Visual Abstraction and Stylization of Maps

Tobias Isenberg
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What is this talk/project about?
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abstraction
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visual abstraction
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interactive & exploratory
visual abstraction
What is this talk/project about?

interactive & exploratory visual abstraction

disclaimer: this is not about new graphics algorithms, but about using existing ones for a visual goal
Abstraction in NPR/Expressive Graphics

Curtis et al., 1997
Hertzmann, 1998
Hausner, 2001
Abstraction in NPR/Expressive Graphics

Luft & Deussen, 2006

DeCarlo & Santella, 2002
Abstraction in NPR/Expressive Graphics

Mi et al., 2009
Inspiration: Substrate simulation by Tarbell

http://www.complexification.net/gallery/machines/substrate/
Inspiration: (Old) Artistic Map Depictions
Abstraction in Cartography

- abstraction based on scale level
- show more or less detail
- show elements (e.g., streets) wider than they are in reality
- elements are shown/hidden depending on a map’s purpose
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Input Data & Its Characteristics

• map data from OpenStreetMap
• graph of polygonal streets.paths and shape elements
• geographic and political elements
• data not always consistent/correct
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Constraints for the Abstraction

- data: polygonal network
- no inside/outside
- ordered sequence of abstraction steps
- abstraction not by quantitative quality but by visual effect: not only simplification but relocation
- iterative application & interactive exploration

Mi et al., 2009
Abstraction by Progressive Meshes

Hoppe, 1996
Abstraction by Progressive Meshes
Abstraction by Ramer-Douglas-Peucker

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Abstraction by Ramer-Douglas-Peucker
Abstraction by Force Direction
Abstraction by Orthogonalization

Composition with Yellow, Blue and Red (1937–42) by Piet Mondrian (1872–1944)
Abstraction by Orthogonalization
Realization to Match Visual Inspiration
Realization to Match Visual Inspiration

random portion

constant portion
Realization to Match Visual Inspiration

random portion

constant portion
Realization to Match Visual Inspiration

random portion

constant portion
Realization to Match Visual Inspiration

random portion

constant portion
How to use the different elements together
Interactive Visual Abstraction: Demo
Some Examples & Insights
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Limitations and Further Thoughts

• **visual** abstraction limited by data
• currently only line primitives; would like other shapes
• application of shading limited by data encoding
• practical limitation: size of map downloads (OSM API)
• practical limitation: only most detailed scale level available
• practical limitation: interactive control could be better; would like to go back and forth
But what does this all mean?

• does it have a practical use? – as such probably not really
• do you get aesthetic results? – in the eye of the beholder
• is it fun? – I believe so, started as a fun side project
• can I try it out? – yes, go to: http://tobias.isenberg.cc/VideosAndDemos/Isenberg2013VAS
• can we learn something from it? – I think so:
  – dedicated control of abstraction in expressive graphics
  – the many forms of abstraction and their capabilities/limitations
• is it useful? – maybe …
Future Work = Past Work: Bristle Maps

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Thanks

- url & tool: http://tobias.isenberg.cc/VideosAndDemos/Isenberg2013VAS

- I’d love to hear about & see your results