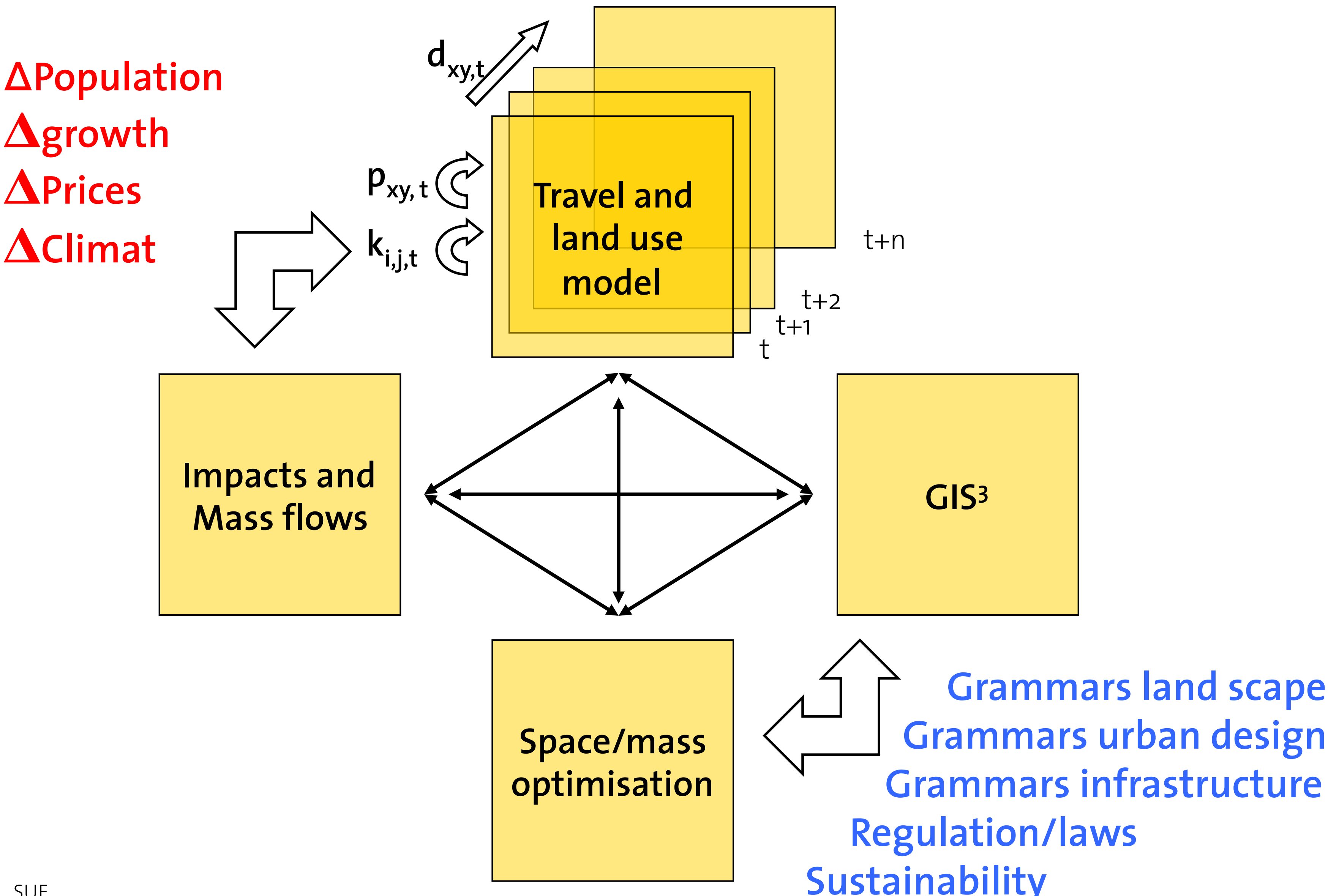
Institute for Transport Planning and Systems

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

What do we need ?

SUE ....

Integration of land use (optimisation)



Thinking about equilibrium

SUE ....

Wardrop, 1952

(1) The journey times on all the routes actually used are equal, and
less than those which would be experienced by a single vehicle on any unused route.
(2) The average journey time is **a** minimum.

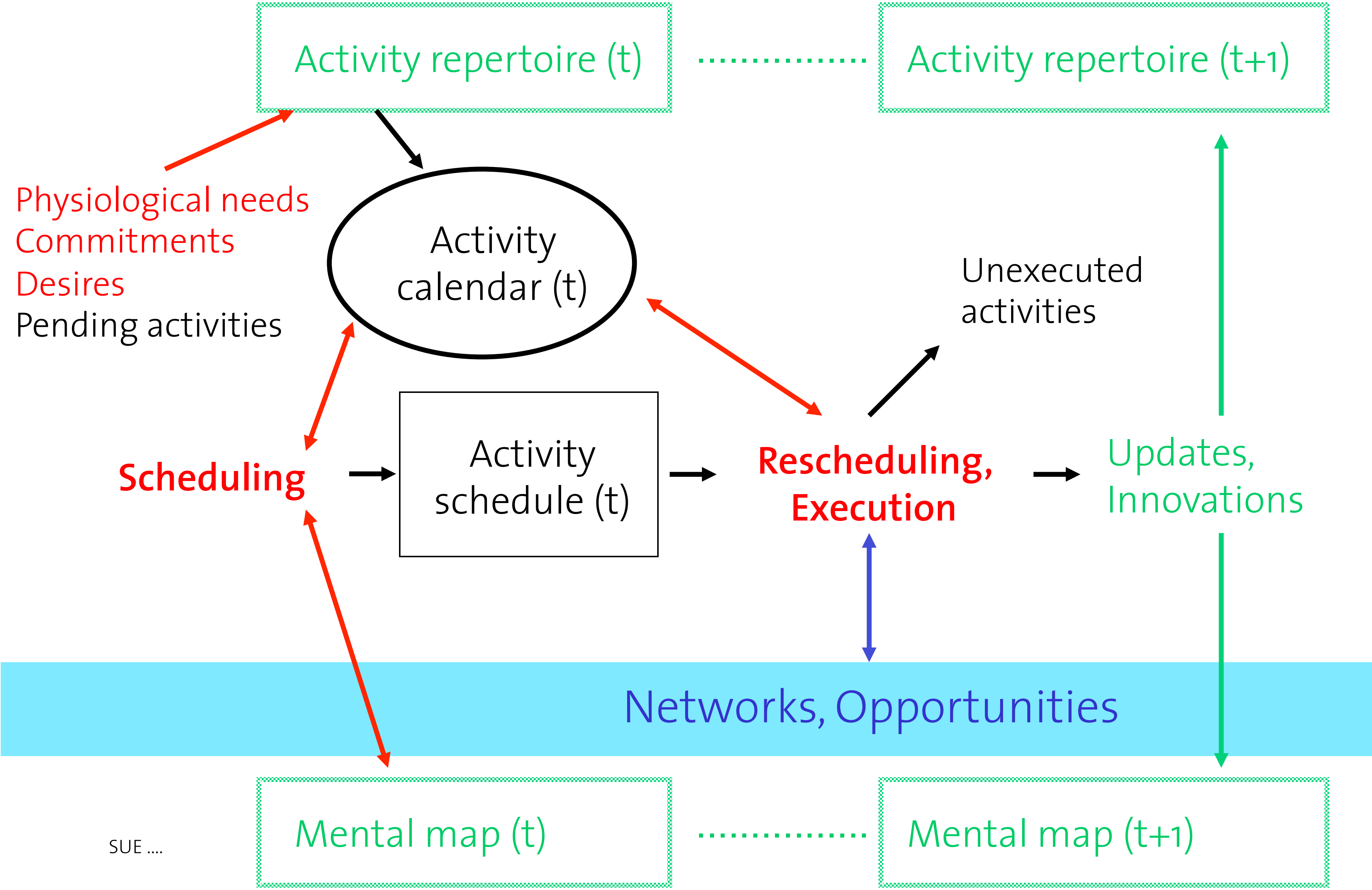
“Activity based approach”

SUE ....

Key points of the critique of equilibrium approaches

- Travel is derived demand, with some exceptions
- The travellers are constrained by their commitments and mobility tool ownership
- Travellers aren’t in equilibrium
- Travellers don’t know all alternatives
- Travellers don’t plan their whole day (week) in advance

Processes suggested for personal daily dynamics

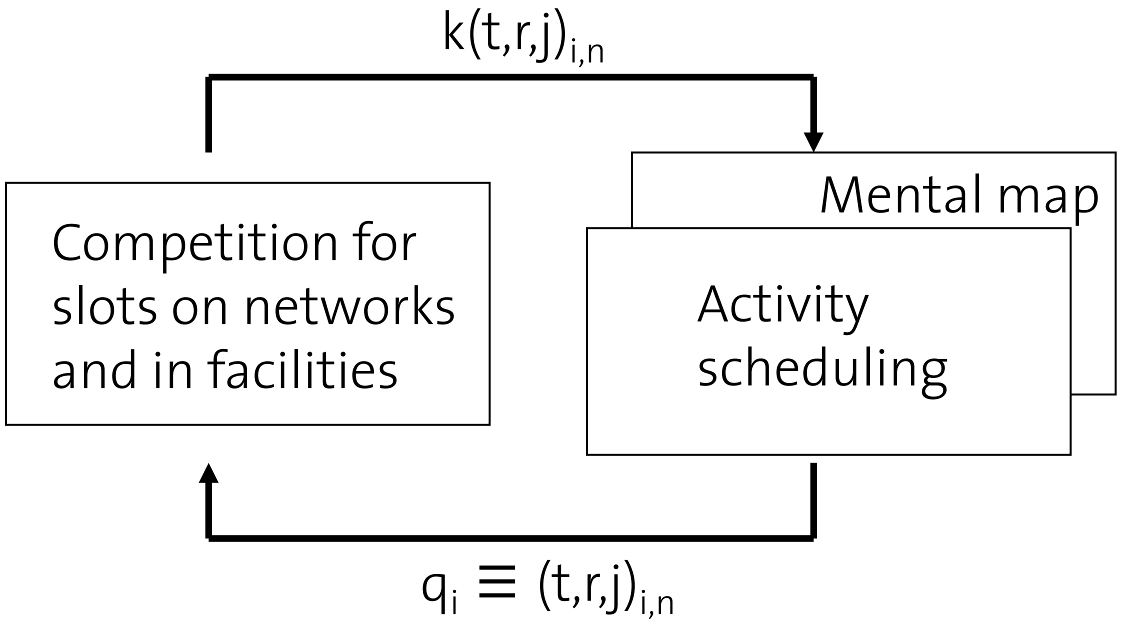


SUE ....

Thinking about SUE and best response

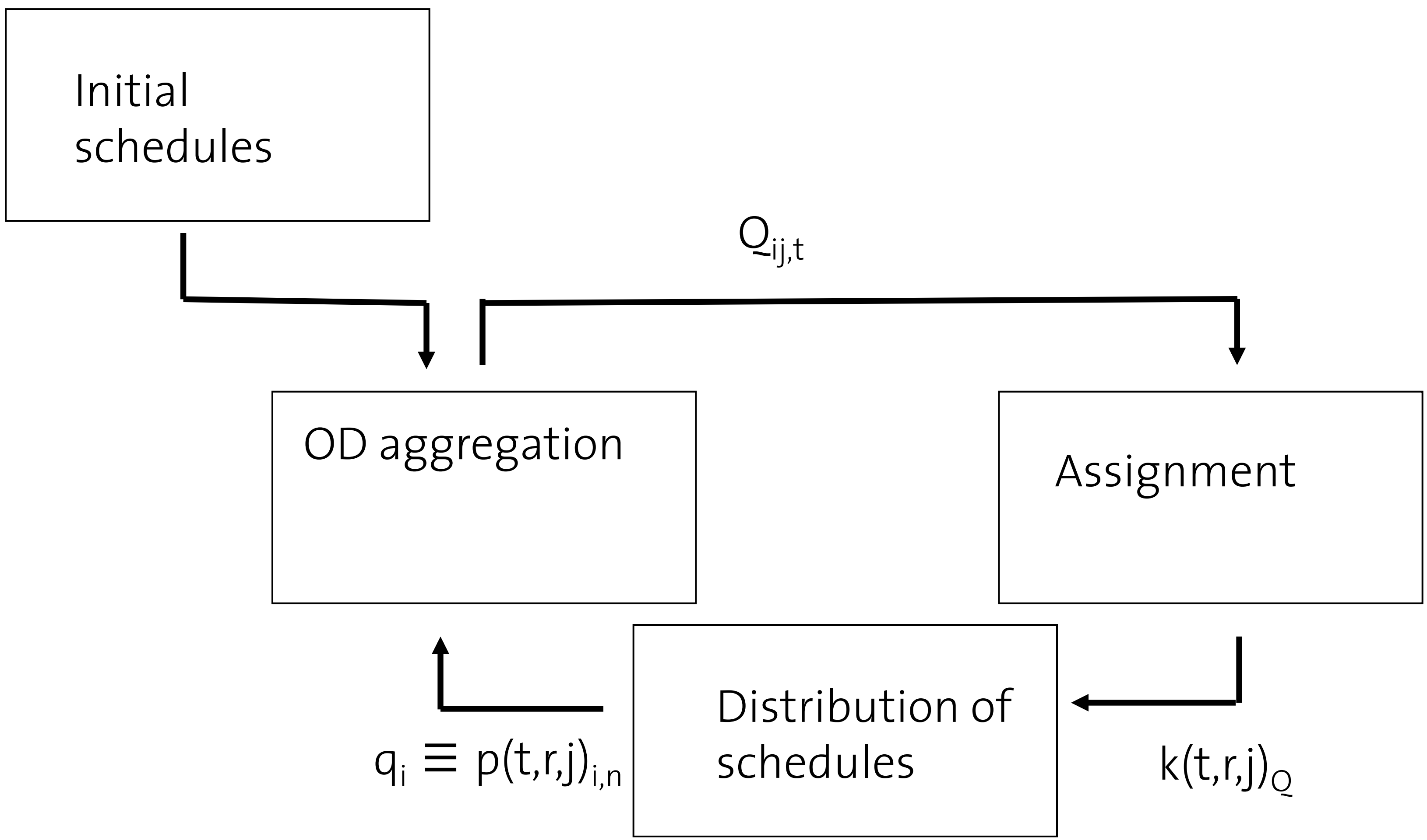
SUE ….

Learning approach of the generic one-day transport model



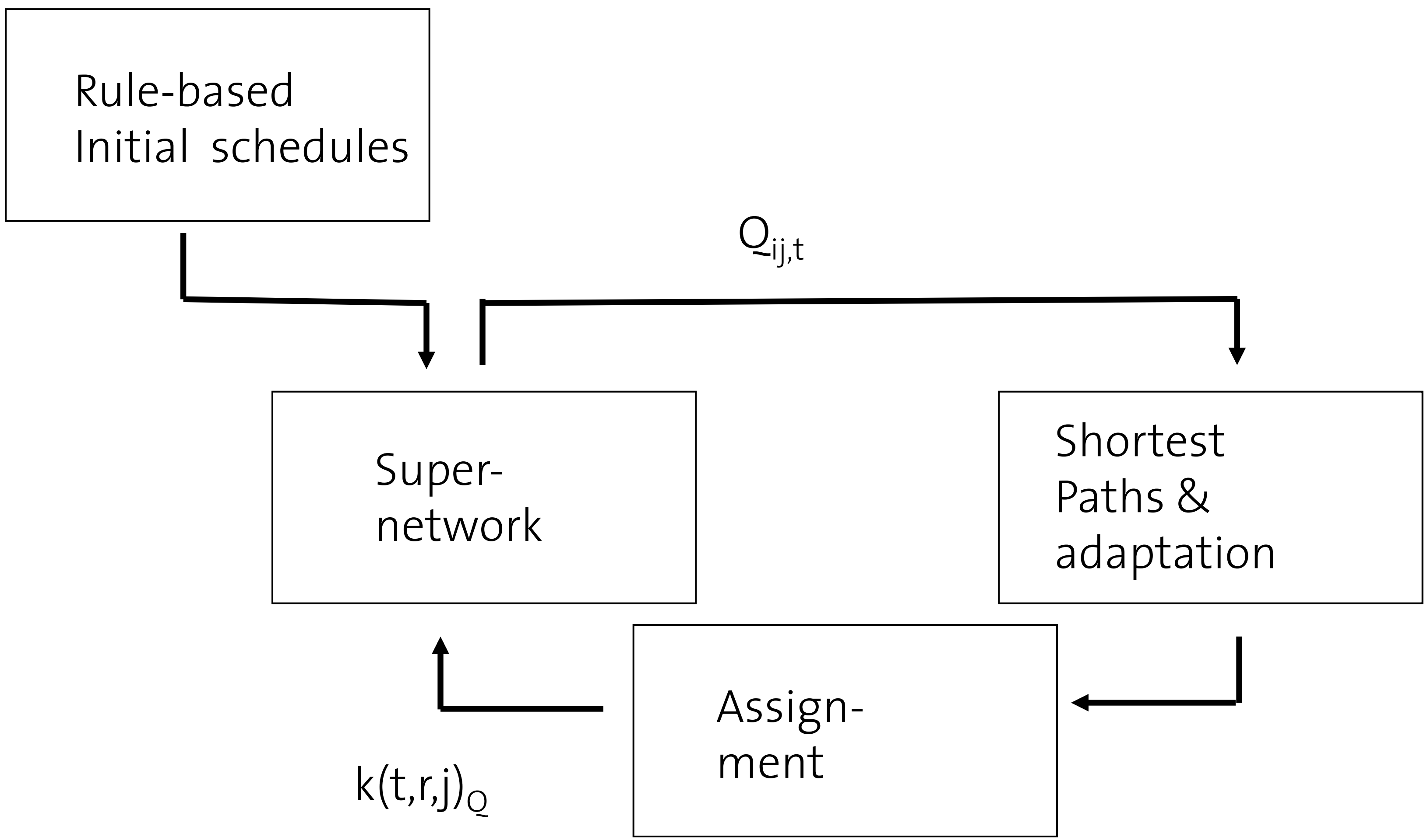
SUE ....

Equilibrium search in „ABM“ & assignment combinations



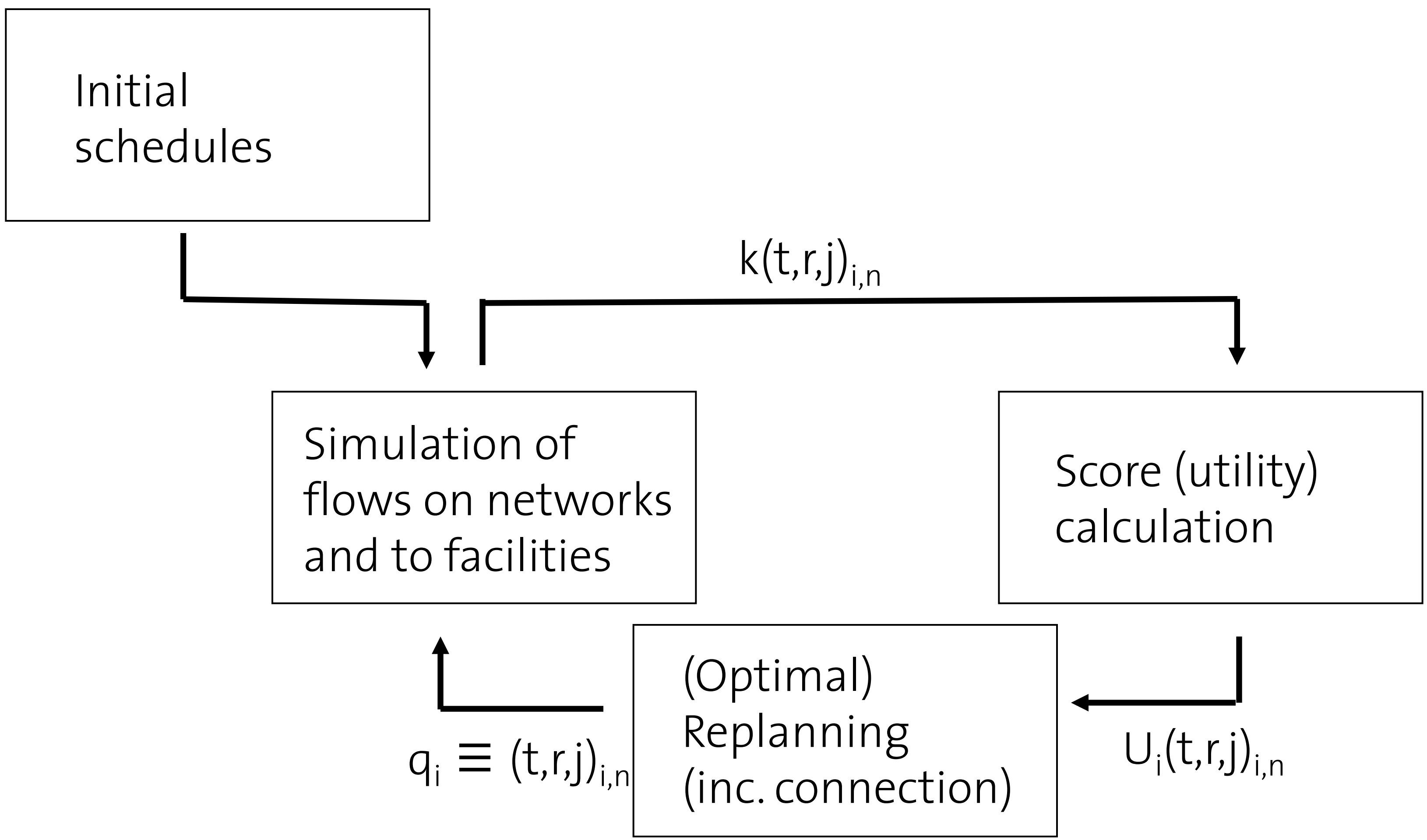
SUE ….

Equilibrium search in supernetworks



SUE ....

Equilibrium search in MATSim



SUE ….

Stochastic user equilibrium

SUE ....

SUE

Daganzo and Sheffi's (1977) define it for the aggregate case:

> "In a SUE network, no user believes he can improve his travel time by unilaterally changing routes."

SUE for aggregate flows

In SUE for flows q'_{rij}

$q'_{rij} = q'_{ij} * P(r)$, for all r, i and j

$P(r) = f(k'_{rij}(q_{rij}))$

with a suitable

f() Choice model
k() definition of the generalised costs k'_{rij}

SUE for agent-based simulation

Flötteröd and Nagel (2009) define it:

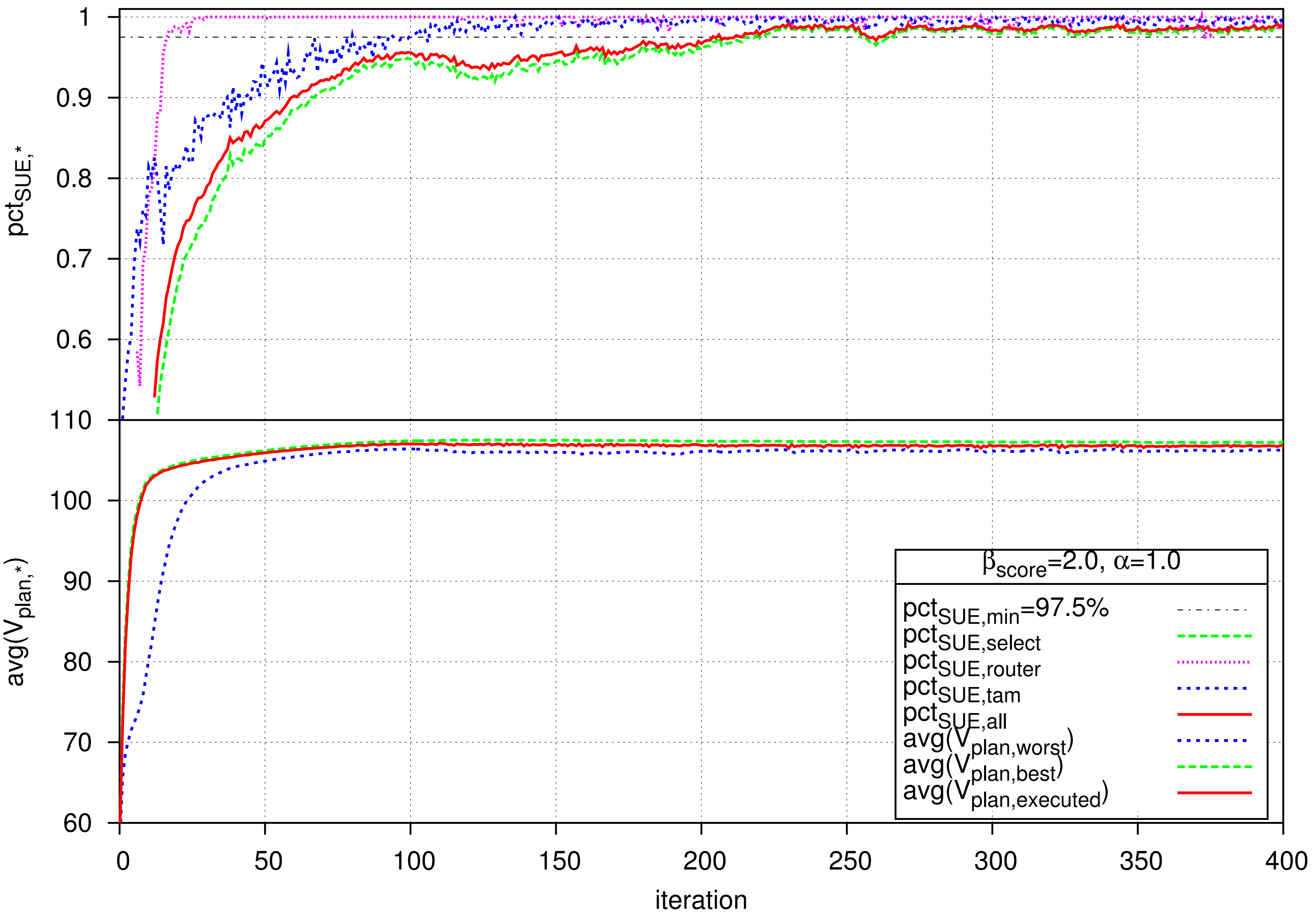
> "An agent-based SUE [. . .] is defined as a system state where agents draw from a stationary choice distribution such that the resulting distribution of traffic conditions re-generates that choice distribution. [. . .] It implies that every agent considers a whole choice of (possibly suboptimal) plans and selects one of these plans probabilistically."

SUE for agent-based simulation operational

Meister (2011) operationalizes it as:

> "…An agent-based SUE is defined as a system state where the number of agents which perceive that they can improve their state is minimized, given a dynamic environment where a constant share of all agents [continues to] change their plans".

MATSim: SUE search example



SUE ....

MATSim today

SUE ....

MATSim: A GNU public licence software project

Main partners

- TU Berlin (Prof. Nagel)
- ETH Zürich and FCL Singapore
- senezon (Dr. Balmer, Rieser)

Coordination via:

- User meeting
- Developer meeting

Help for new users

- Tutorials
- www.matsim.org

SUE ....

Activity scheduling with Vickrey-style utility function

Number and type of activities
Sequence of activities

- Start and duration of activity
- Composition of the group undertaking the activity
- Expenditure division
- Location of the activity
    - Movement between sequential locations
        - Location of access and egress from the mean of transport
            - Parking type
        - Vehicle/means of transport
        - Route/service
        - Group travelling together
        - Expenditure division

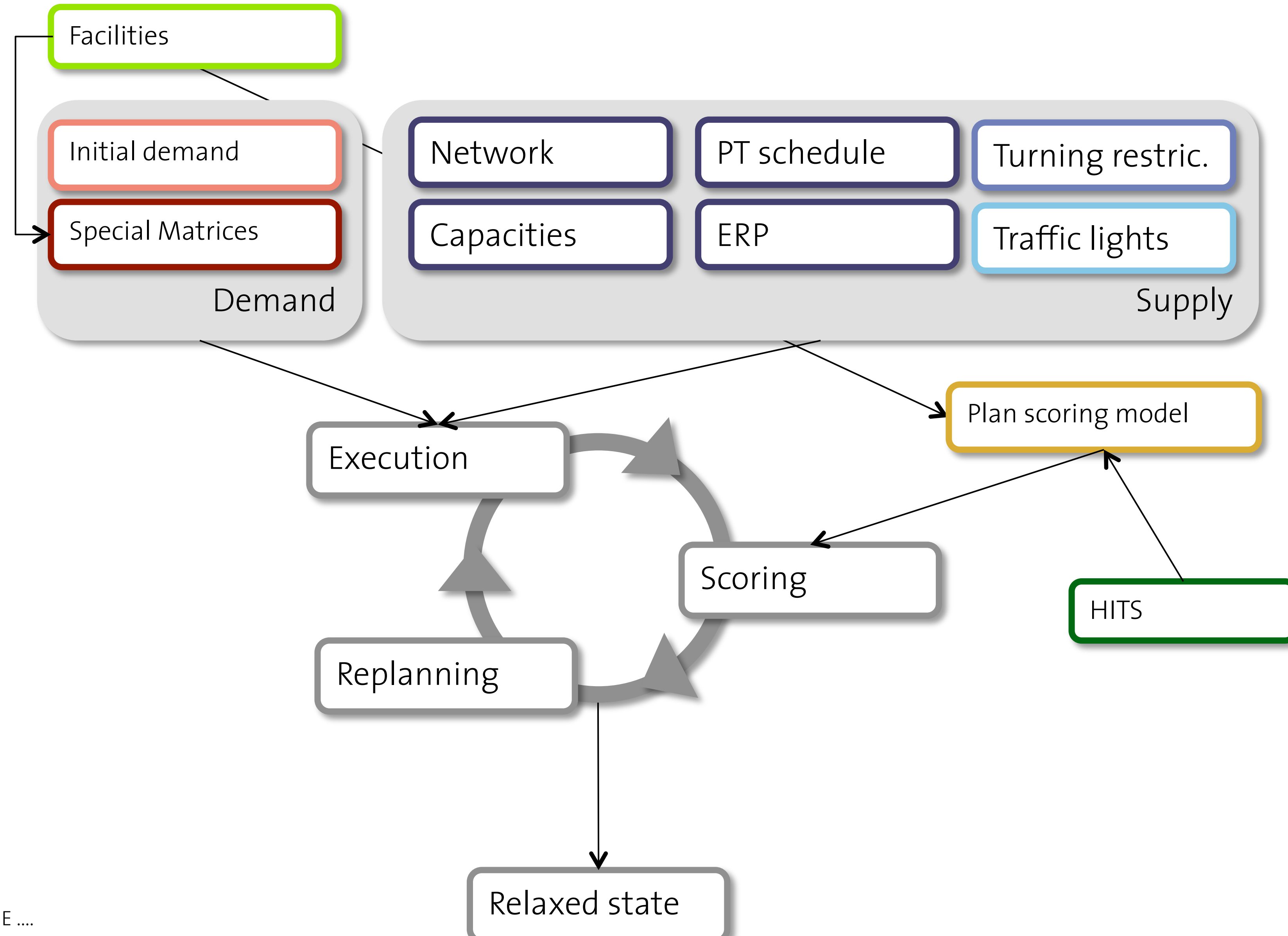
Current Vickrey-type utility function

$$U_{plan} = \sum_{i=1}^{n} U_{act,i} + \sum_{i=2}^{n} U_{trav,i-1,i}$$

$$U_{act,i} = U_{dur,i} + U_{late.ar,i}$$

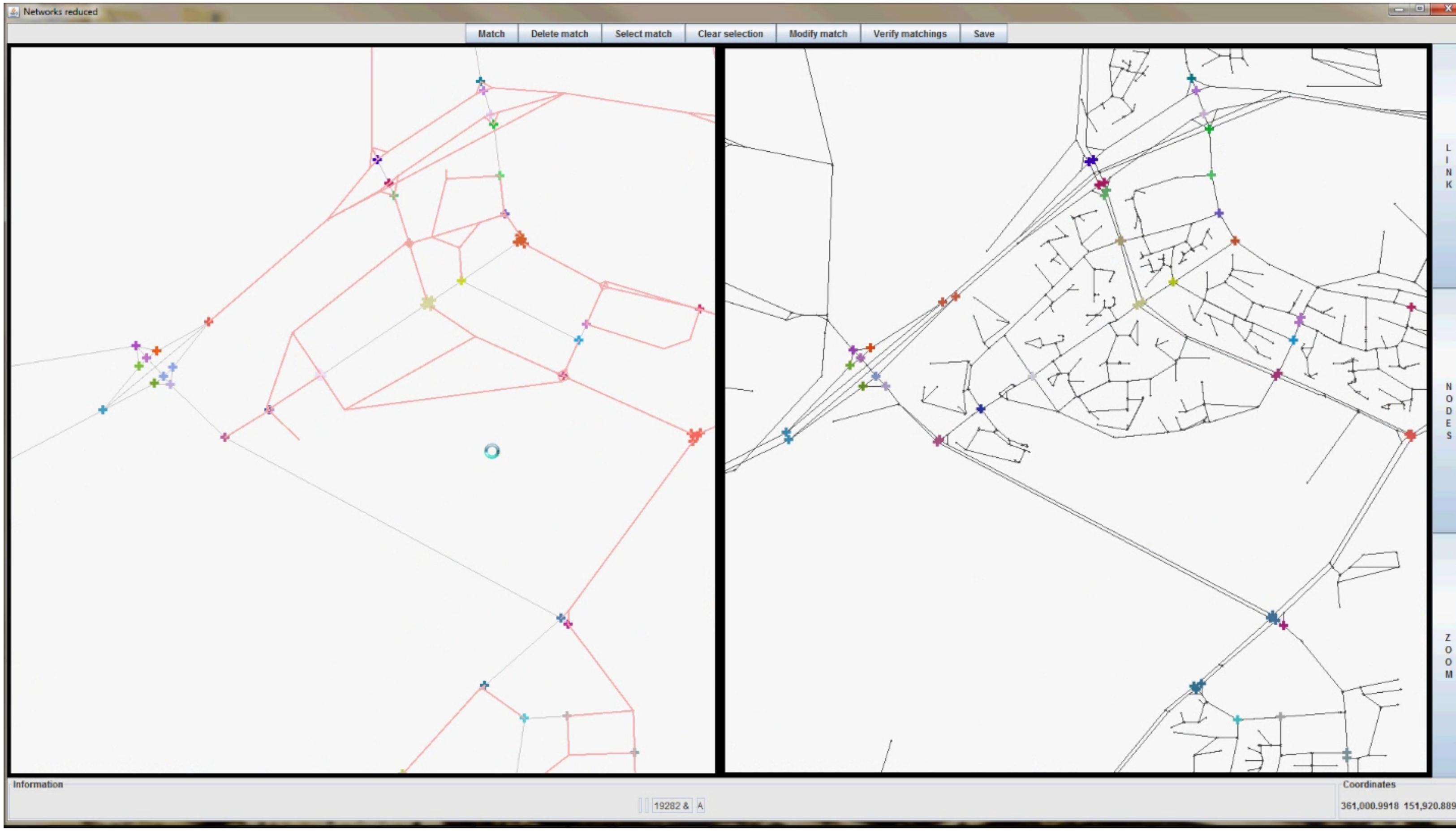
SUE ....

MATSim framework:



SUE ….

Network node matching tool



SUE ....

Simulation: MATSim 1.0 demand on MATSim 2.0 network

Thinking about SUE (2)

Basics: Traffic DUE and SUE

- Search or add a shortest path to the set of paths considered

- Allocate flows among the set of paths considered

- Check if chosen convergence criterion is met

Basics: Traffic DUE and SUE

- Search or add a shortest path given the current generalised cost estimate to the set of paths considered

- Allocate flows among the the set of paths considered

- Check if chosen convergence criterion is met

SUE ....

Basics: ABM scheduling SUE

- Enumerate all possible schedules
- Allocate flows randomly among the set of schedules
- Execute the schedules without within-day replanning
- Check if chosen convergence criterion is met

SUE ....

Basics: ABM scheduling SUE

- Construct all schedules considered relevant
- Allocate flows randomly among the set of schedules
- Execute the schedules without within-day replanning
- Check if chosen convergence criterion is met

Activity scheduling with some best response modules

- **Number and type of activities**
- **Sequence of activities**
  - **Start and duration of activity**
  - Composition of the group undertaking the activity
  - Expenditure division
  - **Location of the activity**
    - Movement between sequential locations
      - **Location of access and egress from the mean of transport**
        - **Parking type and location**
      - **Vehicle/means of transport**
      - **Route/service**
      - Group travelling together
      - Expenditure division

Scheduling SUE with MATSim (tomorrow)

- For all agents:
  - Find dissatisfied agent
  - Construct a best schedule given the current generalised cost estimate and agent specific tastes to add to the set of schedules already considered.
  - Rescore existing schedules
  - Select best schedule
- Execute schedule with congestion feedback
- Check if convergence criterion is met

MATSim @ ETHZ, TU Berlin, FCL, Senozon

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Questions ?

- www.matsim.org
- www.ivt.ethz.ch