Using open-source tools for the simulation of urban transportation systems

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Outline

• Introduction
• Related work
• System architecture
• Simulator prototype
• Conclusion
Context

- **Transport systems**
  - Increasingly complex.
  - Incorporate: technological, sociological and political components.

- **A simulation tool**
  - to help urban transportation policy makers to analyze and evaluate the impacts of regulatory strategies.
  - use existing open-source tools
Problematic

• The development of transportation systems
  ▫ Software architecture supporting configuration and adaptive regulation
  ▫ Integration of temporal and spatial aspects.

• The development of a decision support simulator
  ▫ Modeling of transportation infrastructure
  ▫ Simulation of users’ behavior
  ▫ Analyzing the impacts of regulatory strategies
Outline

• Introduction
• Related work
  ▫ Transportation systems
  ▫ Multi-agent systems
• System architecture
• Simulator prototype
• Conclusion
Transportation systems (1)

- *Criteria for designing our simulator*
  - Support for scenarios.
  - Specification model, simulation granularity, modeling and simulation technology.
  - Integration and processing geographic information.
  - Parking.
  - Multimodal transport.
  - Attraction point.
Transportation systems (2)

- **Application in the transportation field**
  - ARCHISIM (Espié, 2004)
  - MobiSim (Antoni, 2011)

TRANSIMS (Nagel, 2001; Hobeika & al., 2004)  MIRO (Lang & al., 2007; Antoni, 2011)
Transportation systems (3)

- **Synthesis**

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<th>Granularity of simulation</th>
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<th>GIS</th>
<th>Multimodal transport</th>
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## Multi-agent platforms (1)

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Multi-agent platforms (2)

- **GAMA**
  - a simulation platform, open-source.
  - developed by French and Vietnamese research teams IRD UMMISCO & Partners.
  - providing a complete modeling and simulation development environment for building spatially explicit agent-based simulations.
  - [http://gama-platform.googlecode.com](http://gama-platform.googlecode.com)
Outline

• Introduction
• Related work
• **System architecture**
  ▫ Layered approach
  ▫ Architecture of the simulator
• Simulator prototype
• Conclusion
Layered approach
Architecture of the simulator


* INSEE: French National Institute of Statistics and Economic Studies
**BD TOPO – IGN : Topographic Database – French National Geographic Institute
Outline

• Introduction
• Related work
• System architecture
• **Simulator prototype**
• Conclusion
Simulator prototype

- Case study
- Simulation of individual movements
Case study

- La Rochelle
- Data source
  - INSEE
  - EDVM
  - BDTopo 2 – IGN
Individual profile

**in the temporal dimension**

- Home
- Work/Study

**Other activities**: Accompaniment, leisure, purchasing …

**in the spatial dimension**

- Entry point
- Exit point
- Internal agent move only in SA
- Internal agent move outside
- External agent
Analysis of data (1)

- **Tools**
  - OrbisGIS 3.0.1
  - LibreOffice
OrbisGIS (1)

- Geographical Information System
- IRSTV
- Manipulate and create vector and raster spatial data
- Open source software
- www.orbisgis.org
OrbisGIS (2)

- Process the geographical data of BD TOPO
  - Road infrastructure (road, path)
  - Buildings
## Analysis of data (2)

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Analysis of data(3)

- **Blue**: Residence
- **Red**: Work
- **Pink**: Study
- **Green**: Remarkable
Simulation of individual movements

- GAMA platform
- Roads, buildings of La Rochelle
- 10000 individuals

+ Blue: Residence
+ Red: Work
+ Gray: Other building
+ Yellow: Individual
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Conclusion

• For transportation systems
  ▫ presented a system architecture which enabled us to configure and control the simulator.

• Besides a decision support simulator
  ▫ the modeling of a transportation infrastructure was addressed.

• Used open-source tools: LibreOffice, OrbisGIS, GAMA platform.

• Prototype for individual movements in the city of La Rochelle using the GAMA simulation platform.
Future work

• the integration of the multimodal transportation into our simulator.
• improvement of the activity plan for each individual.
Thank you for your attention!

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