Preferred citation style for this presentation

Erath, Alex (2013) Activity based modelling, accessibility and high rises, Digital Fabrication Seminar input lecture, Future Cities Laboratory, March 2013.
Activity based modelling, accessibility and high rises

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March 2013
Principles of agent-based transport modeling
Agent-based transport demand modeling and simulation with MATSIM

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5 million agents

70,000 travel diaries
7 days of EZ Link Data

80,000 home locations

79,635 links

10 desktops = 1 server

648 count stations

3.3 activities per agent

630,000 cars

2.3 million places of work

362 lines

1 day = 50 minutes
A morning in Singapore with MATSim

http://vimeo.com/55004446
What do we know about activities?

Travel diary

- Household interview travel survey (HITS)
- 1% of Singapore’s resident population
- Only trips > 500m
- Underreporting of short activities, e.g. lunch, shopping
What do we know about activities: example Singapore
What do we know about activities?

Travel diary
- Only trips > 500m
- Underreporting of short activities, e.g. lunch, shopping

Location of main activities
- Home and work location from censuses
- Connection between home and work location according to observed patterns
What do we know about activities

Home

Work, primary, secondary, tertiary, other
What do we know about activities?

Travel diary
  Only trips > 500m
  Underreporting of short activities, e.g. lunch, shopping

Location of main activities
  Home and work location from censuses
  Connection between home and work location according to observed patterns

Location of secondary, ‘in-between’ activities
  Dependent on main activities
  Within time space prism
What do we know about activities
Change of scale: with MATSim

Fig. 9. City of Zurich with traffic flows at 08:15 a.m.

Fig. 10. Shopping center with traffic flows at 08:15 a.m.

Fig. 11. Shopping center with traffic flows at 12:00 p.m.

Measuring space and opportunities: accessibility

Simplest form: \( A_i = \sum_{j=1}^{n} d_{ij} \)

With distance threshold \( A_{id} = \sum_{d} O_d \)

As distance weighted sum \( A_i = \sum_{d} \frac{O_j}{d_{ij}^{\beta}} \)
Measuring space and opportunities: accessibility

Change of number of opportunities

Change of layout

Change of spatial form

Measuring space and opportunities: graph based approaches


Figure 4.51 Three houses by Wright: (a) Life house, 1938; (b) Ralph Jester house, 1938; (c) Vigo Sundt house, 1941; (d) access graph for the three projects. The dotted lines refer to the additional bedroom, B, in the Sundt house.
Basic idea of Space Syntax

Depth is a ‘system metric’ and varies from place to place in the spatial layout.

Using colours to represent numerical values provides an effective visualisation of simultaneous relations in spatial layouts.

Space Syntax applied to city street network

Basic idea of Space Syntax I: Angle turn count

Shortest path/least metric distance?

Simplest path/least angle change?

Space Syntax: comparison with economic activity

Another measure, similar result: betweenness

Space syntax and agent-based modelling
Visibility and location choice within a shopping centre

Different activities in a highrise: downtown athletic club

- Downtown Athletic Club, seventh floor: interior golf course.
- Downtown Athletic Club, 12th floor: swimming pool at night.

Mainly monofunctional activities in a highrise: Pinnacle @Duxtion
Wrapp up: type of activity and patronage

Mandatory activities
   Frame our daily lives
   Repetitive activities
   Different patronage densities for home/work/education

Planned secondary activities
   Having lunch, daily shopping and leisure activities
   Conscious decision making
   Bring people together

Induced secondary activities
   Performed because of convenient opportunity, e.g. beer at the pub, lunch in the park
   Subconscious decision making
   High activity density -> make a lively environment
   Bring even more people together