A COMPARISON OF METHODS FOR AUTOMATIC GENERALIZATION OF CONTOUR LINES GENERATED FROM DIGITAL ELEVATION MODELS

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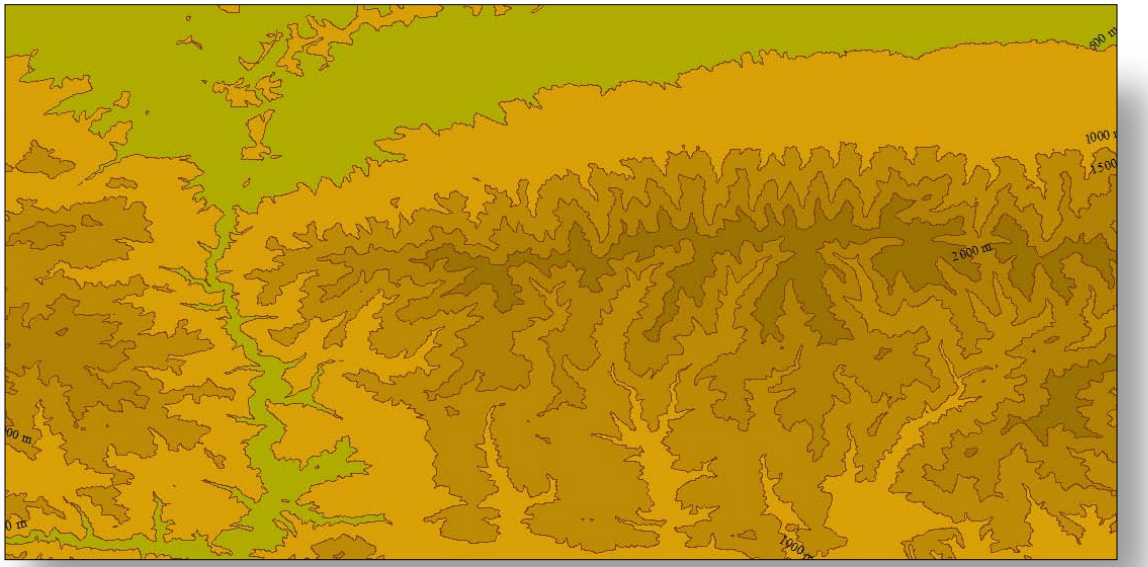
Motivation and workflow

- Creating contour maps for printing
  - Using free terrain data for contour lines
  - Making contour maps at different scales
  - Using line simplification algorithms
    - Comparing Douglas – Peucker algorithm to linear regression (using for line simplification)
    - Representation the simplified, broken polylines with curves- aesthetics requirements
  - Testing various file formats for data storage and data interchange

Sources of data

- SRTM 90 v. 4: 3 arc seconds spatial resolution
- Generating contour lines in a GIS software
- Writing own program for generalizing and curve fitting

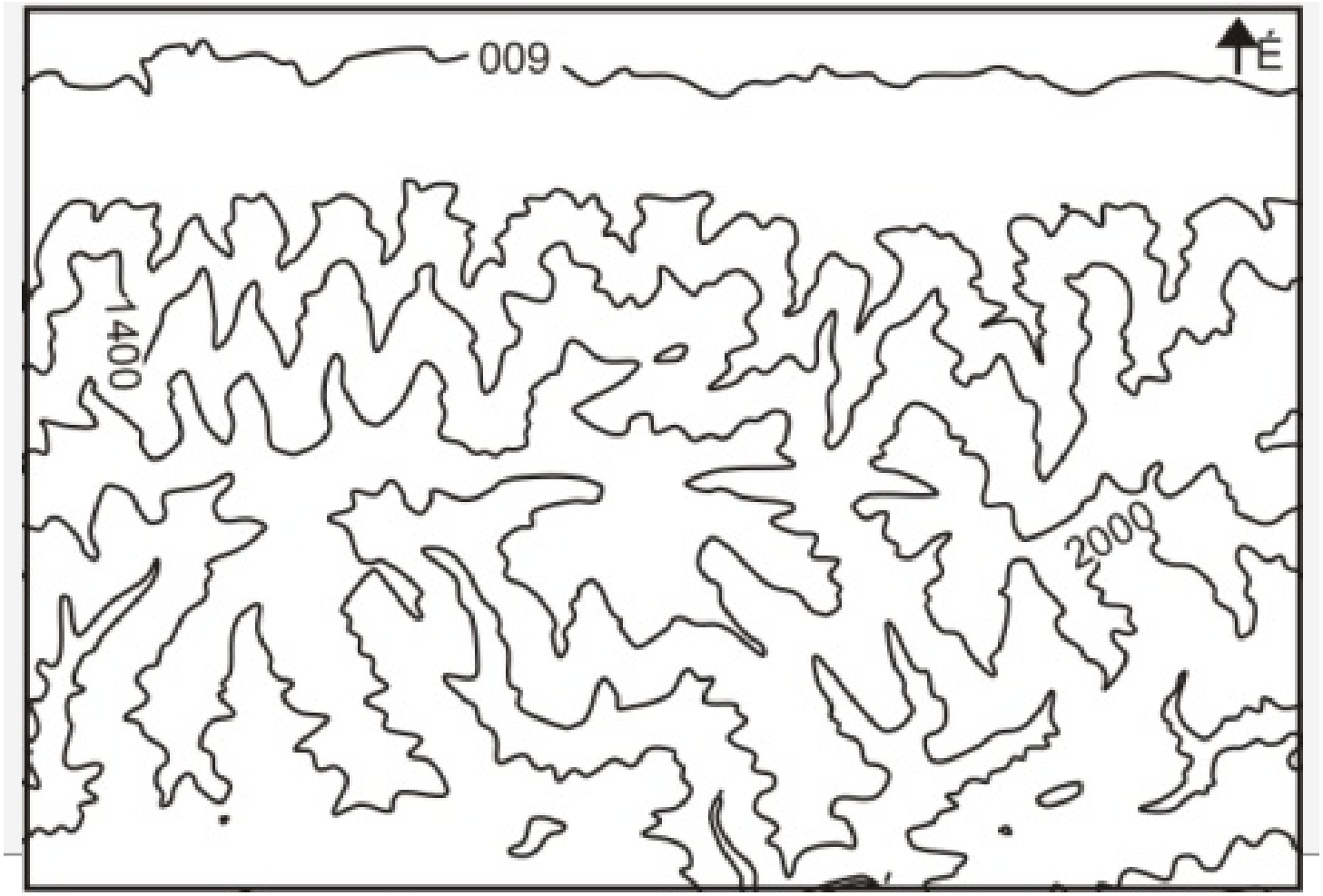


Writing an own program

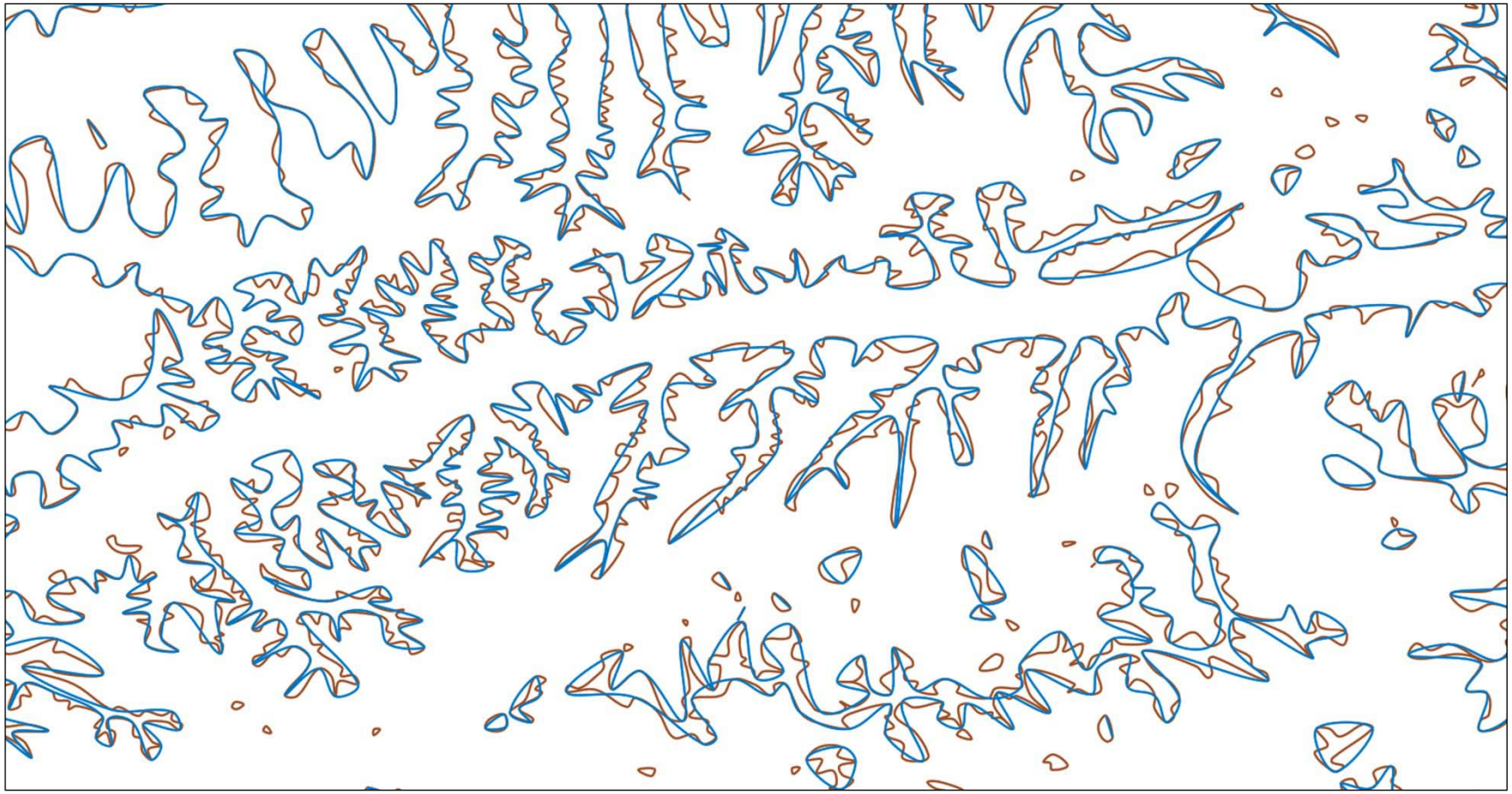
- Importing the contour lines from a text file
  - TXT, XYZ, GeoJSON
- Running the simplification algorithm
  - DP, linear regression
- Curve fitting
  - Bezier curves
- Exporting to a text file
  - XYZ, SVG, AI

Replacing the polylines with curves (DP)

- Interpolation of control points of Bezier curves

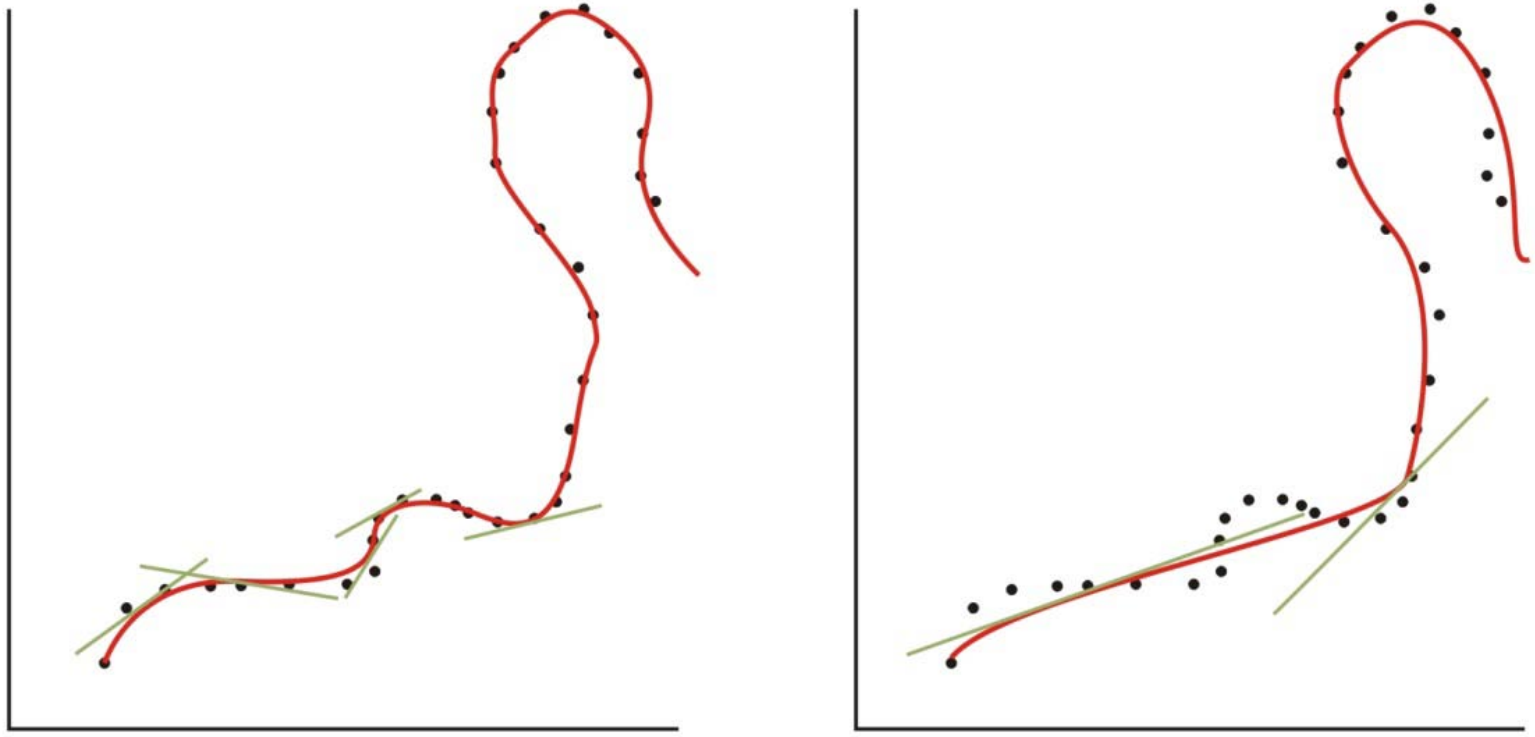


Different simplification with DP

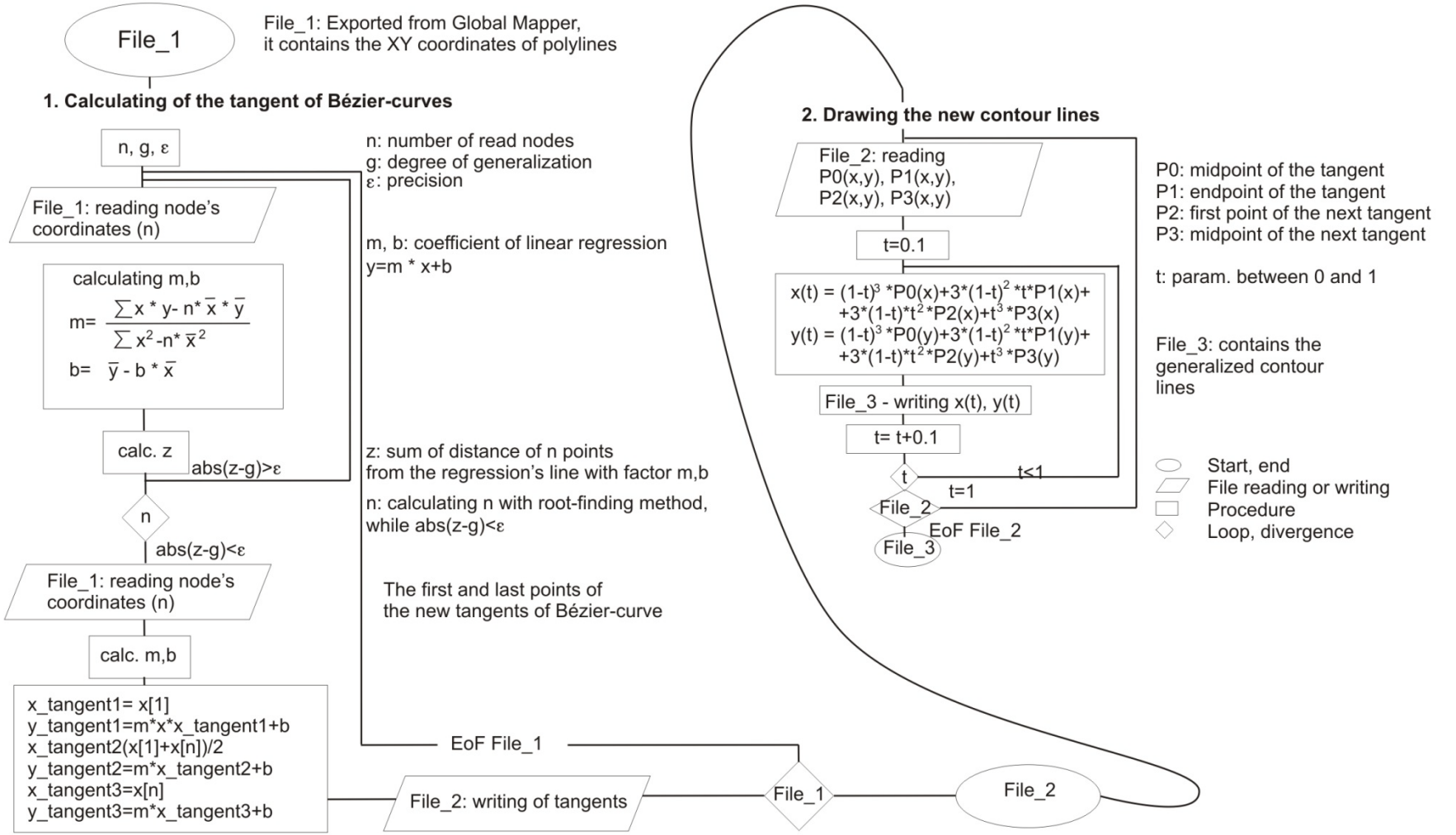


Linear regression

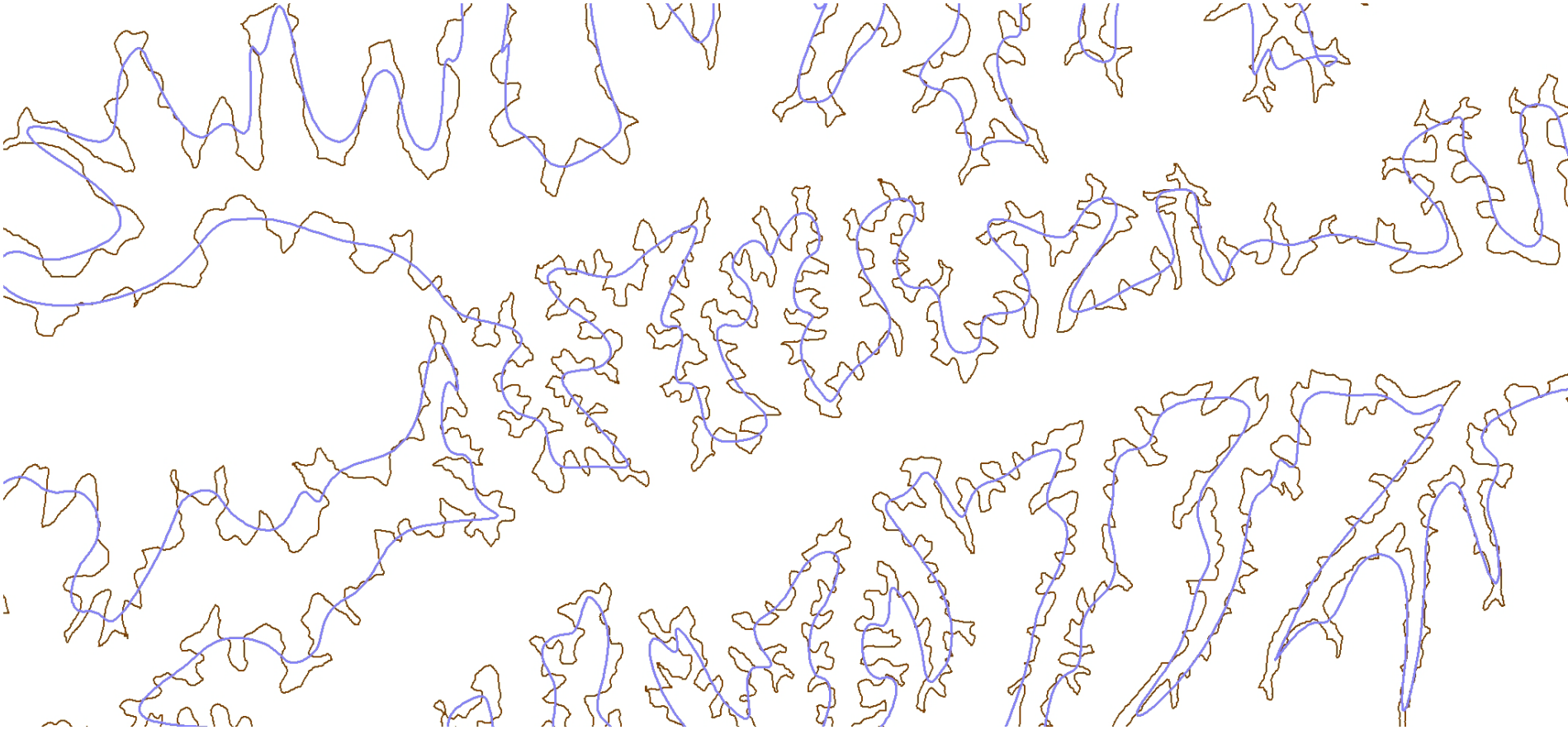
- Regression analysis is a statistical technique for estimating the relationship among variables



Calculation using linear regression



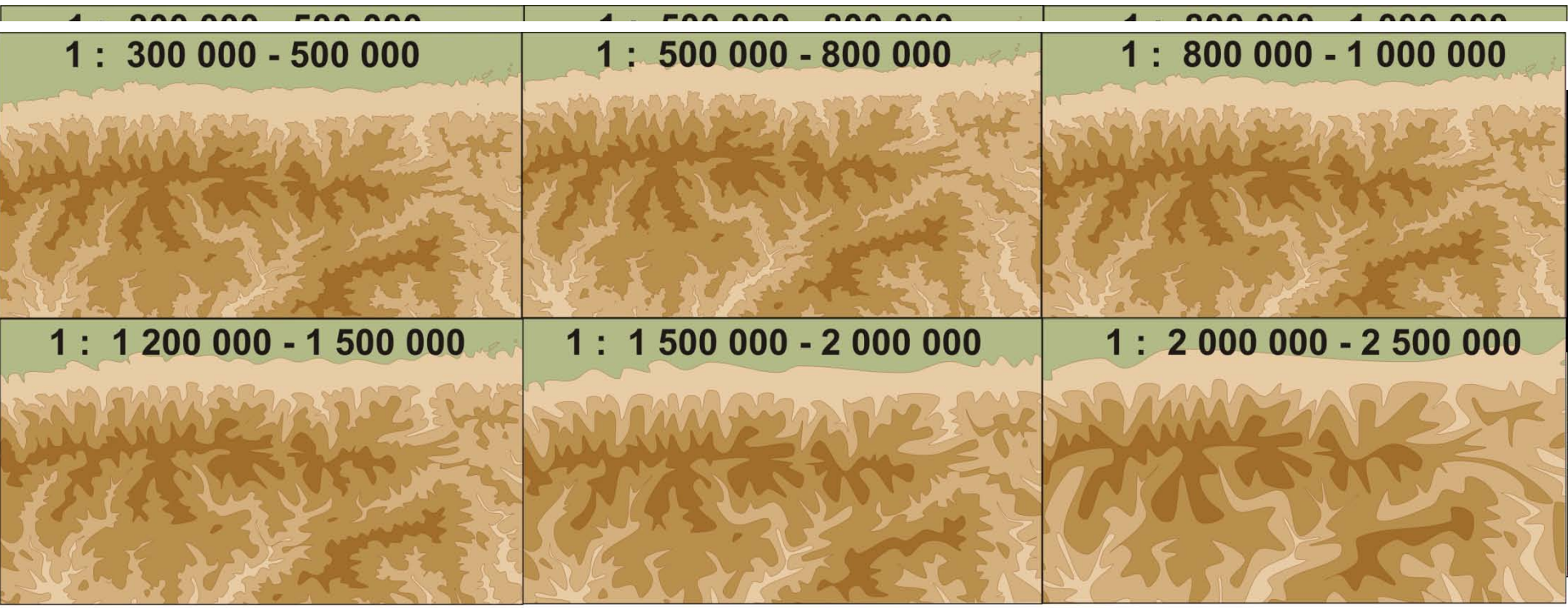
Simplification with linear regression

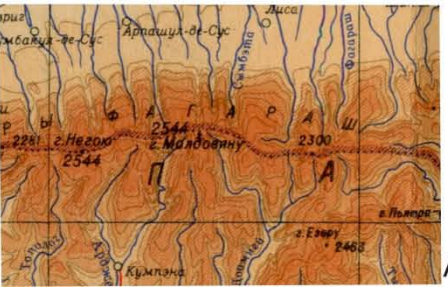


Comparision of methods

- Scales
- Line shapes
- Program's run time

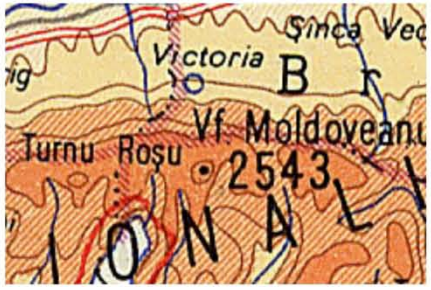
Scales





A

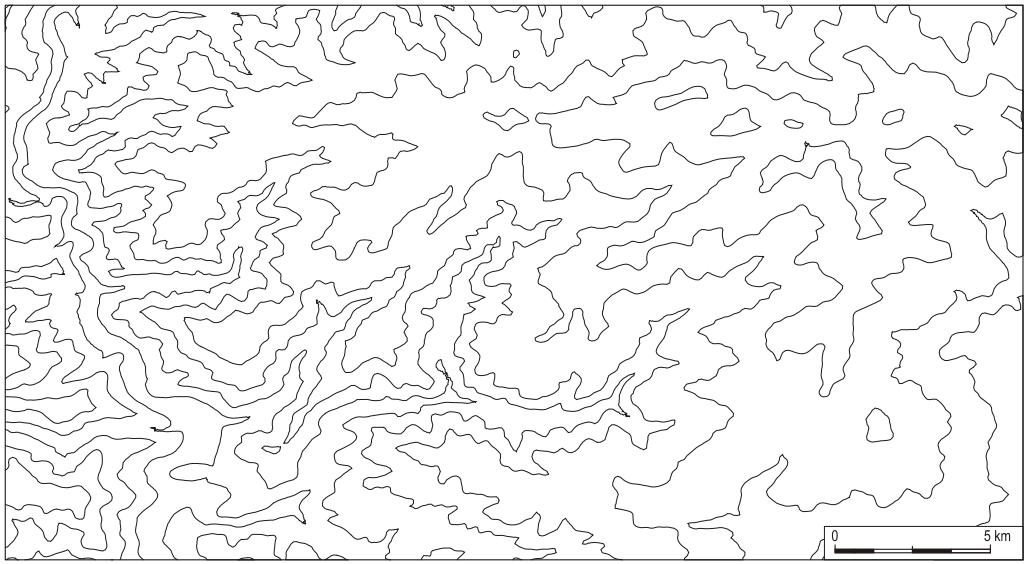
B



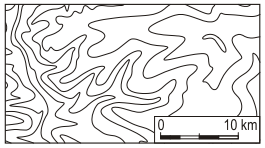
C

A: Atlas Mira, 1 : 1 250 000
B: Magyar Nemzeti Atlasz, 1989, 1 : 2 000 000
C: World Map, 1 : 2 500 000

Scales



1 : 250 000

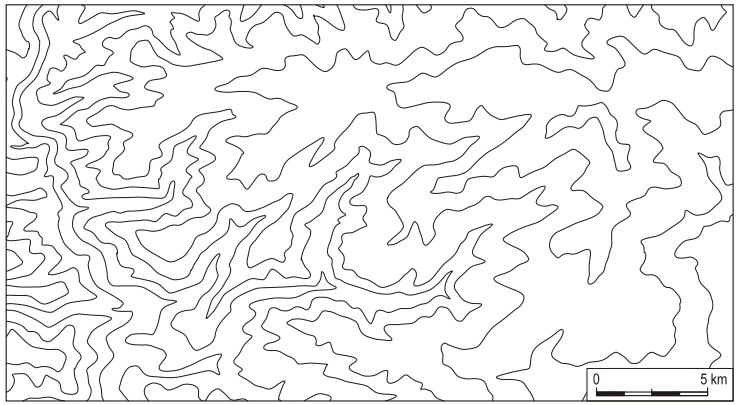


1 : 1 000 000

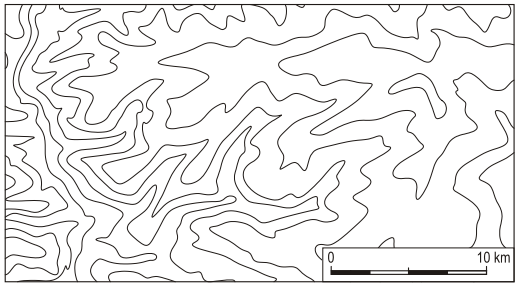
1 : 1 500 000

1 : 2 000 000

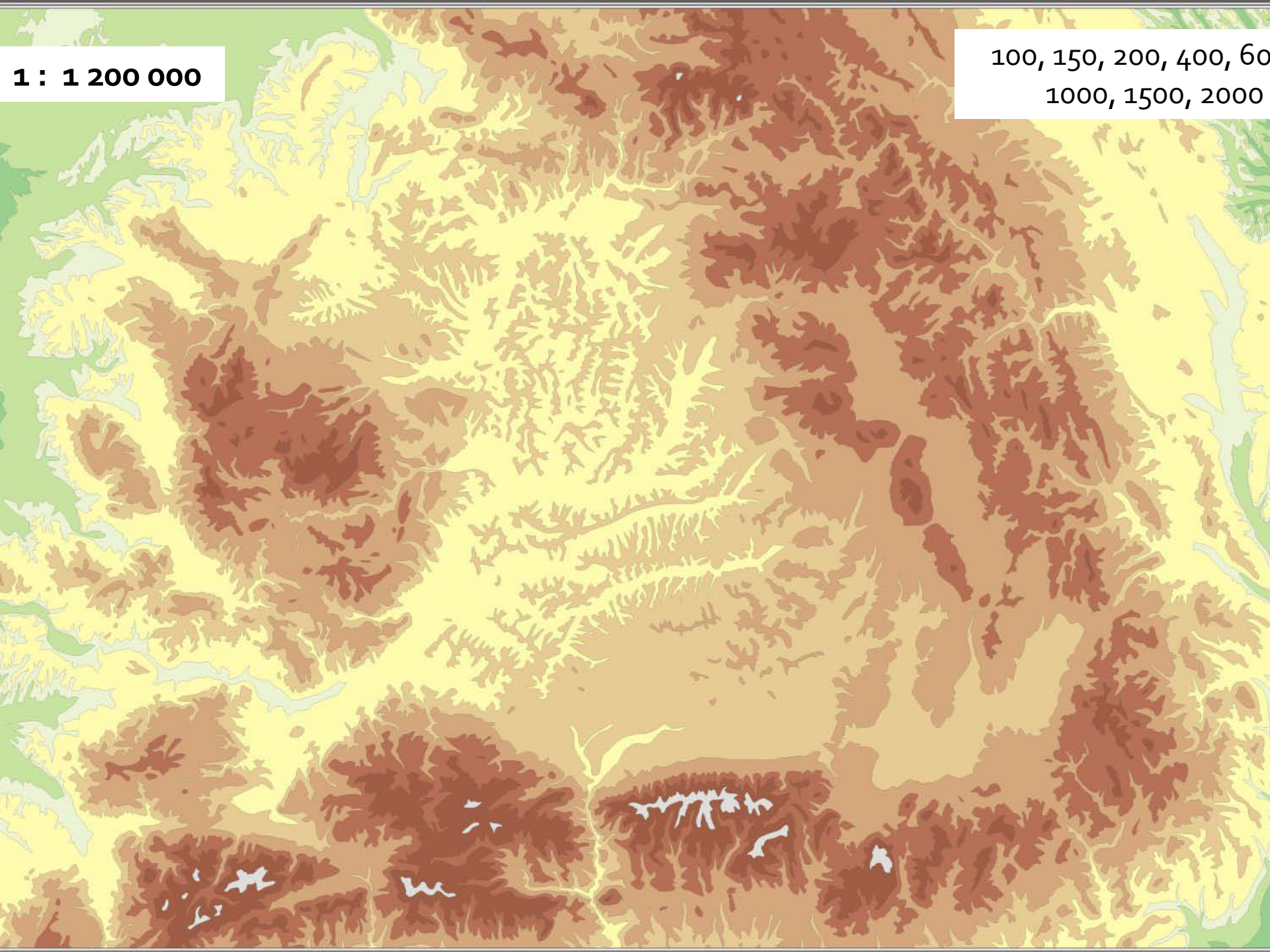
1 : 2 500 000



1 : 350 000



1 : 500 000


1 : 1 200 000
100, 150, 200, 400, 60
1000, 1500, 2000

Real-time generalization on the web

- Possible, only not too complicated and/or short sourcefiles
- Offered to use:
  - JavaScript/PHP, GeoJSON file format
  - Displaying
    - Vector format: SVG
    - Raster type: HTML5 Canvas

Conclusions

- DP and linear regression are suitable for generalizing lines at 1 : 250 000 – 3 000 000 scales on SRTM 90
- These scales can be determined at every DEM

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