

Voronoi Diagrams Without Bounding Boxes

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Dialect Research

The Meertens Institute in Amsterdam studies and documents the language and culture of The Netherlands

An important part of our research consists of studying language variation of the Dutch language: the Dutch dialects

Maps are an important way to represent dialect data

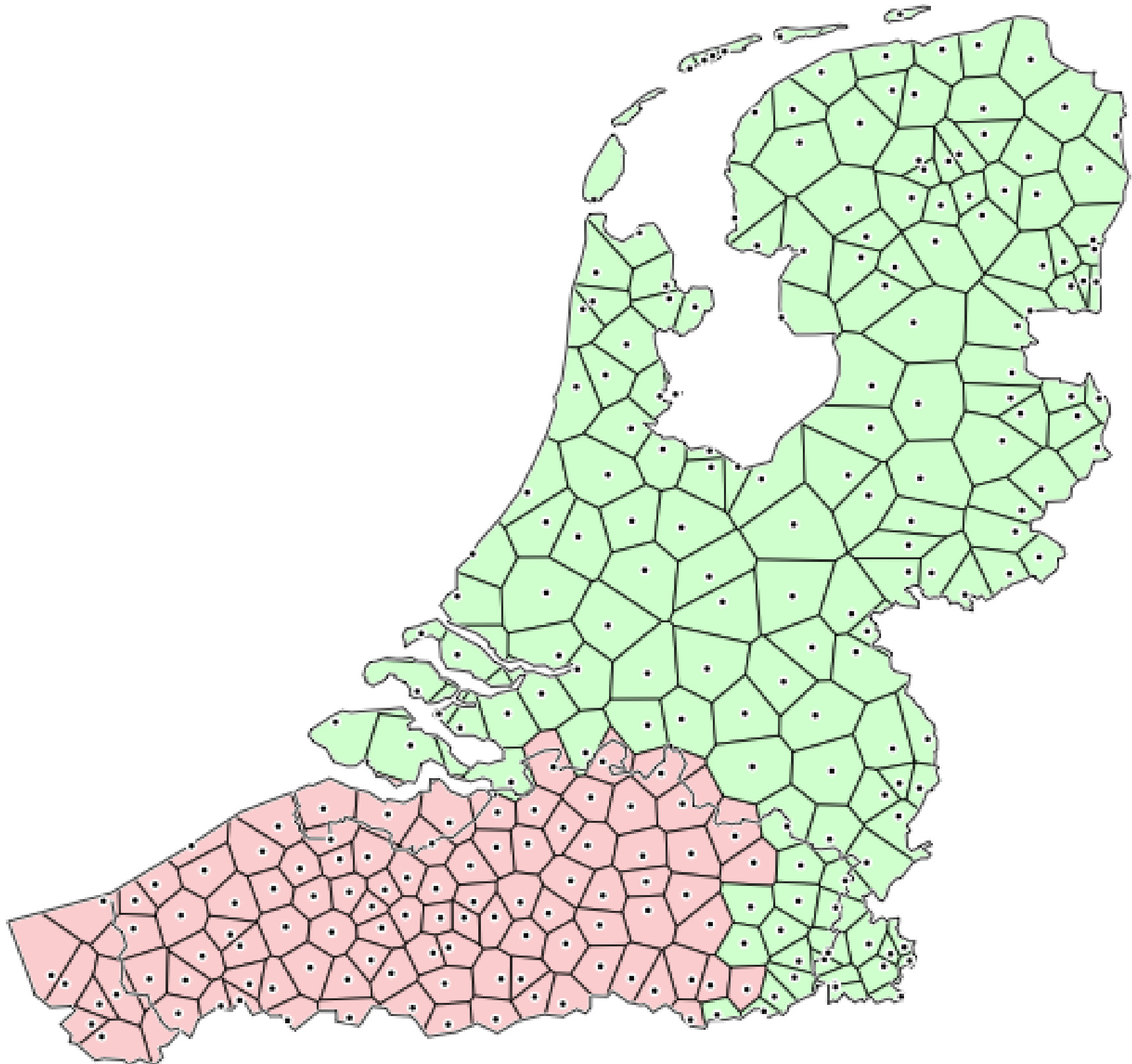
Computer-generated maps have replaced the paper maps since the 1990s

State-of-the-art in mapping dialects

Several software packages exist for generating dialect maps:

- Gabmap.nl (University of Groningen): online, variable maps
- RuG-L04 (University of Groningen): Linux software, adaptable
- Kaarttool (Meertens Institute): online, fixed map
- VDM (University of Salzburg): Windows software

None of them offers the flexibility we are looking for



Wish list for a dialect mapping tool

We are looking for a mapping tool for dialects that is easy to use:

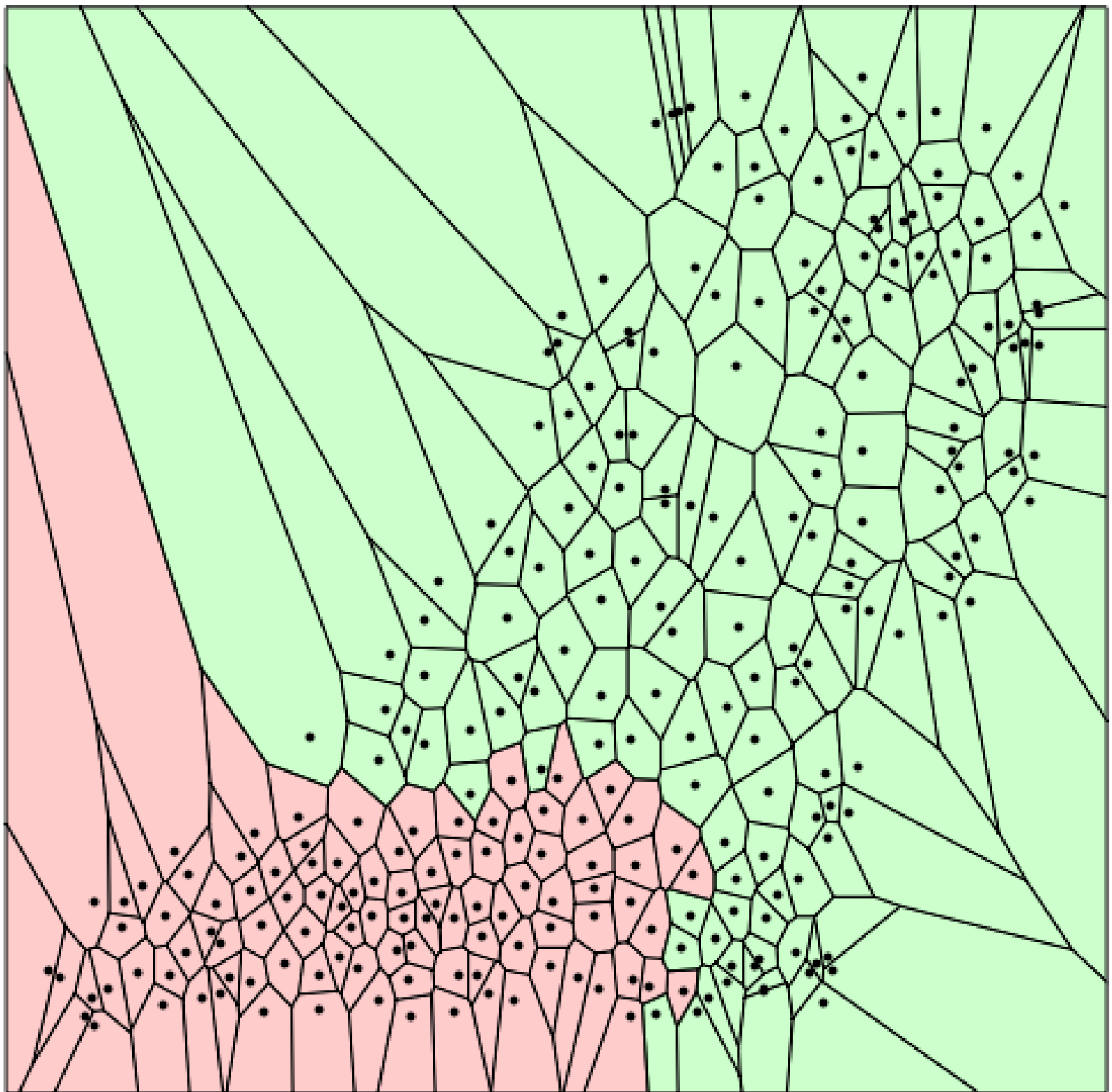
- it should be an online tool
- it should not be restricted to a geographic region
- it should enable uploading data in tabular form (coordinates and associated data values)
- it should not require additional map-specific data (like map boundaries)
- it should satisfy the user's visual expectations (that is: it should display Voronoi maps)

New dialect mapping tool: Arvid

We implemented a new online dialect mapping tool in Javascript using standards like OpenLayers, OpenStreetMap, csv and kml

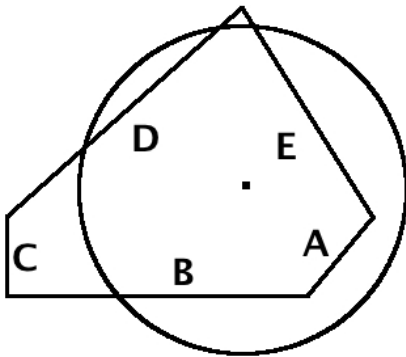
We used a rectangle as bounding box for the Voronoi maps but this did not give a satisfactory result (see next slide)

Our data points are spread in a irregular way and rectangles do not represent good delimiters for such data sets



Solution: limit the size of the tiles

We identified four types of Voronoi boundary lines and created an algorithm for replacing them with shorter variants



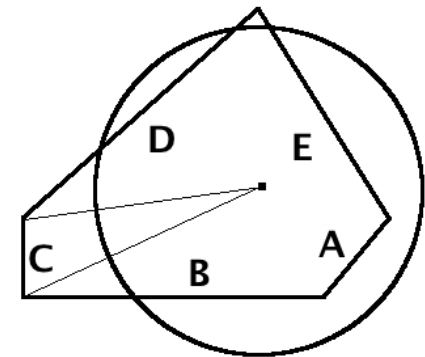
Tiles with most or all of the boundary lines positioned outside of the circle, required additional attention

Pseudocode tile border clipping

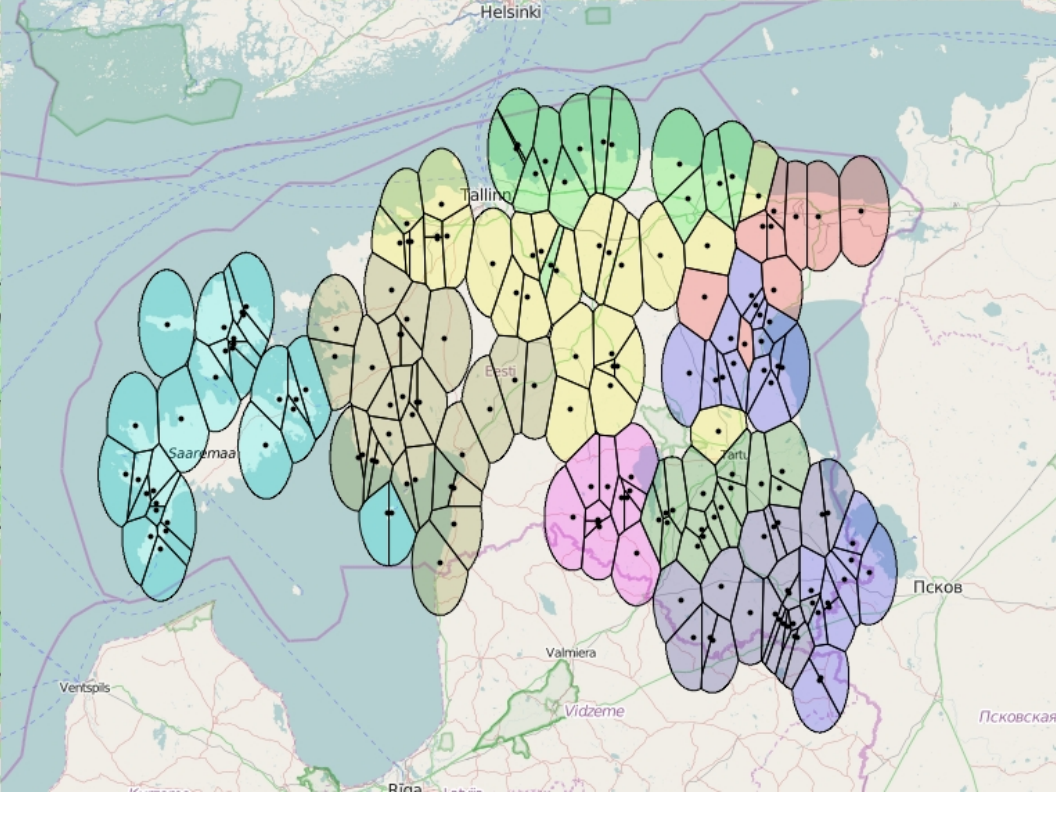
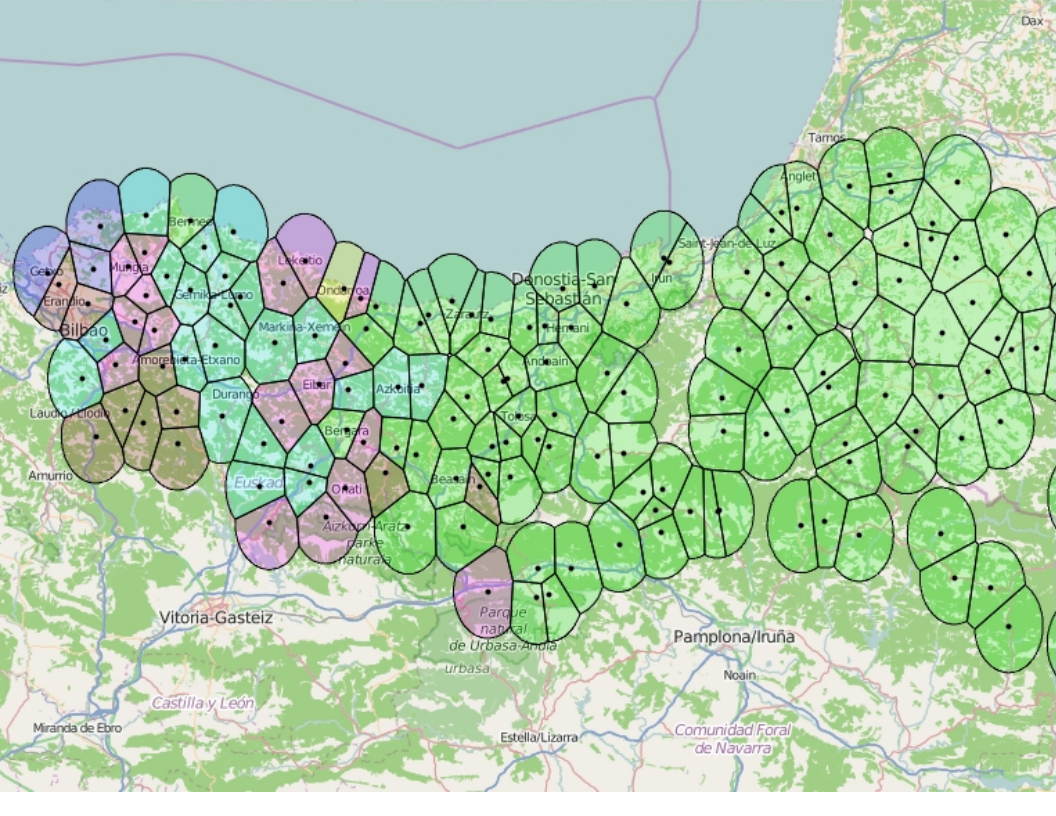
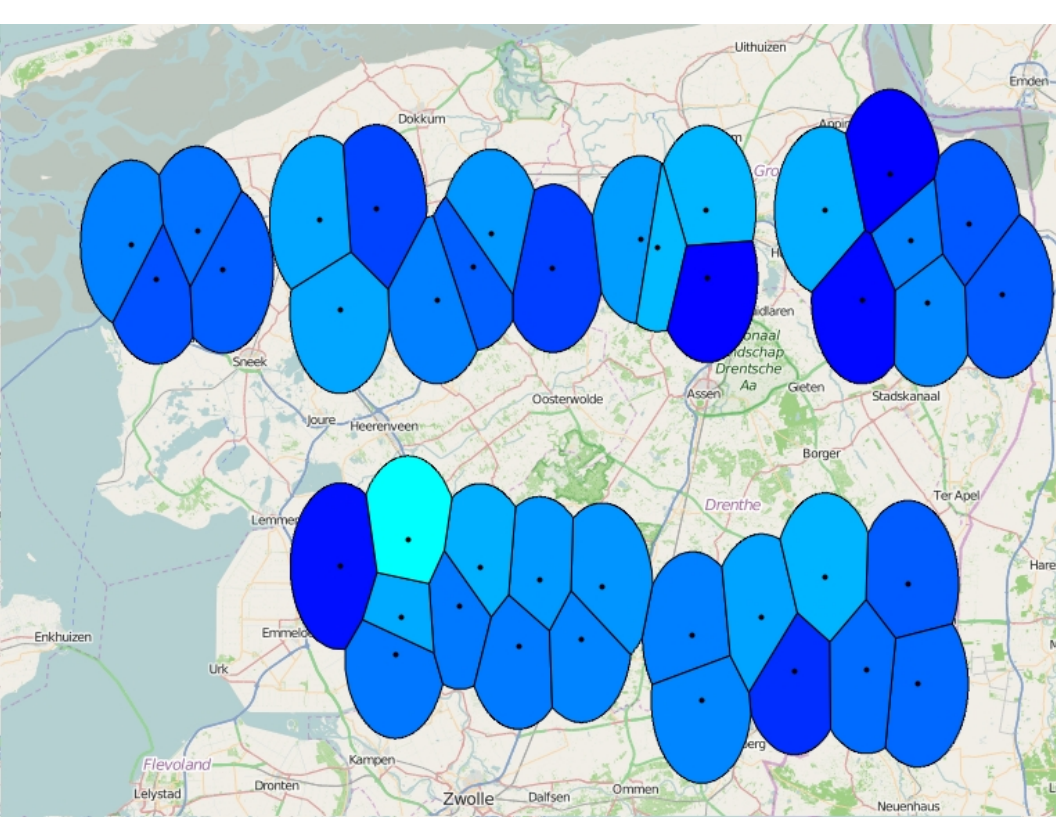
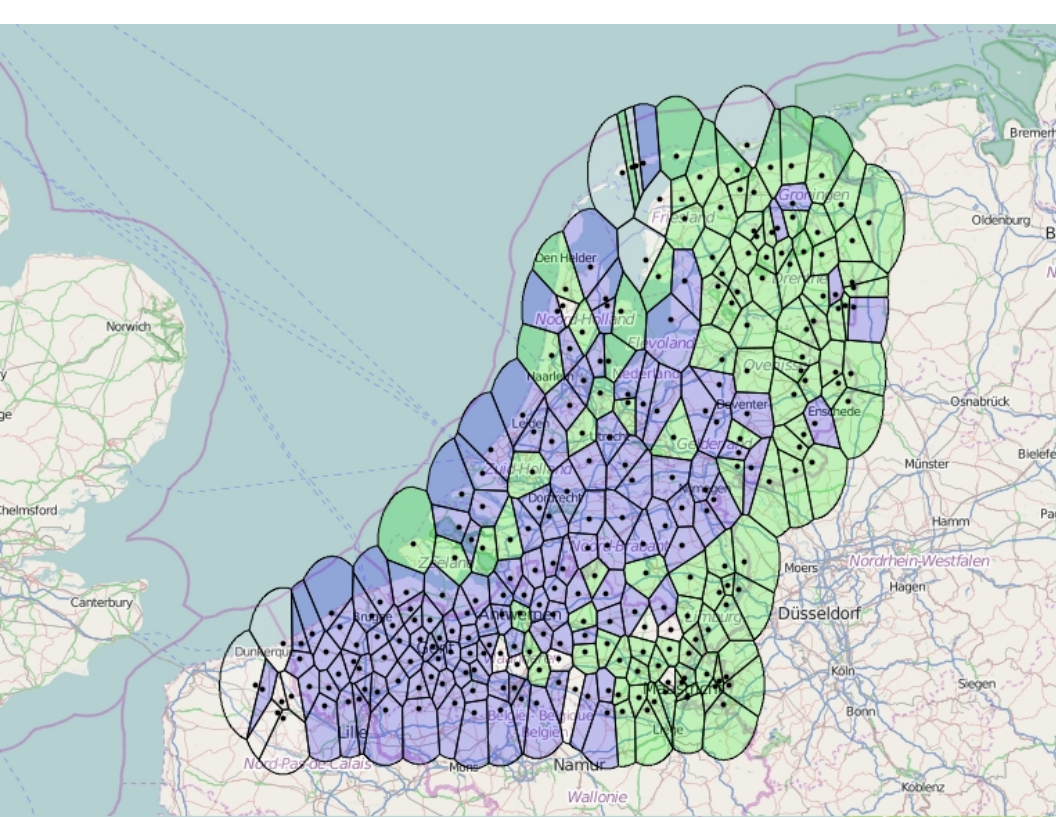
- use all border segments inside the bounding circle
- replace all border segments outside bounding circle with their corresponding circle part

The corresponding circle parts can be found by projecting the end points of a line to the circle

Associated mathematical formula's can be found in the paper







Concluding remarks

We have developed a flexible tool for visualizing dialect data: Arvid:
<http://ifarm.nl/maps/arvid>

We presented a solution for drawing Voronoi maps without requiring bounding boxes

Future work

Maintain the tool for at least two more years (-2017)

Document research applications of the tool

Encourage other dialect mapping tool builders to use similar solutions (public map services and Voronoi maps without region boundaries)

THE END