

Bridging the Gap between LBS, GeoVisualisation, and Decision Support

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Modern trends in geovisualisation

- Maps are used for data analysis, problem solving, and decision making

Instruments:

- ✓ Interactive & dynamic maps
- ✓ Simultaneous consideration of multiple linked displays
- ✓ Combination of visualization with computational methods (multiple-criteria decision making, data mining, statistics)

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Example 1

➤ Analysis of spatial time series (US crime)





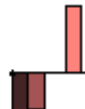

1. Animated map
2. Data transformation => {Animated} change map
3. Time diagrams

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Example 2

➤ Spatial multi-criteria decision making

	Option A	Option B
Initial appearance of the symbols (no comparison)		
Comparison to option A		
Comparison to option B		

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Example 2

➤ Spatial multi-criteria decision making

1. Diagrams
2. Interactive computations
3. Dynamic query with immediate visual feedback
4. Visualization that facilitates comparison of options

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- *Slow CPU*
- *Small amount of RAM*
- *Small screen size, low resolution*
- *Limited interaction possibilities*
- *Low bandwidth*

Technology is rapidly developing, so these problems will be solved soon

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Mobile services are widely used

- Navigation information
- Calculating optimal route
- Overview of closer surrounding
- Information about specific objects
- Field data collection (verification, update)
- On-line information access

Decision support?

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Why only Location-BS ?

- Information about a history of positions and actions of the person can be used for making the mobile services more focused and useful:
 - Current time
 - Speed and duration of the movement
 - Moments and locations of stops
 - Usual preferences and behaviour of the user
 - ...

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Scenario: informed decision making

- Typical task: find a suitable hotel
- General procedure:
 1. Specify preferences and constraints
 2. Request a list of suitable options from server
 3. Select some {best} options for detailed study (request additional information, display map, proceed with booking a room, calculate route etc.)

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Problems

1. What price is reasonable for a hotel room in Vienna in January? ... **Statistics**
2. What hotels are close or well connected by public transport to TU Vienna? ... **Geocomputations**
3. Strict query => no options to select from; relaxed query => hundreds of options ... **Dynamic query**
4. Multiple conflicting criteria! ... **MCDM, sensitivity analysis, tolerance**

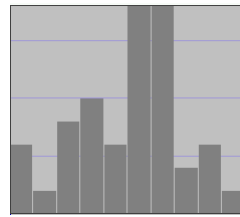
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More flexible procedure - 1

1. Request statistics of distribution of values of the decision criteria from server

2. Study distribution of values for deciding about feasible values of individual criteria

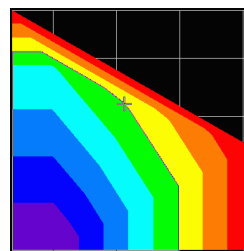


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More flexible procedure - 2

3. Analyse trade-offs between the criteria



4. Formulate a query, request results.
Tolerance!

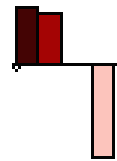
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More flexible procedure - 3

5. Specify a feasible goal (values of multiple criteria)

6. Find options close to the goal and analyze them using maps and other visualizations



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Discussion

- We adapted the highly interactive and dynamic method so that it can be implemented in a mobile environment:
 - Small amounts of client-server communication
 - Modest requirements to CPU, RAM, screen size
 - Limited interaction
- Similar adaptations could be done for other methods

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Conclusions

- Modern geovisualization creates new exciting opportunities for mobile users
 - Context- & Task-based dynamic displays
 - Decision support
- New research questions:
 - What are possible tasks and scenarios?
 - How existing methods can be adapted for mobile usage?
 - What methods are missing?
 - How uses can be educated?

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