Implementation of a land use transport interaction model for experimental game simulations

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STRC
Ascona, March 2012
1. **Why modelling land-use**

2. FaLC-Project
   a. Goals / idea
   b. Possible applications
   c. Concept
   d. Partners

3. Next steps

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**Public and privat institutions plan**
What are the effects of these plans

**Testing options** for cantonal and municipal authorities’ intent on e.g. attracting firms or residents:

- improvements in *transport infrastructure*
- designation of *new building zones*
- *tax reductions*

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**Effects of improvements in transport infrastructure**

Real projects according to cantonal directive plans (see Bodenmann, 2011)
Effects of new building zones: additional residents

Scenarios for Eglisau: residents 2015 (Bodenmann et al., 2009)

Effects of new building zones: additional young families

Scenarios for Eglisau: kindergarten pupils 2008-2020 (Bodenmann et al., 2009)
Experimental games with real decision makers

Content

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FaLC (working title)

Software tool for

Facility Location Choice Simulation

FaLC and UrbanSim

UrbanSim is an integrated microsimulation model system for planning and analysis of urban development, incorporating the interactions between land use, transportation, and public policy.

It is intended to explore the effects of

- infrastructure
- policy choices

(www.urbansim.org)
FaLC: Goals + idea

• **Modular** choice model system
• Using just **one database** (avoiding redundant data)

• **Open source** (based on Java – versus Python)
• Connection to **MATSim**
• **Only simulations** – no estimations

• Models adapted to **Switzerland/Europe**
• **No historical ballast** in source code
• Allows **fast runs** for experimental game simulations

• Level of **municipalities** – later city quarters

Questions to be answered: what are the effects of

**Political decisions**
• **infrastructure projects** (roads, public transport)
• Changes of **taxes / incentives**
• Changes of **law / regulatives** (e.g. building zones)

**Economy**
• **Economic crises** (decreasing number of employees needed)
• Changes in **market mechanisms** (land, buildings)
• Location decisions of (very) **large firms**
Questions to be answered: in regard of 1

Demographics
- Number and age of population
- Stage in life cycle: school – employment – retirement
- Income / taxes
- Spatial segregation

Firmographics
- Sectors and size of companies
- Jobs supplied
- Taxes

Questions to be answered: in regard of 2

Social and political goals
- Affordability of land and housing
- Reliability of land and housing market

- Use of public transport
- Traffic congestions
- Distances travelled each day (commuting, leisure)

- greenhouse gas emissions
- protection of open space
Interaction concept: FaLC – MATSim – SUA

FaLC
• Residents
• Households
• Jobs
• Firms
• Buildings
• Land development

Transport
• Accessibility
• Distances

MATSim

SUA Database

Economy
Politics

Facilities
Transport externalities
Building park and use
Environmental externalities
Economic changes
Scenarios

Modelling Transport in FaLC and UrbanSim

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Modelling concept

FaLC tables and agents (2012)
FaLC base models (2012)

**Spacial, economic and sociocultural framework**

- Demographic events model
- Household change model
- Household choice model
- Household transition model
- Household relocation model
- Household location choice model
- Building park transition
- Transport simulation

**Persons**

- Job change model
- Workplace choice model

**Firm**

- Firm transition model
- Firm relocation model
- Firm location choice model

**Household**

- Household change model
- Household choice model

**Location**

- Probabilistic models
- Discrete choice models
- Complex models

**Agents**

- Geography
- Sociocultural values
- Economy
- Politics
- Authorities
- Investors
- Developers

**Tables**

- Models
FaLC base models: model types (2013+)

Spatial, economic and sociocultural framework

- Demographic events model
- Household change model
- Household choice model
- Household transition model
- Household relocation model
- Household location choice model
- Transport simulation
- Building park transition
- Building transition model
- Building (re-)construction model

- location
  - person
  - firm
  - household
  - quarters
  - building
  - land development

- geography
- sociocultural values
- economy
- politics authorities
- investors
- developers
- agents
- tables
- models
- Model options

Economics and money flows

- Real estate price model
  - Sub-model: Urban shape options
  - Sub-model: dwelling cooperatives

- Partners

  - ETH
  - Eidgenössische Technische Hochschule Zürich
  - Swiss Federal Institute of Technology Zurich

  - regioConcept AG
  - Raum + Verkehrsentwicklung

  - Further partners would be appreciated
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Next steps

- Start of SUA-Project 04/2012
- Concept FaLC 05/2012 (paper)
- Implementation core of FaLC 12/2012 (paper)
- Modell of Switzerland (municipalities) 12/2012 (paper)
- Spatial regressions of e.g. speed, loadings 2012- (paper)
- Zurich case study for SUA 12/2013 (report)
- Game simulation (regioConcept) 12/2013
- Connection to MATSim 2013-
- Other enhancements 2013-
Thank you for your attention

Literature