Road Network Selection for Small-Scale Maps Using an Improved Centrality Approach

Roy Weiss & Robert Weibel

ICA Workshop on Generalisation and Map Production
Dresden, Germany, 2013
Recap

• Development of an automatic **road network selection** approach
• Input: 1:5,000 – 1:25,000 (TLM3D)
• Target: **1:200,000**
• Stroke-based Centrality Approach used as a basis *(Jiang & Claramunt, 2004)*
Recap

Dual Graph

Jiang et al. 2008

- Junctions or ends
- Strokes / Roads
Centrality

- Degree
- Closeness
- Betweenness

Freeman (1978)
1. Stroke Generation

• Original stroke approach based on the principle of good continuation
• Concatenation based on exact road type is too restrictive
• Developed stroke generator uses a multi-step comparison to allow concatenations between different road types
1. Stroke Generation

- Freeway
- Expressway
  - Entry
  - Exit
  - Access-Road
    - Highways

- 10m Street
- 8m Street
- 6m Street
  - Major Roads
    - 4m Street
    - 3m Street
      - Minor Roads

- 2m Path
- 2m Path Fragment
  - Paths

- 1m Path
- 1m Path Fragment
  - Marked Track
  - Trails
1. Stroke Generation

- Concatenations only between segments of same group
- Different angle thresholds
- Specialized comparator for very mountainous regions
1. Stroke Generation

Basic

Improved
2. Roundabout elimination

- Roundabouts disrupt strokes.
- They are usually completely contained in single strokes.
- Jointly developed algorithm detects and collapses roundabouts.
2. Roundabout elimination
3. Adaptive Threshold

- Roads in urban areas tend to have higher centrality values, resulting in higher road network densities.
- After an initial selection, the algorithm extracts dense regions (DBSCAN) and adapts the thresholds for the contained roads.
3. Adaptive Threshold
4. Reconnection of dead-ends

• Stroke-based selection algorithms create new dead-ends

• Especially in small-scale (1:200,000) maps, dead-ends should only exist for very specific reasons (e.g. access-roads)

• Algorithm detects and reconnects dead-ends
4. Reconnection of dead-ends
Summary

• Purely stroke-based centrality approach is able to select most of the relevant roads for the intended target scale
• Several problems inherent to the basic approach were identified and solutions to them implemented
• The inclusion of these extensions improve the result
• Achieved results were rated as good according to swisstopo cartographers
Questions?
References

