First Thoughts for the Orchestration of Generalisation Methods on Heterogenous Landscapes

Guillaume Touya
COGIT Lab IGN France

PhD Supervisor : Anne Ruas
Co-supervisor : Cécile Duchêne
Outline of the presentation

• Objectives

• Key problems of orchestration
  • Identify relevant geographic spaces
  • Find out orchestration techniques
  • Manage side effects
  • Ensure harmony et interoperability

• The test protocol

• Conclusion and further work
Goal of the PhD:

- Design a generic orchestration model for generalisation models and processes on relevant geographic spaces
- Generalisation = \{ (Space_i, Process_j) \}_{i,j}
  
  where Process = generalisation process or side effects process
- Base conclusions on practical tests
Many different generalisation models and approaches

<table>
<thead>
<tr>
<th>Generalisation Model or Approach</th>
<th>References</th>
<th>Examples of Relevant Geographic Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT</td>
<td>(Ruas 99)</td>
<td>Urban spaces</td>
</tr>
<tr>
<td></td>
<td>(Barrault et al 2001)</td>
<td>Mountain roads</td>
</tr>
<tr>
<td>Elastic Beams</td>
<td>(Bader 2001)</td>
<td>Road overlapping conflicts</td>
</tr>
<tr>
<td>Least Squares Adjustment</td>
<td>(Sester 2000)</td>
<td>Not too dense spaces</td>
</tr>
<tr>
<td></td>
<td>(Harrie 2001)</td>
<td></td>
</tr>
<tr>
<td>CartACom</td>
<td>(Duchêne 2004)</td>
<td>Rural spaces</td>
</tr>
<tr>
<td>GAEL</td>
<td>(Gaffuri 2008)</td>
<td>Particular relief spaces</td>
</tr>
<tr>
<td>Stochastic Model</td>
<td>(Ware et al 1998)</td>
<td>Roads and buildings spaces</td>
</tr>
<tr>
<td></td>
<td>(Monnot et al 2007)</td>
<td></td>
</tr>
<tr>
<td>Machine Learning</td>
<td>(Mustière 2001)</td>
<td>Spaces with similar patterns</td>
</tr>
<tr>
<td></td>
<td>(Neun 2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>
Outline

• Objectives

• Key problems of orchestration
  • Identify relevant geographic spaces
  • Find out orchestration techniques
  • Manage side effects
  • Ensure harmony et interoperability

• The test protocol

• Conclusion and further work
Key problems of orchestration
Identify relevant geographic spaces

- Spaces deduced from knowledge on models

Ex. : AGENT is relevant for urban spaces
Key problems of orchestration
Identify relevant geographic spaces

- Spaces deduced from knowledge in generalisation

Ex. Forested spaces
Key problems of orchestration
Identify relevant geographic spaces

• Emerging spaces:

Ex.: Remaining conflicts after CartACom process

Conflicts: space emergence
Key problems of orchestration
Find out orchestration techniques

How to automatically associate and sequence spaces and processes?

• Multi-Agents System

YELLOW PAGES
• AGENT: urban spaces, roads
• CartACom: rural spaces
• GAEL: mountains
• Veget. Proc.: vegetation
• …

• Other techniques: workflows [Petzold et al. 2006], web services chaining [Lemmens 2006], stochastic methods [Ware & Jones 1998]…
Key problems of orchestration
Side effects management

Without side effects management

When to trigger? How?

Process 1

Process 2

After Process 1

After Process 2

Process 1

Process 2
Key problems of orchestration
Ensure harmony and interoperability

• The problem of harmony (homogeneity of treatment)

• The problem of interoperability
  ex. : AGENT → constraints

  Least squares → equations

  A common solution

• Ontological base of generalisation constraints

• Translation tools for inputs/outputs from/to the base of constraints

• Formalise, model constraints : "a building should be bigger than 300 m²"
Components and resources of the proposed orchestration model

Orchestration model

- Geographic Spaces Detection and Characterisation
- Geometric Spaces
- DB

Sequencing Component

- Parameterises
- Triggers
- Consults
- Describes

Generalisation Processes

Process Description

Constraints Ontological Base

Side Effect Management

Operate on

Triggers

Analyses

Contains

Chooses
Outline

• Objectives

• Key problems of orchestration
  • Identify relevant geographic spaces
  • Find out orchestration techniques
  • Manage side effects
  • Ensure harmony et interoperability

• The test protocol

• Conclusion and further work
The Test Protocol

• Manual sequences of application of models on predefined spaces
• Aim of the test : Learn on
  • the relevant spaces
  • process sequencing
  • emerging behaviours
  • side effects

• On the same platform (Clarity) :
  • AGENT [Barrault et al 2001]
  • CartACom [Duchêne 2004]
  • GAEL [Gaffuri 2008]
  • Elastic Beams [Bader 2001]
  • Vegetation Generalisation [Touya et al 2007]
  • Roundabout Typification [Touya 2007]
  • Least Squares Adjustment [Harrie 2001]
The Test Protocol

Tester

| data | TEST | Generalised data |
| constraints | | Manually obtained sequence |

Generalisation Result

<table>
<thead>
<tr>
<th>0..*</th>
<th>0..*</th>
<th>1..*</th>
<th>ordered sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographic Space</td>
<td>Process Application</td>
<td>Process Sequence</td>
<td>Process</td>
</tr>
</tbody>
</table>

Geographic Structure

Geographic Object

Side Effects Process

Generalisation Process
Conclusion

• Model orchestration rather than a brand new model

• 4 key problems identified:
  • Identify relevant geographic spaces
  • Find out orchestration techniques
  • Manage side effects
  • Build an ontological base of constraints

• A test protocol designed
Further Work

• Tests set-up (CartACom and Least Square migration,…)

• Carry out the tests

• Tests analysis

• Constraints ontological base modelling

• Orchestration modelling
First Thoughts for the Orchestration of Generalisation Methods on Heterogenous Landscapes

THANKS FOR YOUR ATTENTION!