Bevorzugter Zitierstil für diesen Vortrag

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Current transport planning research at the IVT: Models and behaviours

KW Axhausen

IVT
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Zürich

May 2003

Institut für Verkehrsplanung und Transportsysteme
Institute for Transport Planning and Systems

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

The Institute for Transport Planning and Systems

Three groups with about 40 members of staff:

- **(Road) traffic engineering**: highway safety and design; highway maintenance; system capacity issues; traffic operations
- **Public transport (operations):** www.opentrack.ch; public transport management
- **Transport planning**

Our website:

www.ivt.baug.ethz.ch

# Transport planning: Models and behaviours

Active areas:

- Land use and transport interaction: Switzerland 1950-2000
- Traditional large scale models: e.g. National models for Switzerland; Air traffic networks
- Demand modelling: ICN impact study
- Travel behaviour and valuation: 6-week Mobidrive survey; VTTS SP-survey
- Large scale microsimulation: (the vision of) modelling human activity scheduling
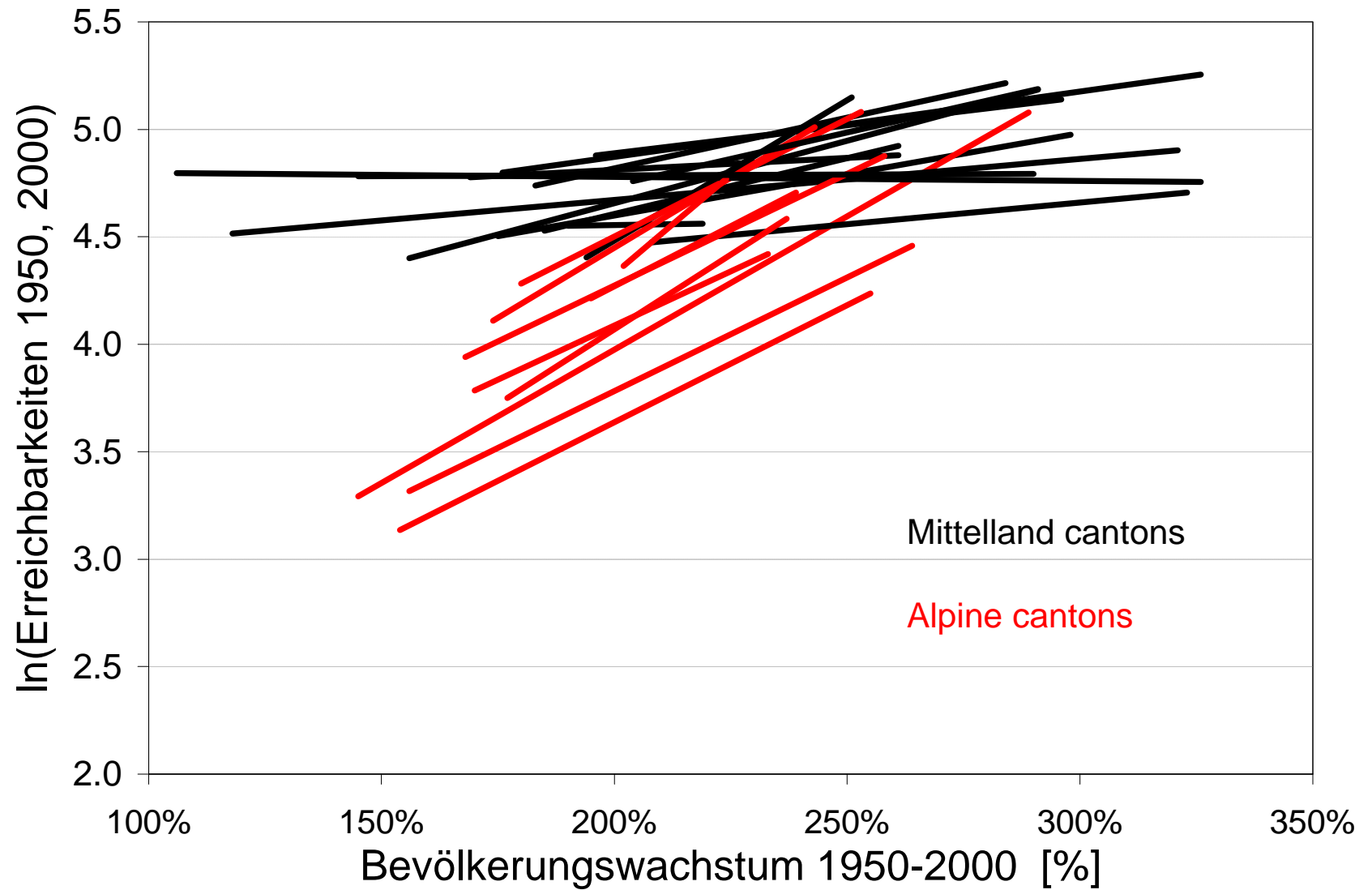
Accessibility surface 1950
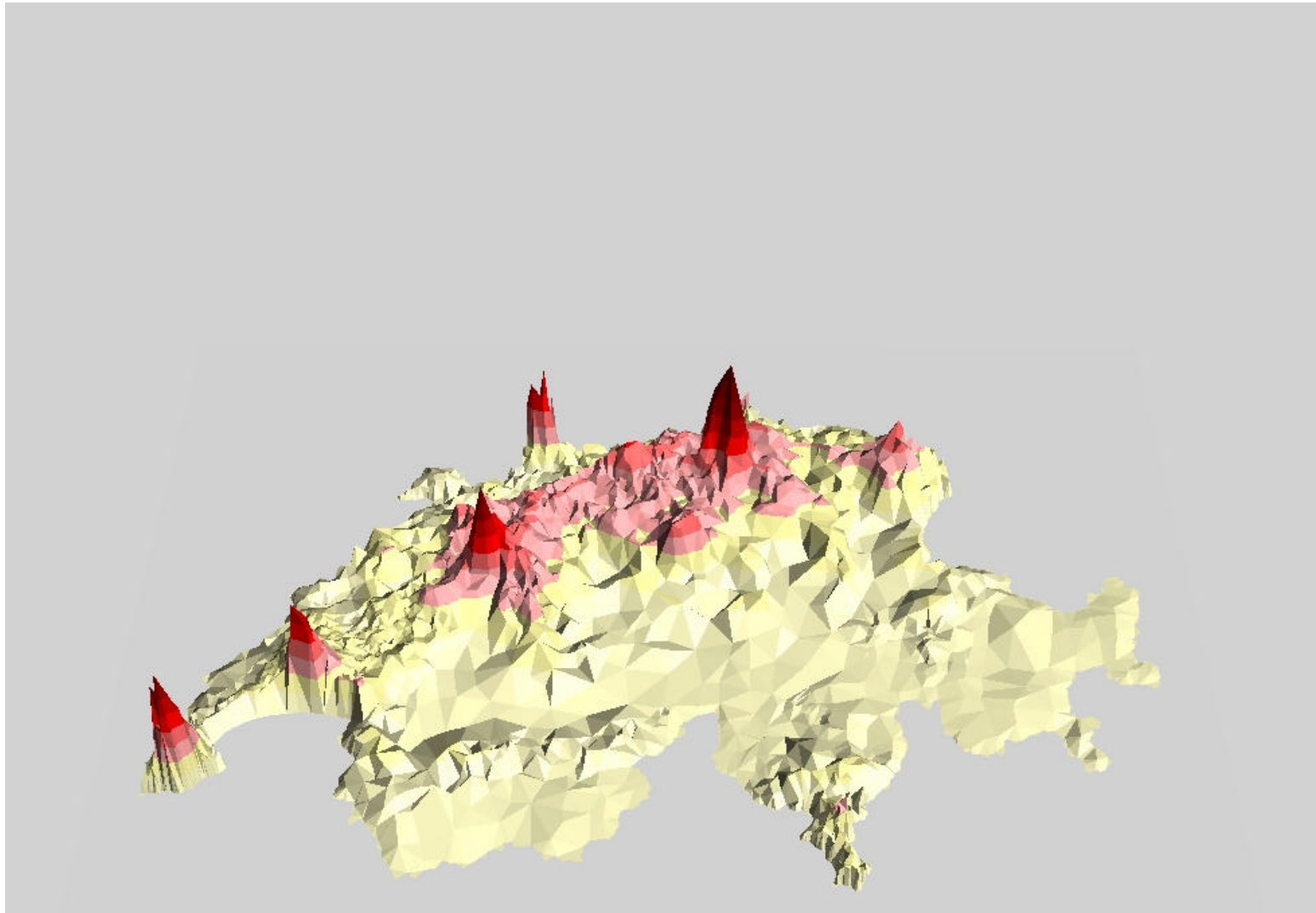
Fröhlich

Accessiblity surface 2000
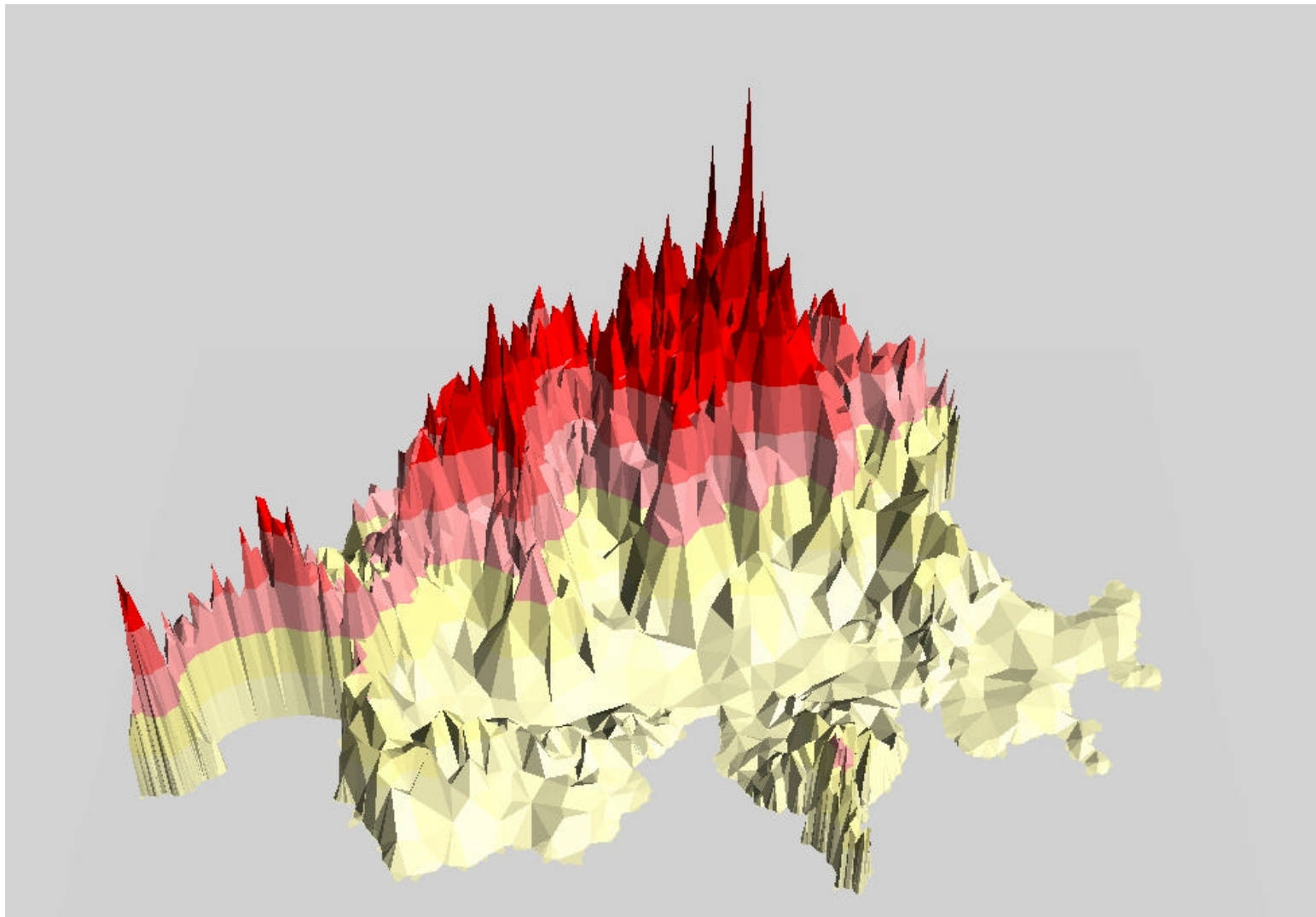
Fröhlich

Accessibility and population change (1950-2000)

Land use and transport interaction

Current status:

- Road and interurban public transport networks and time tables for Switzerland since 1850
- Matching population and economic data
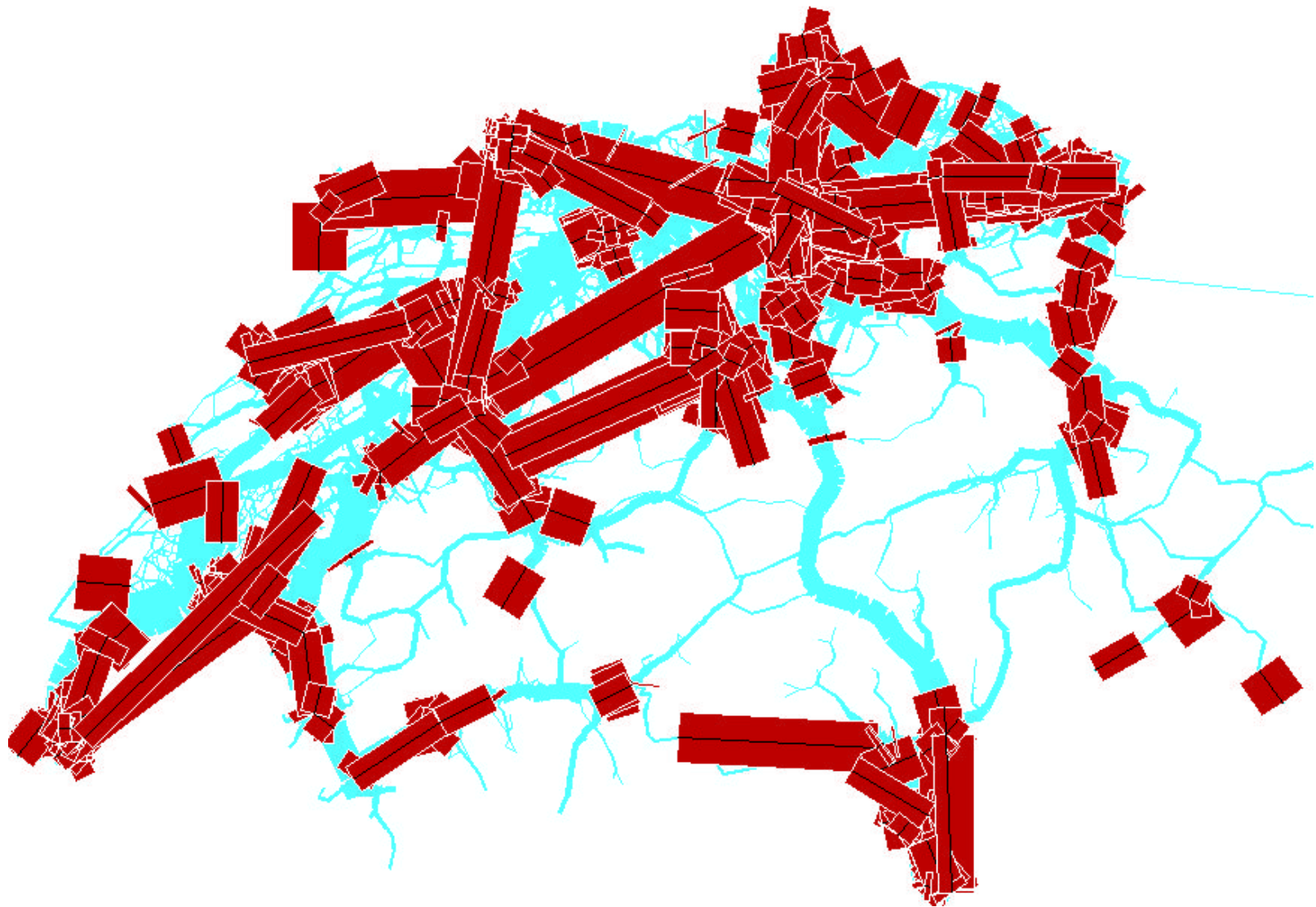- Growing set of demand measurements (counts, matrices)

Goals:

- Furthering our understanding of the links between transport investment and services and economic development
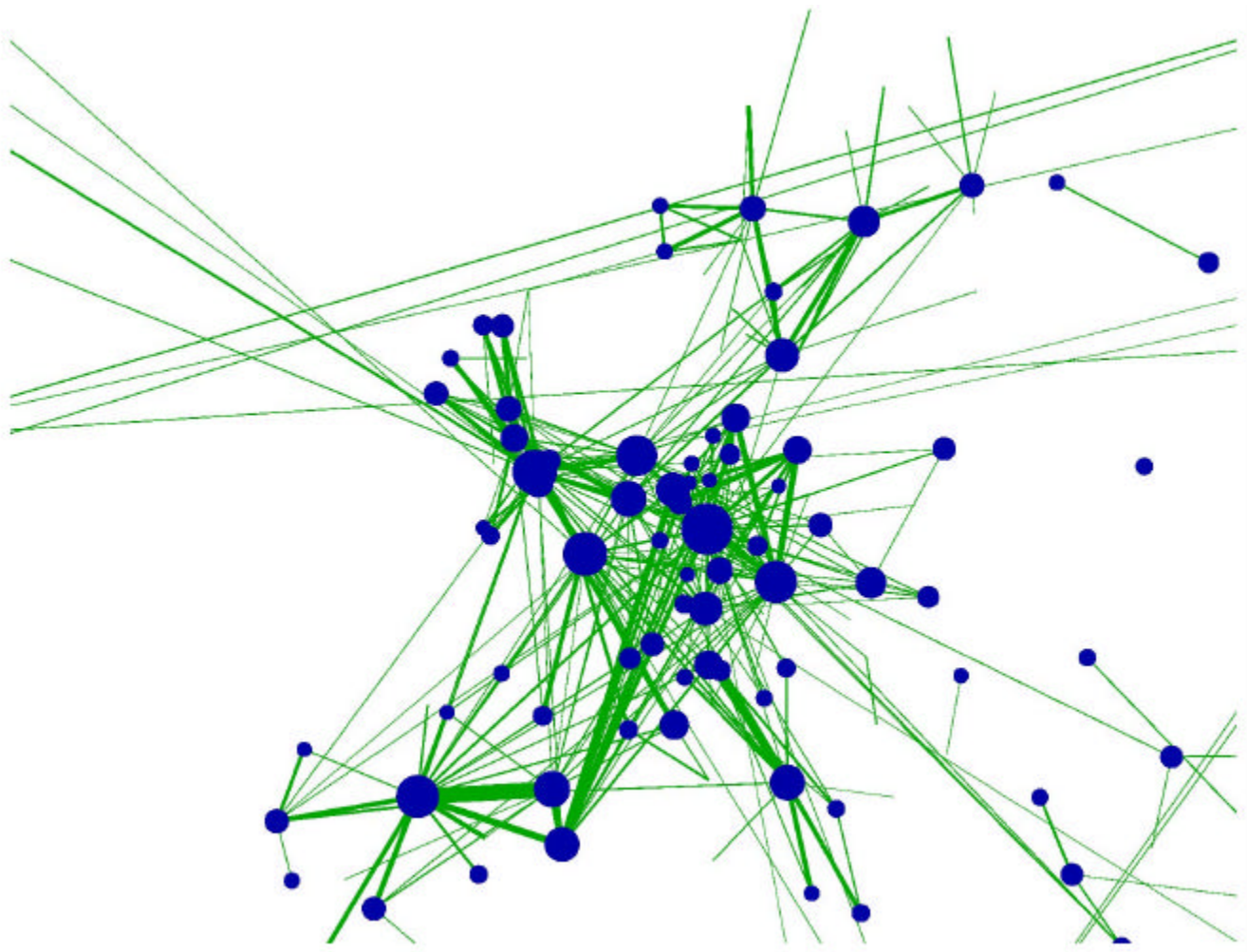- Modelling the total travel demand elasticities with respect to infrastructure supply

National UE assignments (road traffic)

Vrtic
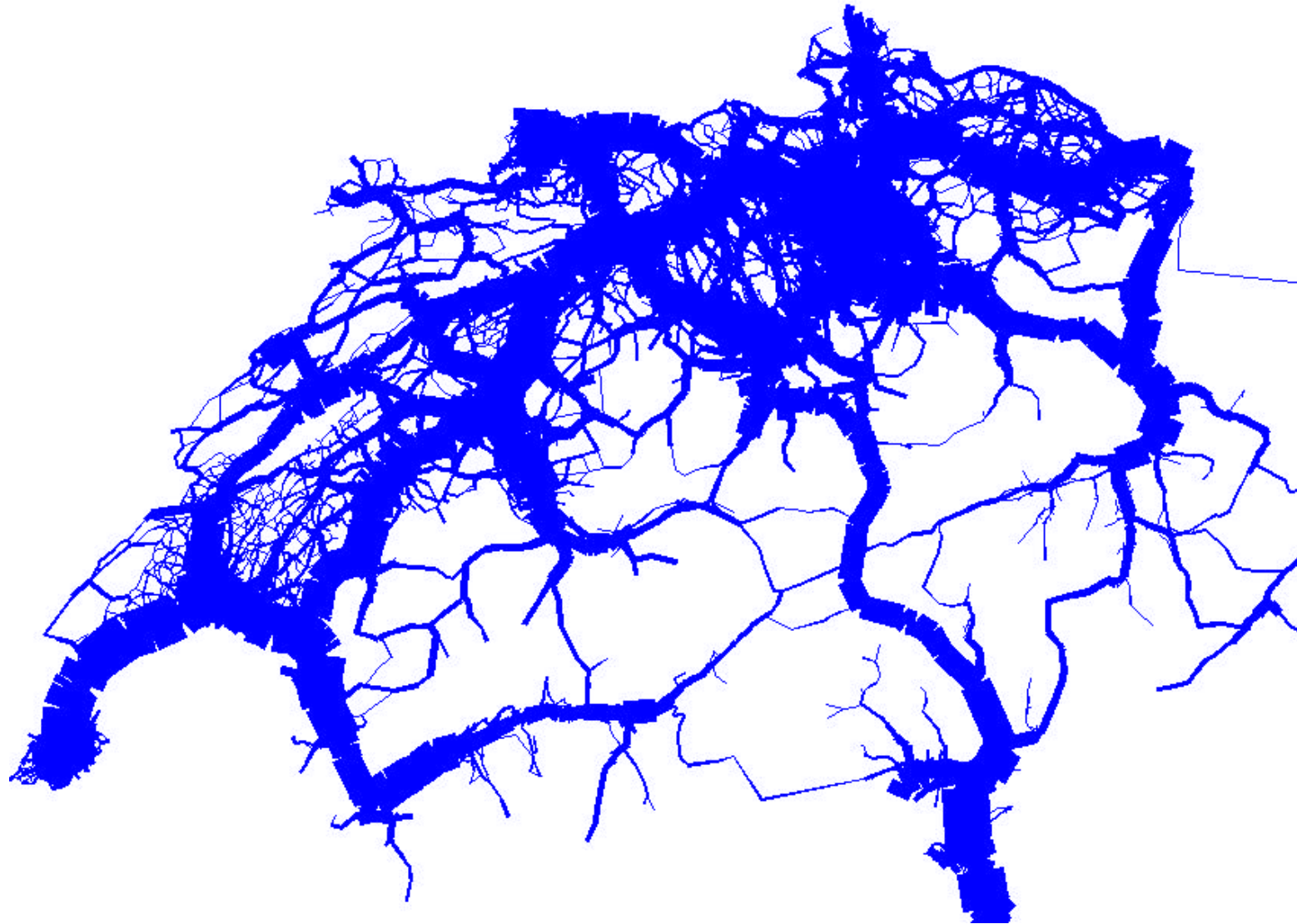
Estimation of the demand matrix (road traffic)

Vrtic

Fröhlich

Circle ~ Number of departures; Band width ~ Number of flights > 10
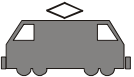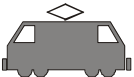
Large scale models

Sophisticated applications using existing tools (VISUM by PTV AG, Karlsruhe):

- Experiments with dynamic aggregate assignments
- Development of logit-based matrix estimation from traffic counts (with Prof. M.G.H. Bell, Imperial College)
- European scale time-table based models (air, rail)

Basic questions:

- Definition of design loads (and standardised demand schedules)

Customised stated-choice experiments

	Alternative 1		**Alternative 2**

You are taking train 1

in -vehicle time :	**29 minutes**
Transfers :	**1 time**
transf er time :	**5 minute**
Headway :	**1 hour**
Comfort :	**regional train**
travel cos :	**3.5 Fr.**

You are taking train 2

in -vehicle time :	: **23 minutes**
Transfers :	**0 time**
transfer time :	**0 minutes**
Headway :	**1 hour**
Comfort :	**ICN**
travel cost :	**4 Fr** .

Your choice ? ☐   ☐

Demand modelling

State-of-the-art choice models:

- Binary mode- and route choice models for Switzerland
- Combined mode and destination choice models for leisure travel
- RPL mode choice models
- Joint choice of car ownership and season ticket ownership

Valuation issues

On-going work using SP/RP data and models:

- Value of travel time savings (with G Abay, M. Bierlaire and J. Bates)
- Value of reliability
- Value of real-time travel information (with M. Bierlaire)

- Support of the VSS working party for the development of a Swiss cost-benefit guideline for road infrastructure investment

Average similarity between activity programmes
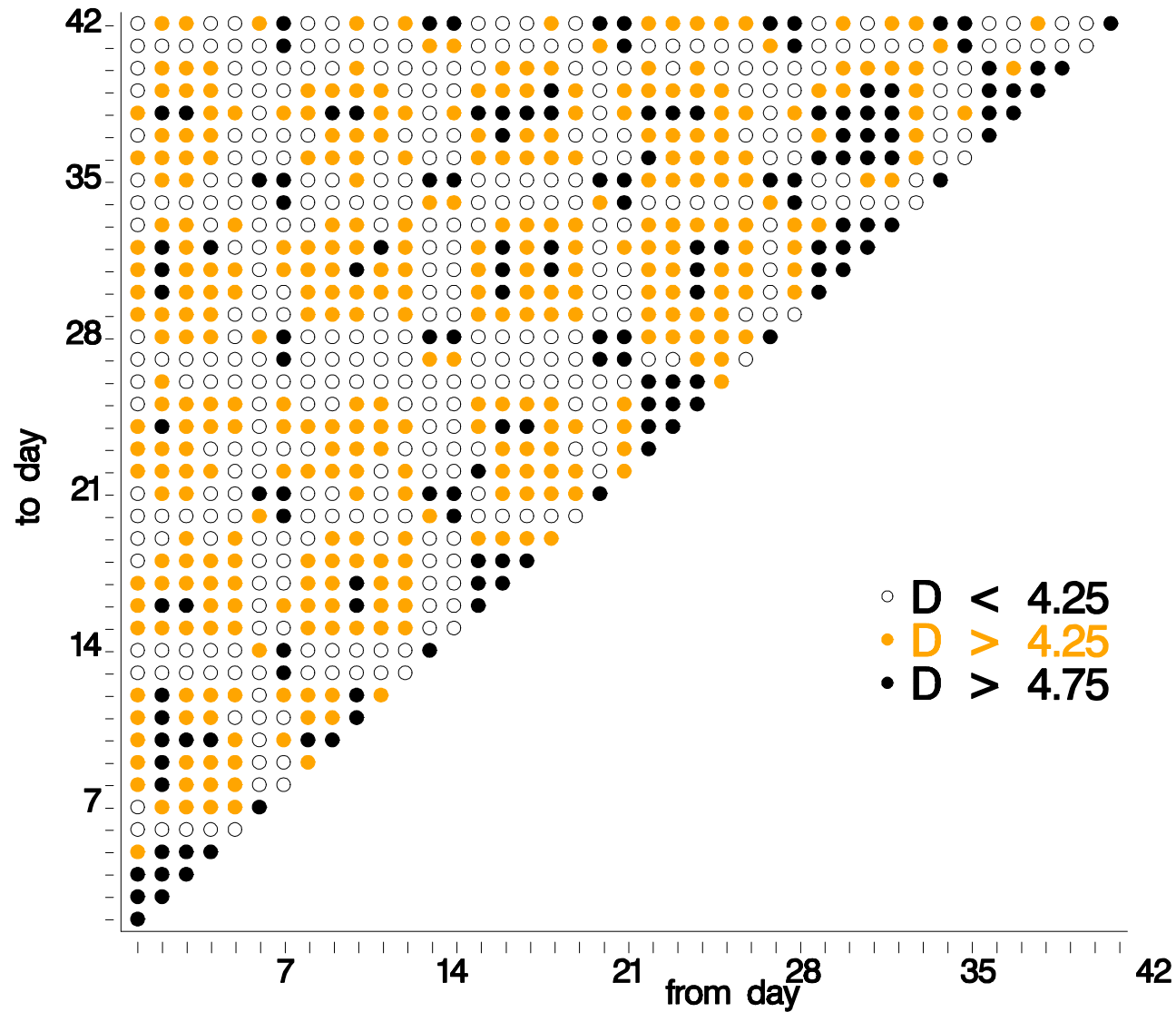
„New leisure locations" (= zip code * detailed purpose)
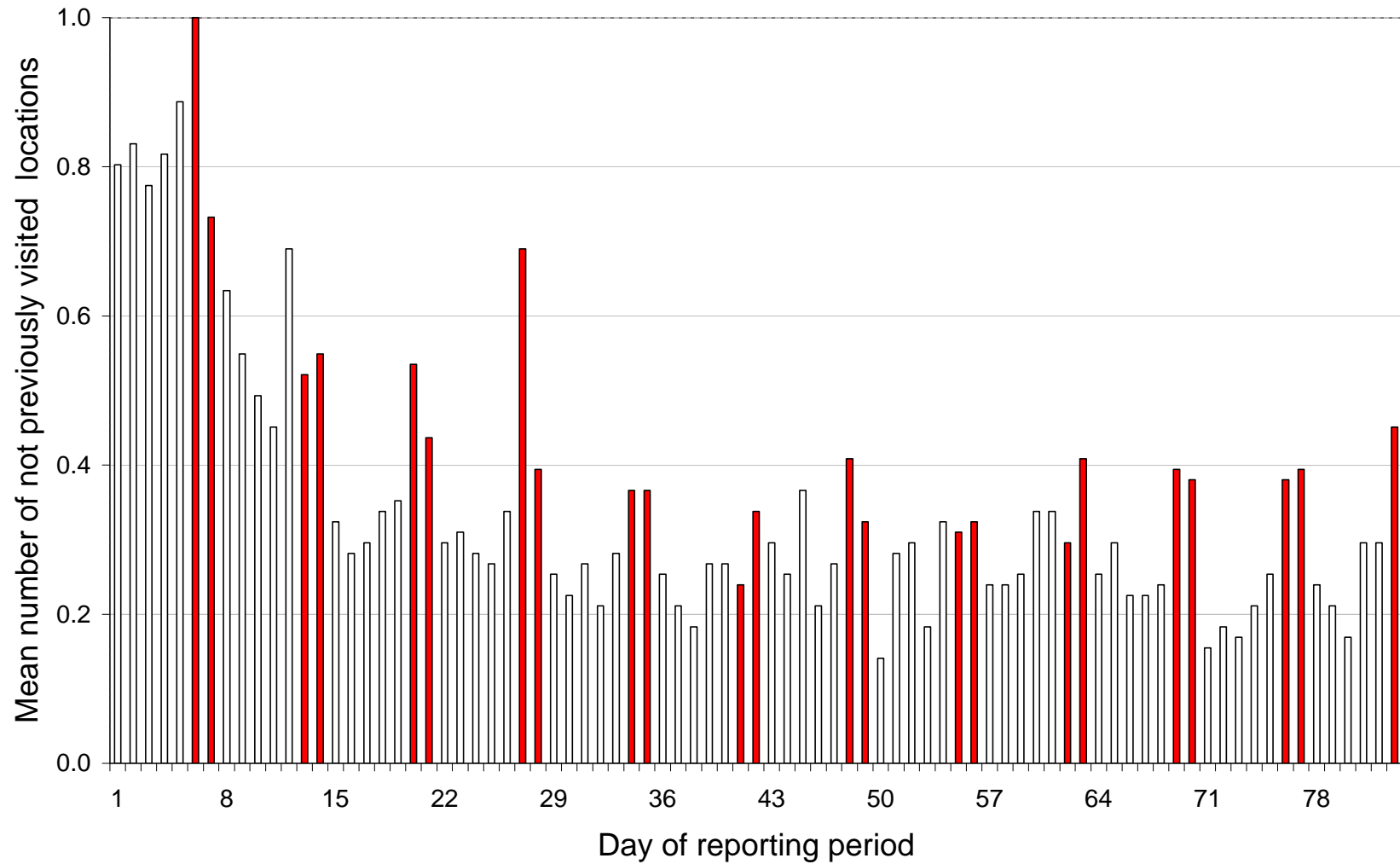
Measures of human activity space
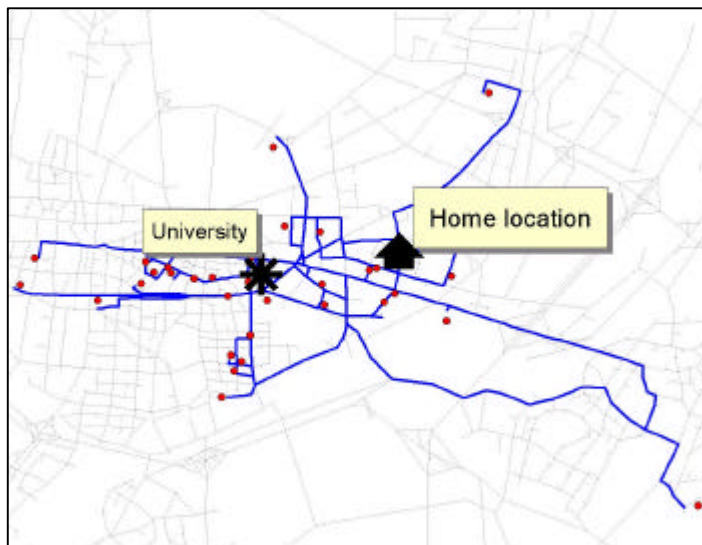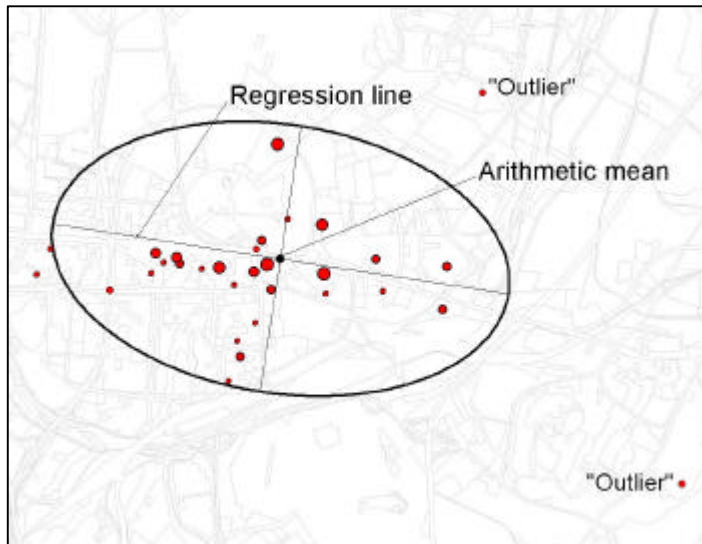
95% Confidence ellipse

Kernel density estimates

Shortest path networks

Travel behaviour

Current projects:

- Measurement of similarity between activity programmes
- Understanding the structure of human activity spaces
- Stability of activity patterns over time

Support activities:

- Data archive using the NESSTAR server software:
www.ivt.baug.ethz.ch/vrp/ethtda.html

Agent-based microsimulation of travel demand

Microsimulation is a standard tool for the modelling of traffic flows

Microsimulation is a standard tool for sample enumeration of probabilistic choice models of travel demand
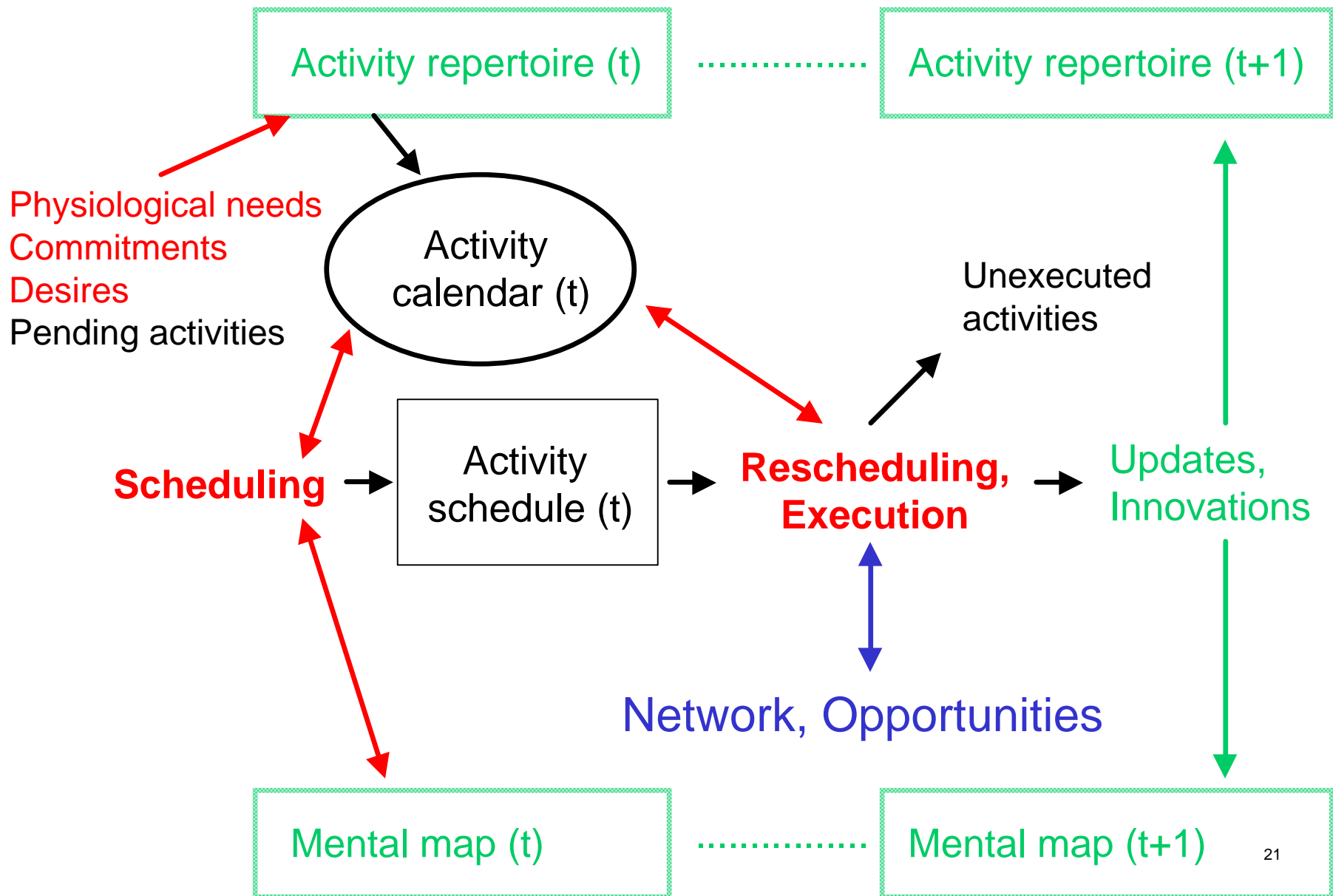
Few working examples with combine both approaches in a consistent and comprehensive manner

Building blocks:

- Fast traffic flow simulations (Prof. Nagel; see www.sim.inf.ethz.ch)

- Agent generator

- Exploration of the effects of learning

Vision of a model of dynamics of daily behaviour

Activity repertoire (t)　·············　Activity repertoire (t+1)

Physiological needs
Commitments
Desires
Pending activities

Activity calendar (t)

Unexecuted activities

Scheduling

Activity schedule (t)

Rescheduling, Execution

Updates, Innovations

Network, Opportunities

Mental map (t)　·············　Mental map (t+1)

Challenges

Scheduling:

- Activity generation over time
- Construction of schedules (utility functions of activity participation)
- Interpersonal bargaining and cooperation

Learning:

- Construction and updating of mental maps
- Formation of expectations

Computing side:

- Speed
- Interaction between agents/synchronisation
- Steady states ?

Outlook

Central issues:

- Measurement of behaviour
- Measurement of social networks and relations

- Activity scheduling
- Valuation of activities and their attributes

- Large scale aggregate models
- Land use - transport interaction

- Behavioural innovation
- System innovation

More information

www.ivt.baug.ethz.ch

-> Verkehrsplanung

-> Publikationen

Appendix: Accessibility surfaces

Current status:

- Network-based travel times distances on the road network using plausible average link speeds

- All Swiss municipalities in the borders of the year 2000

- (log)-sum term of a simple destination choice model with ln(number of residents) and road travel times as the arguments of the utility function

Appendix: VTTS estimation

Approach and current status:

- Customised stated-choice experiments based on the SBB KEP survey

- Tasks: mode choice and route choice; about 1000 respondents

- Current results from MNL estimates using alternative specific variables only (Estimation software BIOGEME by M. Bierlaire)

Appendix: Similarity measurement

Approach:

- A multi-dimensional sequence alignment measure of similarity for discrete sequences, here daily activities by 15 min intervals

- Software CLUSTAL-G and others

Aim:

- Identification of improved approaches to the measurement of the similarity of travel behaviour

Appendix: New leisure locations

Data:

- Continuous 12-week time budget/activity diary; special focus leisure activities

- About 70 persons in Zürich, Opfikon and Männedorf

- Locations geocoded to the post-code level

- „New" = not previously observed combination of detailed activity purpose and post code

Appendix: Measuring activity spaces

Data:

- Continuous 6-week travel diary; 361 persons in Karlsruhe and Halle

Issue:

- Measurement of the activity space: the area of which a person has personal knowledge

Approaches:

- Two-dimensional confidence intervals
- Spatial smoothing/regression using kernel estimators
- Length of the shortest paths between all pairs of locations visited as part of a trip