Overview

• What is the need for transport analysis in GIS?

• Transport network modelling

• The Tyndall and ARCADIA Projects
  • An overview of the project
  • Modelling transport in GIS
  • What questions can we answer?
  • Other models

• Future tools which will be available
Modelling transport in GIS

*Transport modelling a well-developed field*

- Many powerful commercial models
- Simulations of traffic and network performance
  - Micro models of individual junctions
  - Macro models of whole transport networks
- Models are expensive and complex to run
- Sometimes a more simple solution is needed!
GIS Network Analysis

*Most commercial GIS software support networks*

- Can analyse nodes and links
- Many applications
  - Transport
  - Utilities
- Research at Newcastle
  - Developing transport analysis in GIS
  - Tools for analysts and decision-makers
The Tyndall Cities Programme

*Transport modelling for Climate Change options*

- Assess the possible impacts of Climate Change
  - What might future damage and disruption be?
- Testing possible adaptation and mitigation
  - Assess the suitability of interventions
- The Urban Integrated Assessment Facility
  - Consider many aspects simultaneously
- Transport modelling in GIS a key component
Urban Integrated Assessment Facility

Interface for testing of policy options

Working with key London stakeholders

Demographic scenarios

- Climate impacts assessment and adaptation planning
  - Temperature
  - Precipitation
  - Sea level rise
  - Storm surge

Greenhouse gas emissions assessment module

- Multi-sectoral emissions accounting tool
- Detailed sub-modules for transport (personal and freight)
- Analyse of city-scale energy policies

City-scale climate scenarios

MDM-E3 Multi-sector city-scale economics module

- Dynamic resource interactions between sectors
- Specialist energy sector module

Land use and spatial interaction module

- Employment
- Multi-modal transport
- Developed land cover
- Population
- Land use planning constraints and attractors

Climate impacts assessment and adaptation planning

Analyse risks of
- Flooding
- Drought
- Urban heat and health impacts

Test adaptation options

Urban Integrated Assessment Facility

Transport for London

Environment Agency

Mayor of London
Land-use Transport Model

Simulating future population through interactions

\[ \rho_{ij} = f(A_j, c_{ij}, \mu) \]
Modelling Transport Modes

*Four different modes of travel*

- Road transport
  - Individuals incur costs from driving
- Rail transport
  - Heavy and light rail services, stations and lines
- Bus transport
  - The major bus routes in Greater London
- Travel times modelled through GIS networks
  - Further development at NCL...
Accessibility costs

- Travel time only one component of cost
- Generalised cost of travel computed

\[ G_{\text{car}} = (V_{wk} \times A) + T + D \times \frac{VOC}{(occ \times VOT)} + \frac{PC}{(occ \times VOT)} \]

- Represent accessibility between places
- Monetary, spatial and societal costs of travel
- Drive the model of population
Road costs

Minutes
- 0.0 - 50.0
- 50.01 - 75.0
- 75.0 - 100.0
- 100.0 - 130.0
- 130.0 - 180.0
Light rail

Minutes
- 0.0 - 100.0
- 100.0 - 150.0
- 150.0 - 200.0
- 200.0 - 250.0
- 250.0 - 370.0
ARCADIA

- Building on Tyndall Cities work
- More advanced modelling
- Feedbacks between models
- More sophisticated transport
  - Integrated networks
  - Modal interchanges
  - Capacity and congestion
  - Network disruption
  - Delays as costs to business
Modelling a wider region
Mapping flows to networks
Transport Disruption
Other models

- Modelling land-use change
- Finescale grids of development
- Driven by models we’ve seen
- Allow further impact assessment
  - Flooding of buildings
  - Urban heat
  - Air quality
On-going engagement

• Very strong stakeholder focus throughout
  • Drive and direction
  • Secondments with agencies
  • Results, reports, models and key findings
• London-centric up to now
• Generic tools and approaches
  • Nationally-available datasets
  • Free tools
• Developing an open-source framework
  • Aimed at decision-makers and analysts
Thank you

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