Turf.js
Geoverarbeitung im Browser

Numa Gremling, Salzburg, 05.07.2016

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Was ist Turf.js?

Turf is a JavaScript library for spatial analysis.

… JavaScript!

Turf: GIS for web maps

By  Morgan Herlocker on December 23 2014 | DEVELOPER TOOLS

Turf business intelligence

Turf is GIS for web maps. It's a fast, compact, and open-source JavaScript library that implements the most common geospatial operations: buffering, contouring, triangular irregular networks (TINs), and more. Turf speaks GeoJSON natively, easily connects to Leaflet, and is now available as a Mapbox.js plugin on our cloud platform. We're also working to integrate Turf into our offline products and next-generation map rendering tools.

https://www.mapbox.com/blog/turf-gis-for-web-maps/

Ursprünge

- Von Morgan Herlocker, 2013
  - http://morganherlocker.com
  - @morganherlocker

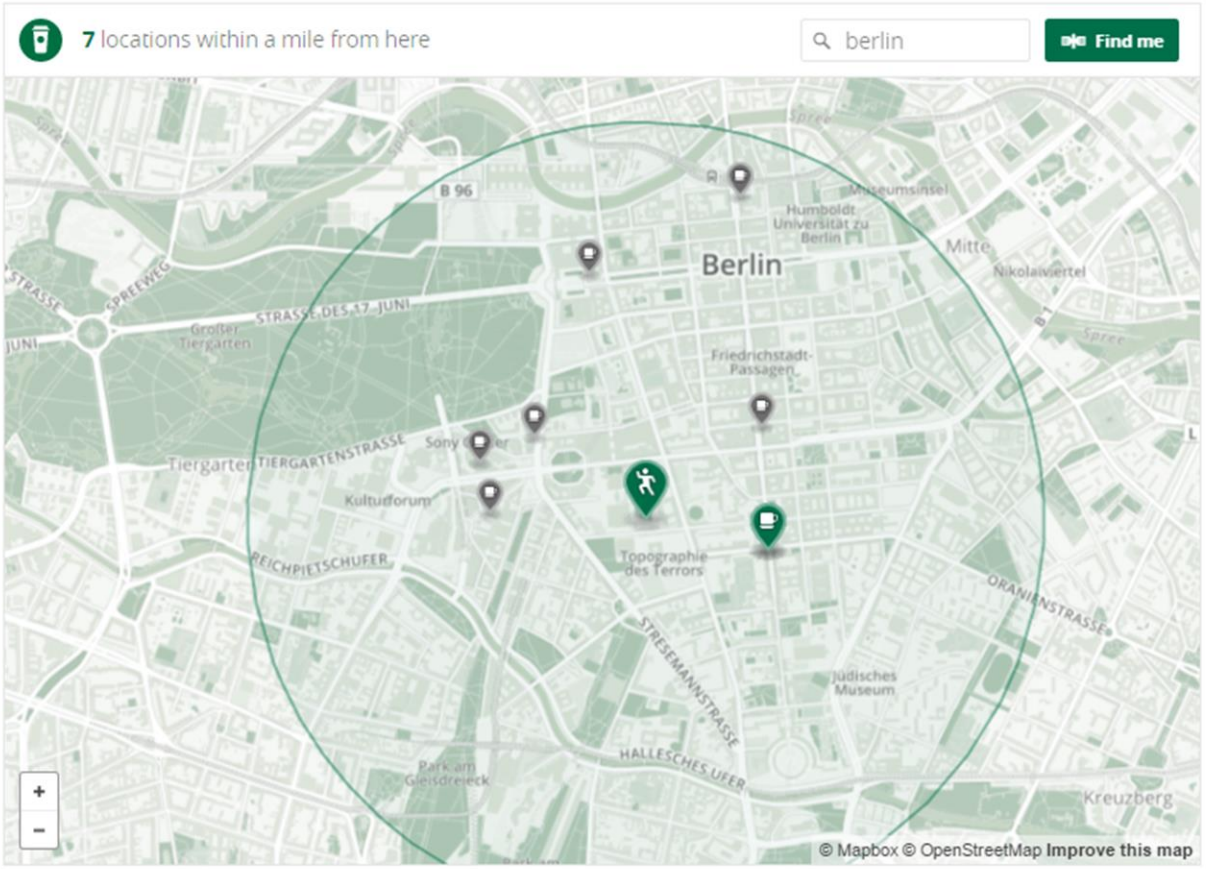
- Mapbox, seit 2014
  - https://www.mapbox.com
  - @Mapbox

Find your nearest cup of coffee with Turf

By Peter Liu on January 14 2015 | DEVELOPER TOOLS

Turf travel real estate business intelligence labs

Turf has opened a wide range of possibilities for apps running entirely in the browser. In this example, we've built a store locator that finds all Starbucks locations near a user's current position. **Drag the little green figure to move it around and mousewheel up and down to adjust the search radius:**



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https://www.mapbox.com/blog/coffee-with-turf/

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GeoJSON in, GeoJSON out

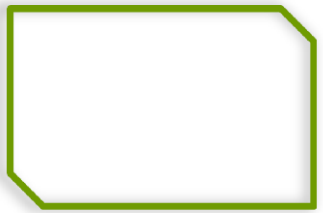
- GeoJSON: **das** Datenformat in Turf.js

- Alles in einer Datei:
  - Geometrie
  - Attribute
  - Koordinatensystem

GeoJSON

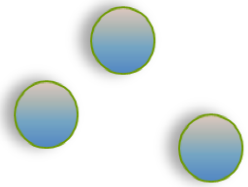
Point

LineString



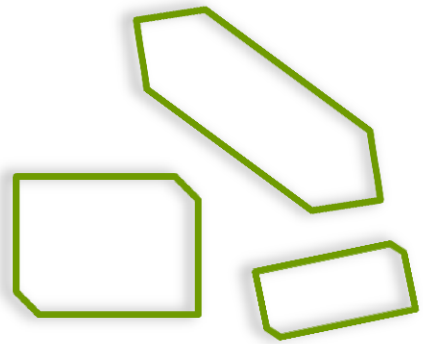
Polygon

GeoJSON



MultiPoint

MultiLineString



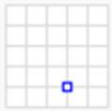
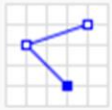
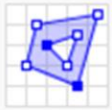
MultiPolygon

GeoJSON

GeometryCollection

Spec: http://geojson.org/geojson-spec.html

Geometry primitives

Type	Examples	
Point		`{ "type": "Point", "coordinates": [30, 10] }`
LineString		`{ "type": "LineString", "coordinates": [ [30, 10], [10, 30], [40, 40] ] }`
Polygon		`{ "type": "Polygon", "coordinates": [ [[30, 10], [40, 40], [20, 40], [10, 20], [30, 10]] ] }`
		`{ "type": "Polygon", "coordinates": [ [[35, 10], [45, 45], [15, 40], [10, 20], [35, 10]], [[20, 30], [35, 35], [30, 20], [20, 30]] ] }`

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https://en.wikipedia.org/wiki/GeoJSON

```
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "geometry": {
        "type": "Point",
        "coordinates": [
          13.06036,
          47.78866
        ]
      },
      "properties": {
        "Ort": "Salzburg",
        "Event": "FOSSGIS"
      }
    },
    {
      "type": "Feature",
      "geometry": {
        "type": "Point",
        "coordinates": [
          7.12352,
          50.71855
        ]
      },
      "properties": {
        "Ort": "Bonn",
        "Event": "FOSS4G"
      }
    }
  ]
}
```

```
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "geometry": {
        "type": "Point",
        "coordinates": [
          13.06036,
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    {
      "type": "Feature",
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        ]
      },
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        "Event": "FOSS4G"
      }
    }
  ]
}
```
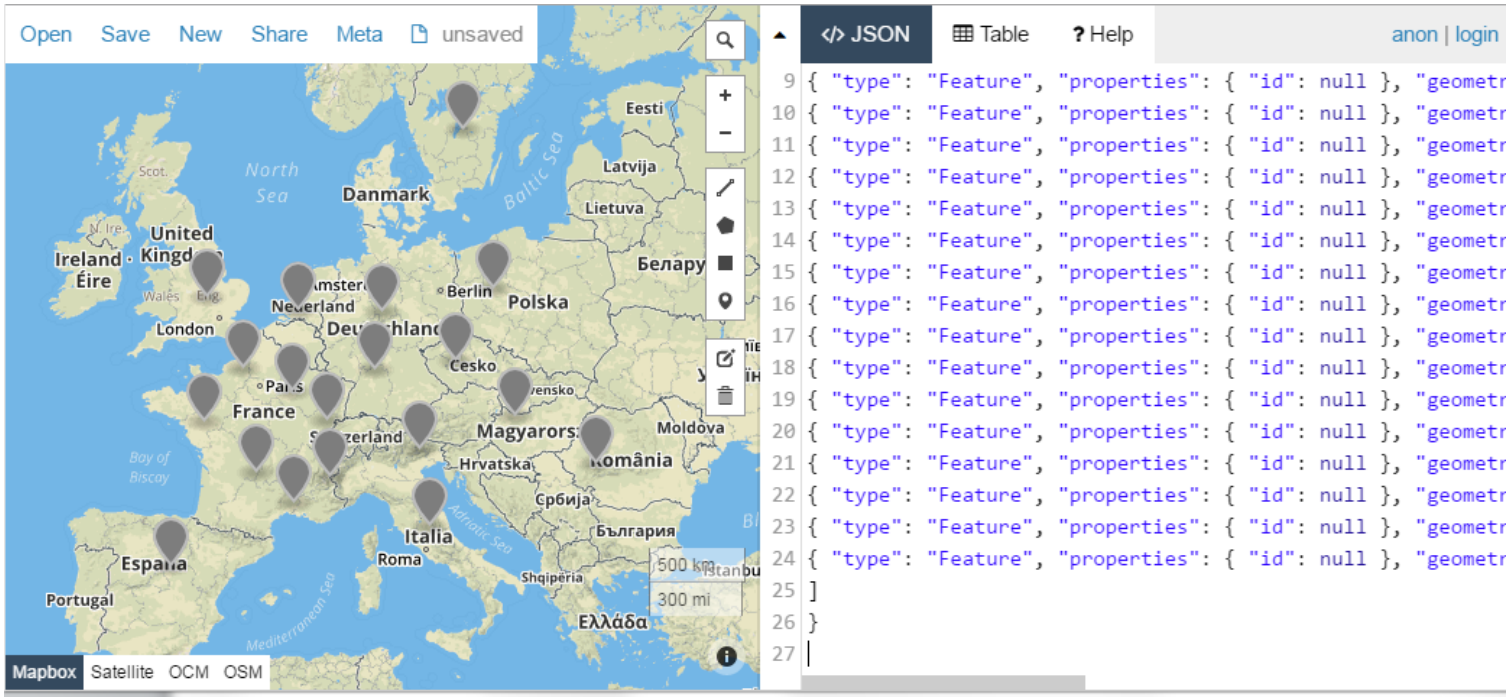

Wie bekomme ich ein GeoJSON?

- Von Hand schreiben ☺
- http://geojson.io/
- QGIS



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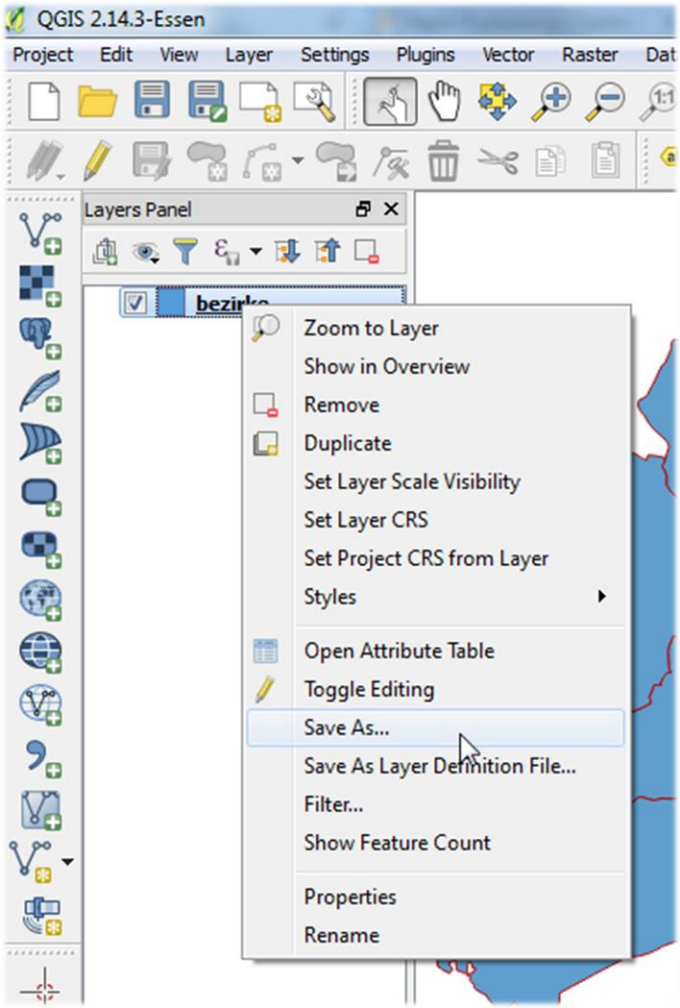
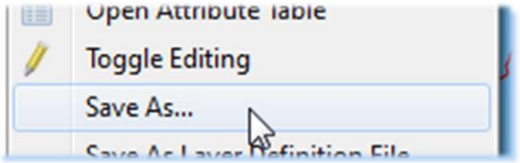
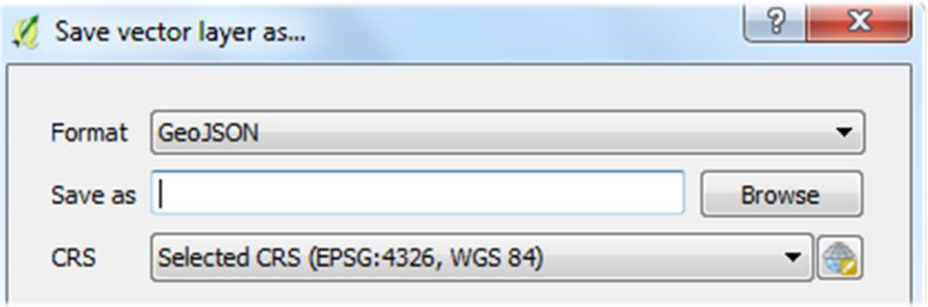
GeoJSON in QGIS







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Geoverarbeitung im Web

Geoverarbeitung im Web: WPS

- Der klassische Fall: **W**eb **P**rocessing **S**ervice

http://www.opengeospatial.org

- OGC Standard

- Verlangt:
  - komplexe serverseitige Infrastruktur
  - Requests
  - Internet

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http://www.opengeospatial.org/standards/wps

Geoverarbeitung im Web: WPS

- User schickt eine Anfrage an den Server
- Der Server bearbeitet die Anfrage in einer DB oder einem GIS
- Der Server schickt das Resultat zurück

Beispiel - WPS: Puffer

… ein paar Minuten später…

Geoverarbeitung im Web: WPS

- User schickt eine Anfrage an den Server
- Server bearbeitet die Anfrage in einer DB oder einem GIS
- Server schickt das Resultat zurück
- (User ist eingeschlafen)
- (User bemerkt einen Fehler, macht das Ganze nochmal)
- (User schläft nochmal ein)
- (User bemerkt schon wieder einen Fehler?)

WPS – ja oder nein?

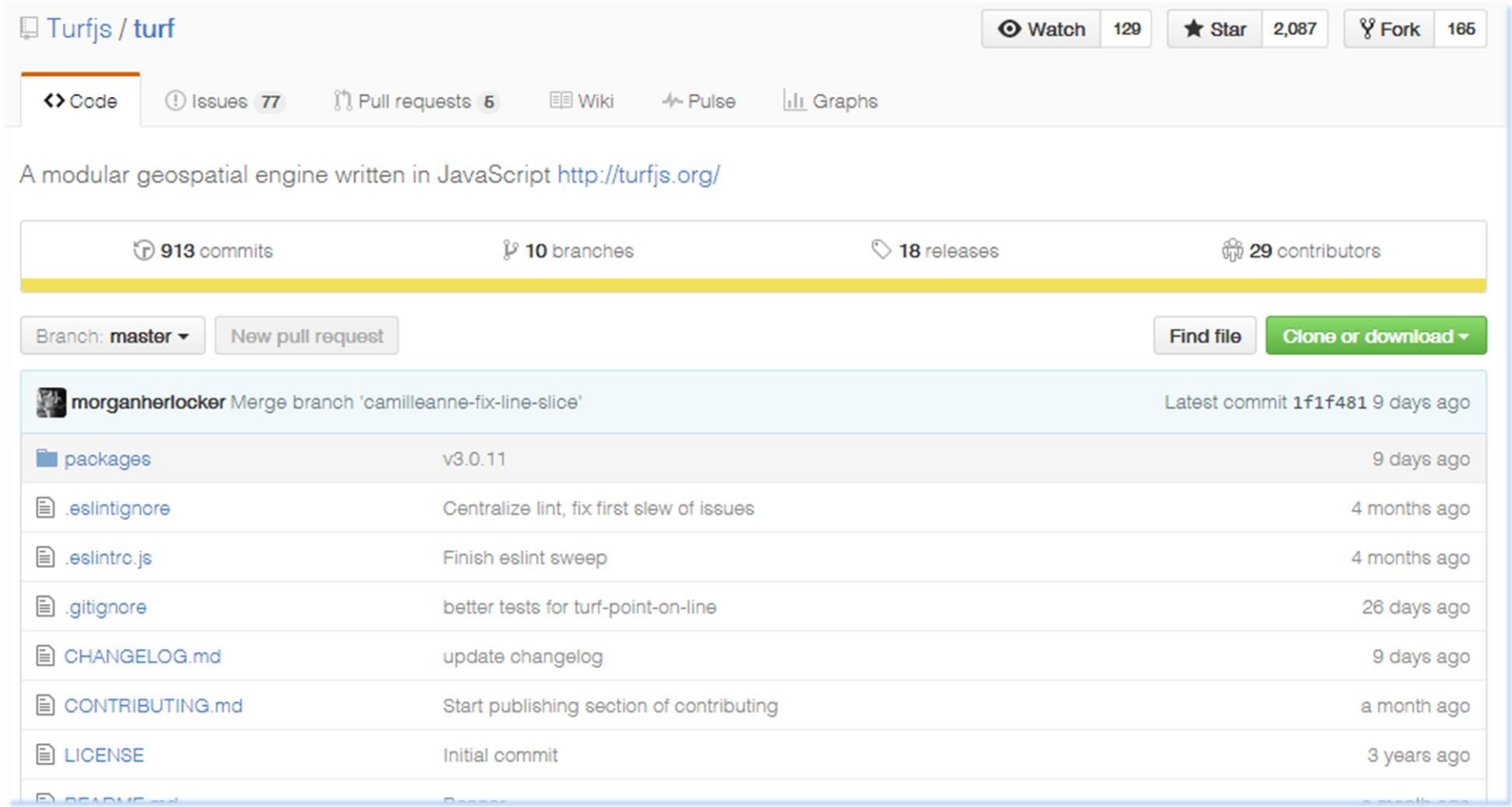
- WPS macht Sinn, wenn:
  - die Analysen und Berechnungen komplex sind
  - die Daten groß sind

- **Allerdings**: WPS wird öfters benutzt, um sehr simple Werkzeuge oder Berechnungen auszuführen

Die Zeiten sind jetzt vorbei!

Turf.js

GitHub



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https://github.com/Turfjs/turf

Turf.js Website

Install

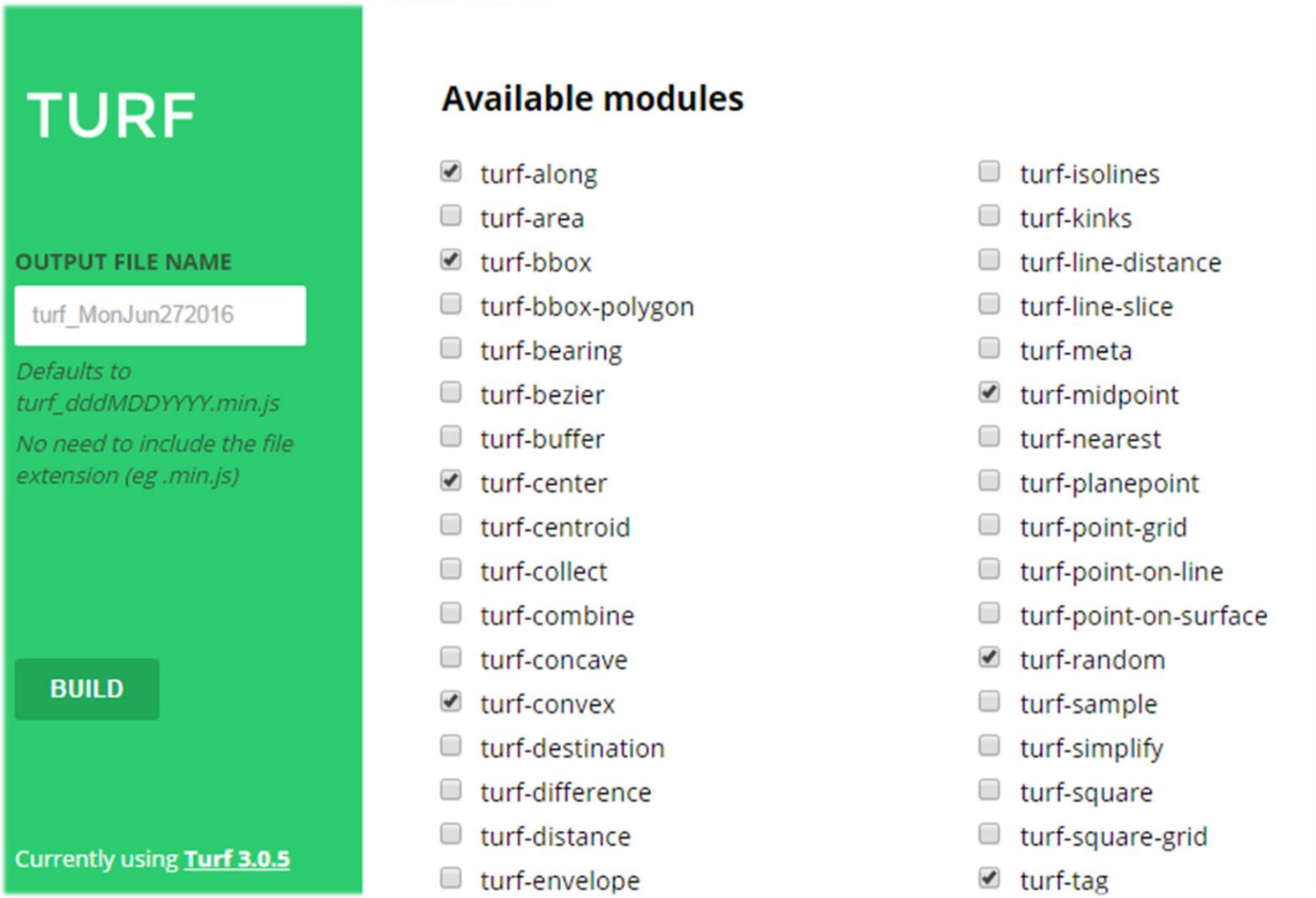
node	`npm install turf`
CDN	`//api.tiles.mapbox.com/mapbox.js/plugins/turf/v2.0.0/turf.min.js`
Download	turf.min.js

Modular

- Every turf function has been broken into its own seperate module, so you can install what you need and nothing else. 05.06.2014, http://morganherlocker.com/

- Um die 50 Module

Build your own!



https://turfjs-builder.herokuapp.com/

Methoden

center centroid distance destination

envelope midpoint bezier buffer

concave convex difference intersect

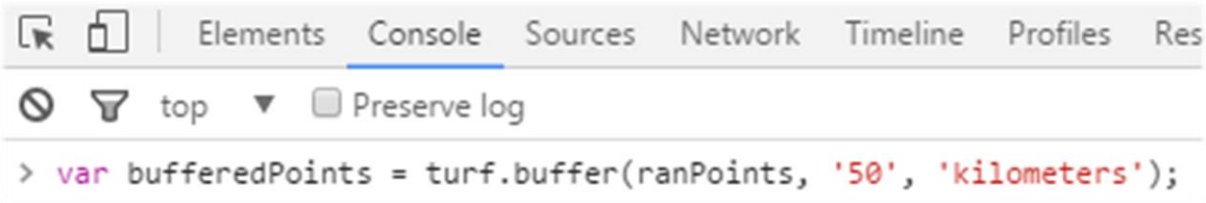
simplify union combine explode

flip kinks pointOnLine random

sample tin inside isolines

Mapbox.js?

- Alle offiziellen Beispiele benutzen Mapbox.js
- https://www.mapbox.com/mapbox.js/api/v2.4.0/
- **Aber**: Turf.js kann vollkommen unabhängig benutzt werden, sogar ohne Karte



Mapping = optional

- Turf.js funktioniert auch **ohne** Karte!
- In den meisten Fällen wird eine Karte benutzt, um die Ergebnisse darzustellen aber die Darstellung ist vollkommen optional

- Turf.js kann auch alleine benutzt werden, als pure GIS Bibliothek, ohne eine Darstellungskomponente
- Turf.js funktioniert auch mit Node.js

Kartenclients

- Leaflet
- OpenLayers
- Mapbox.js
- Mapbox GL JS
- Google Maps JavaScript API
- usw.

… solange GeoJSON unterstützt wird, kann auch Turf.js integriert werden!

Keine API Keys

- Turf.js funktioniert ganz ohne API Schlüssel
- Herunterladen, einbinden und los!

Syntax

- Sehr simpel:

```
turf.werkzeug(params);
```

- Beispiel, Puffer:

```
turf.buffer(features, 45, 'kilometers');
```

DEMO

Point in Polygon

- Point 18 is in **Nevada**
- Point 7 is in **Ohio**
- Point 11 is in **Colorado**
- Point 12 is in **Colorado**
- Point 13 is in **Colorado**
- Point 14 is in **Colorado**
- Point 15 is in **Colorado**
- Point 17 is in **Idaho**
- Point 6 is in **Indiana**
- Point 4 is in **Iowa**
- Point 2 is in **Kansas**
- Point 8 is in **Mississippi**
- Point 3 is in **Missouri**
- Point 5 is in **Nebraska**
- Point 10 is in **New Mexico**
- Point 9 is in **Oklahoma**
- Point 1 is in **Oregon**
- Point 16 is in **Wyoming**

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Point in Polygon

- Point 18 is in **Nevada**
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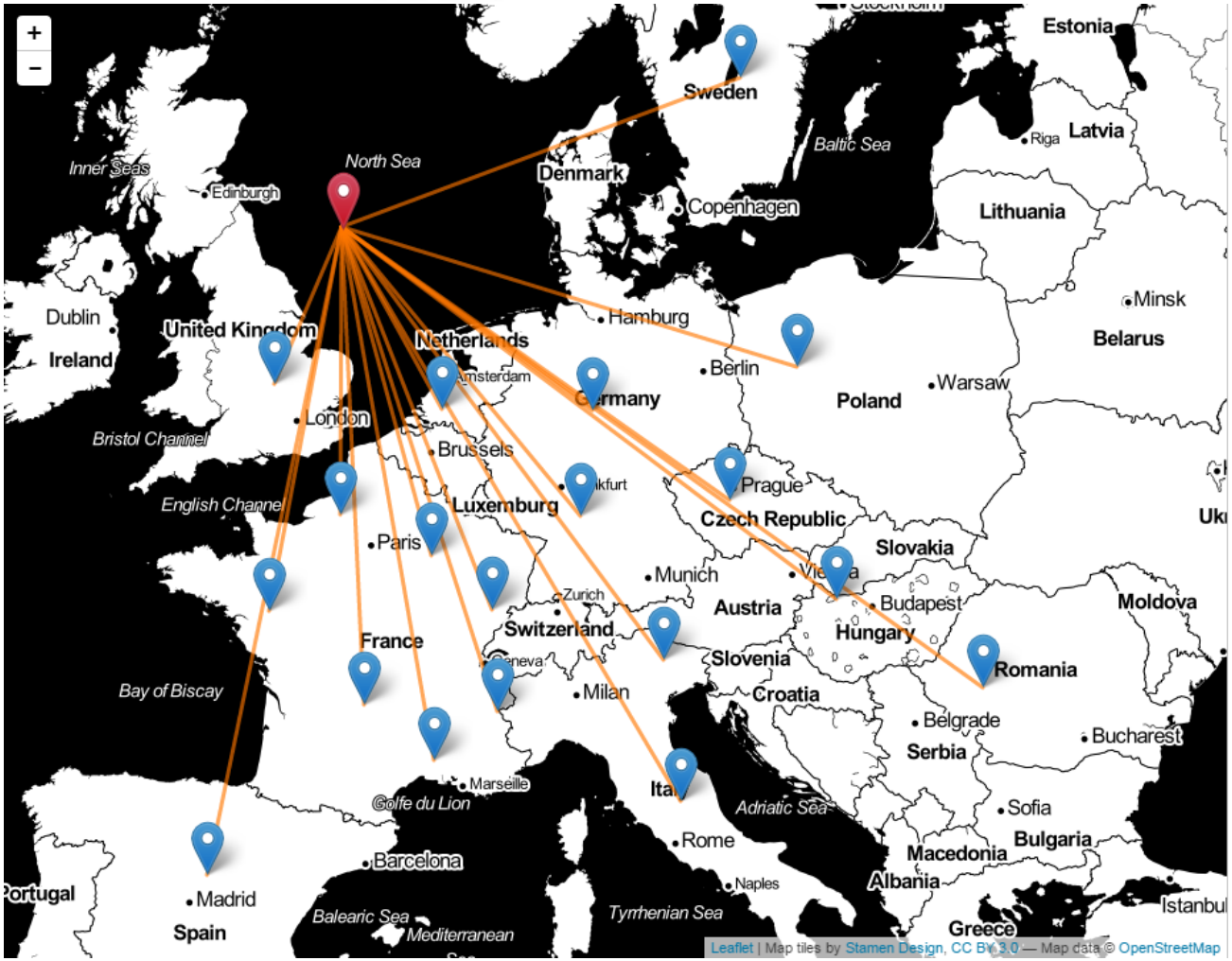
Lines to Points



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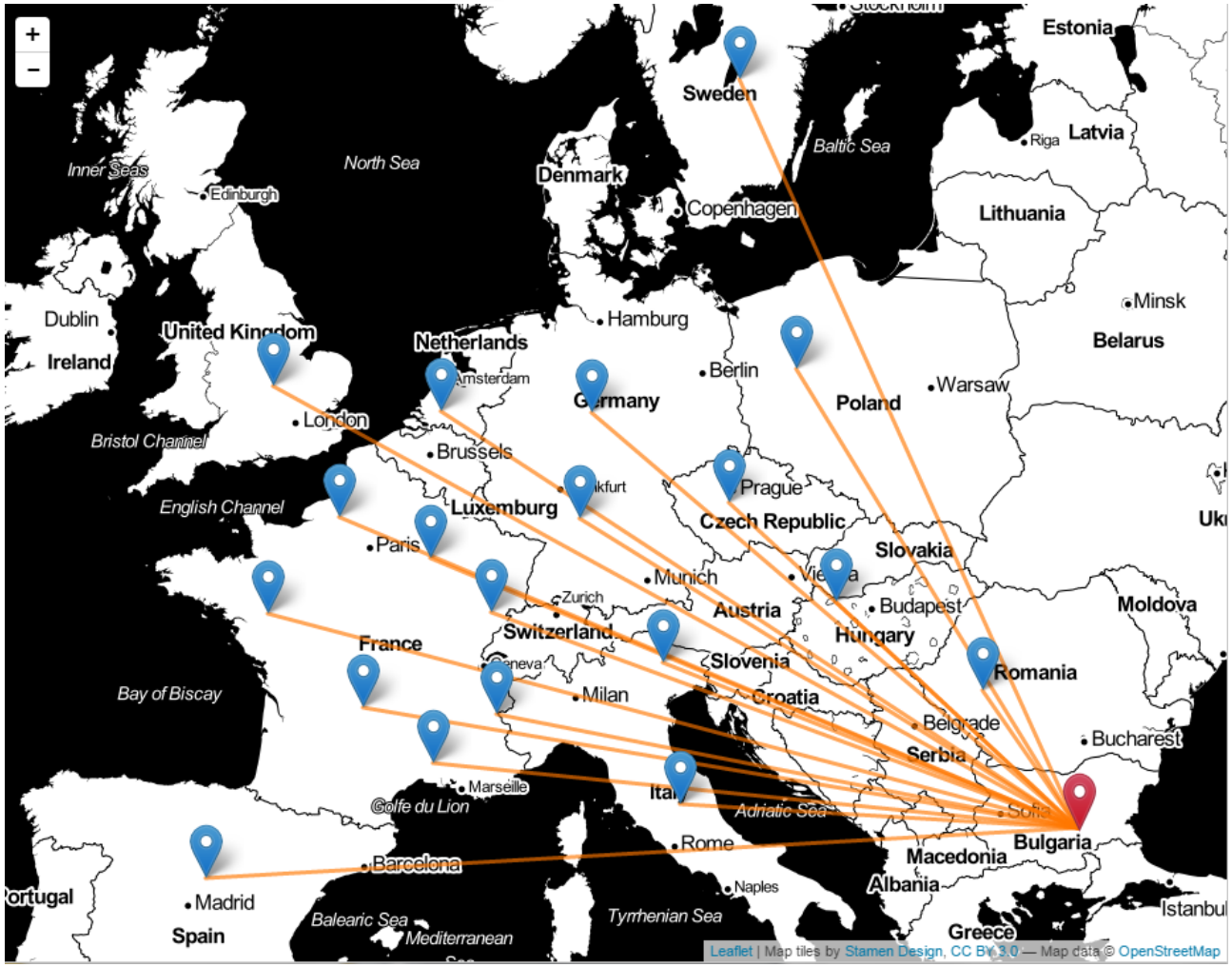
Lines to Points



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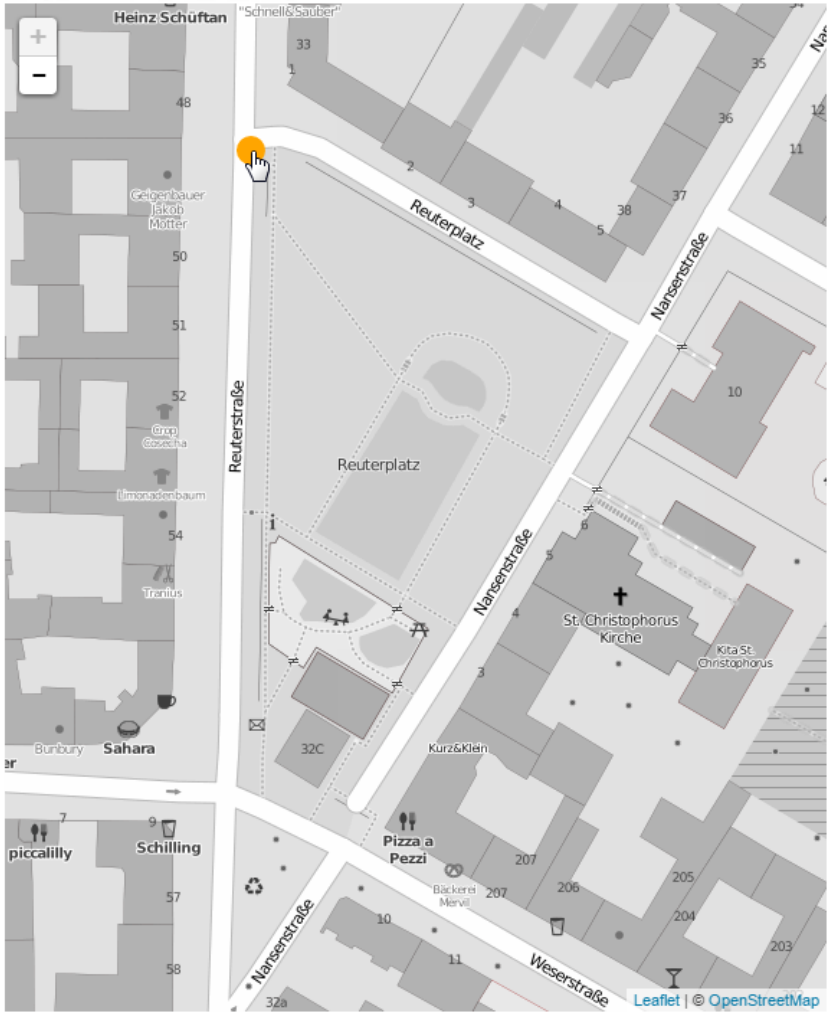
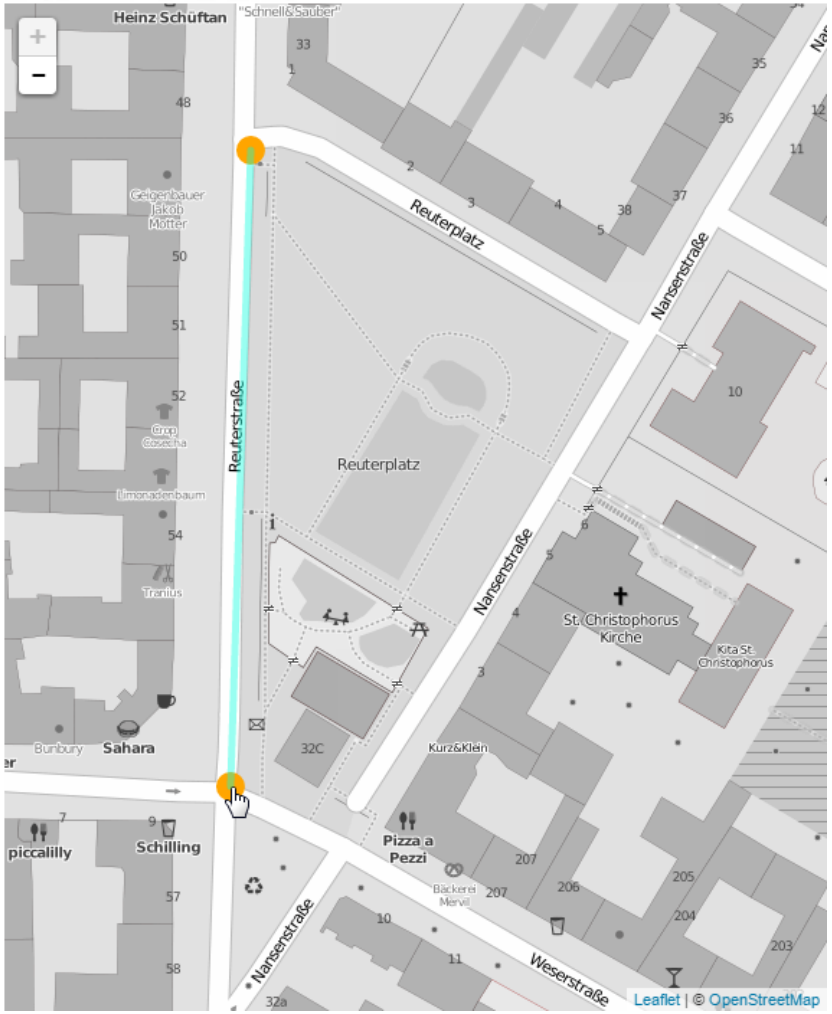
Digitizing



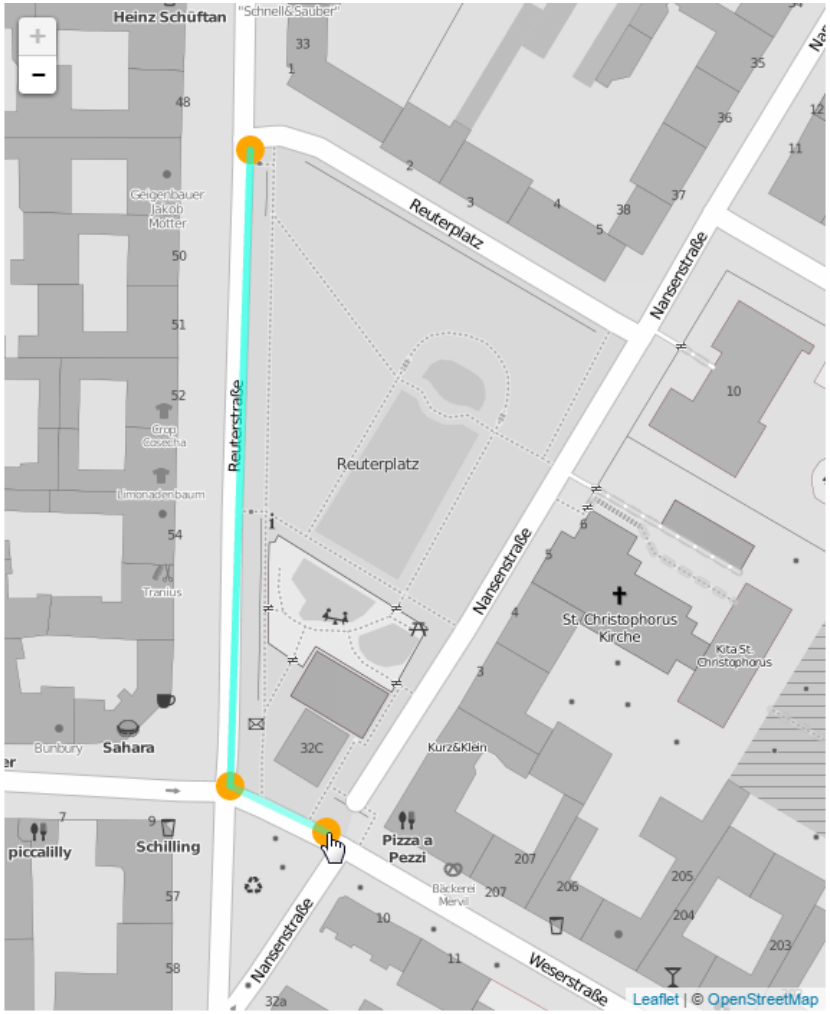
geoSYS

Digitizing



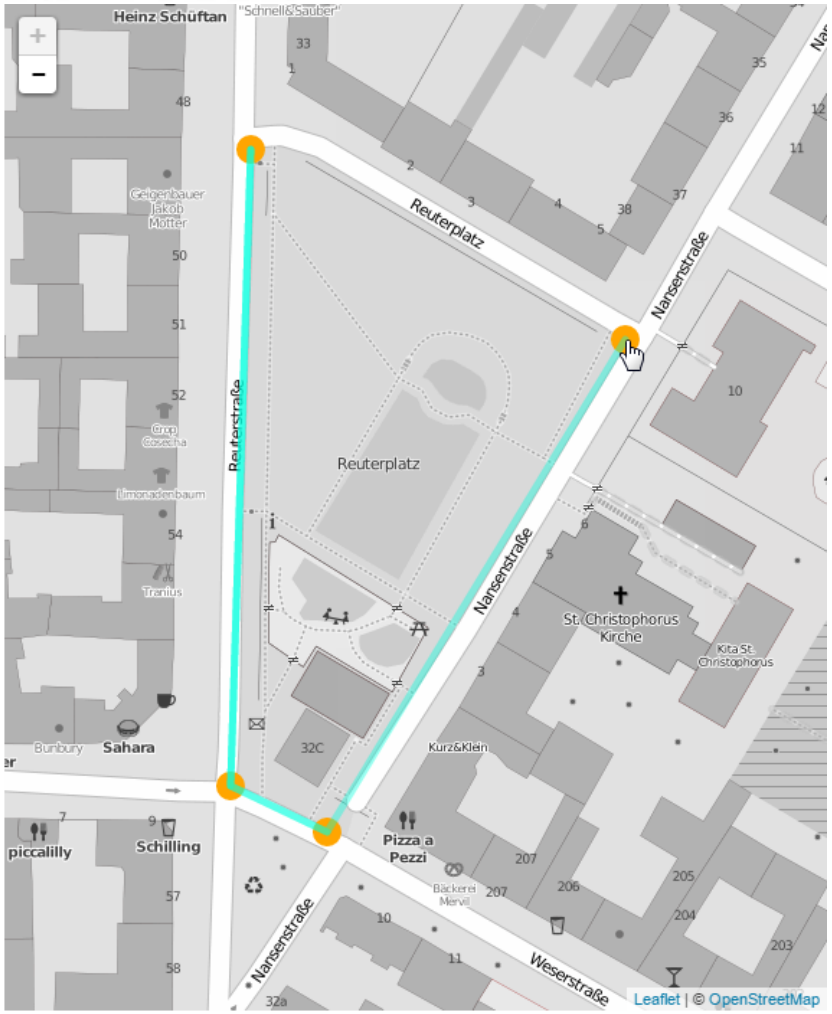
geoSYS

Digitizing



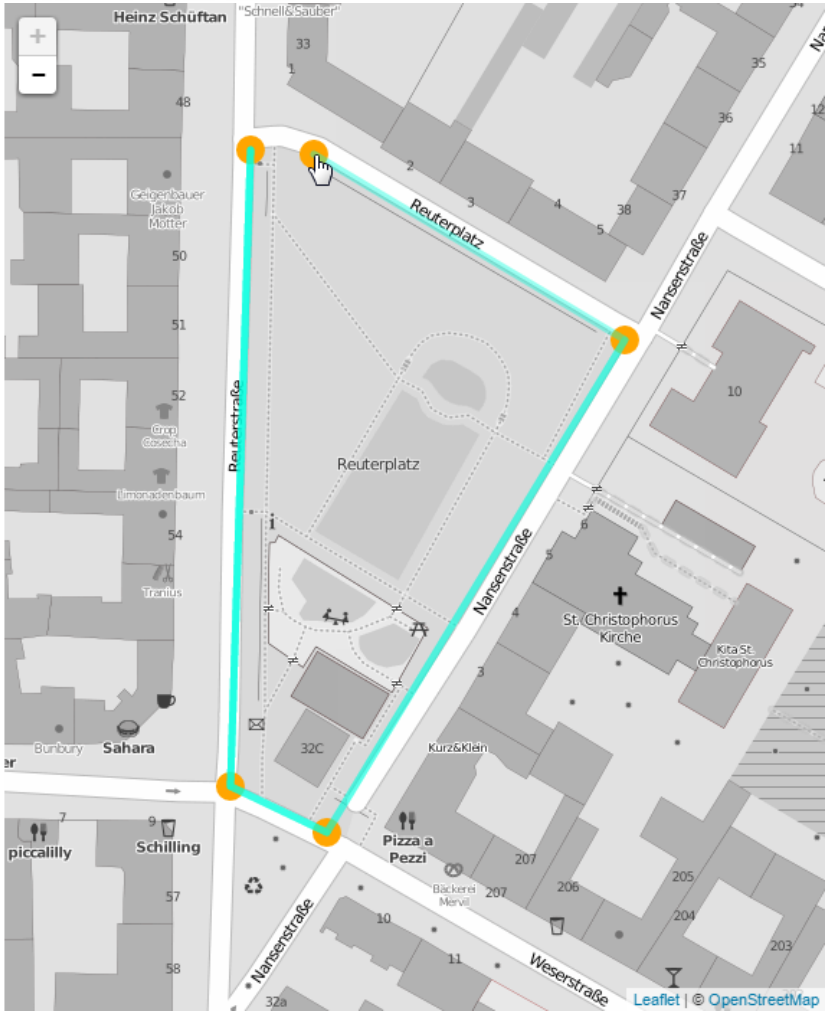
geoSYS

Digitizing



geoSYS

Digitizing



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Digitizing

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Show Result


```
{"type":"Feature","geometry":{"type":"Polygon","coordinates":
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[13.425035,52.487354],[13.431387,52.485211],
[13.437223,52.484244],[13.441086,52.486622],
[13.442202,52.488869],[13.441429,52.491665],
[13.440399,52.494252],[13.438725,52.495585],
[13.436322,52.496316],[13.433833,52.496708],
[13.430657,52.496734],[13.42731,52.496473],
[13.426194,52.496081],[13.425465,52.495062],
[13.425722,52.494461],[13.428426,52.493939]]]},"properties":
{}}
```


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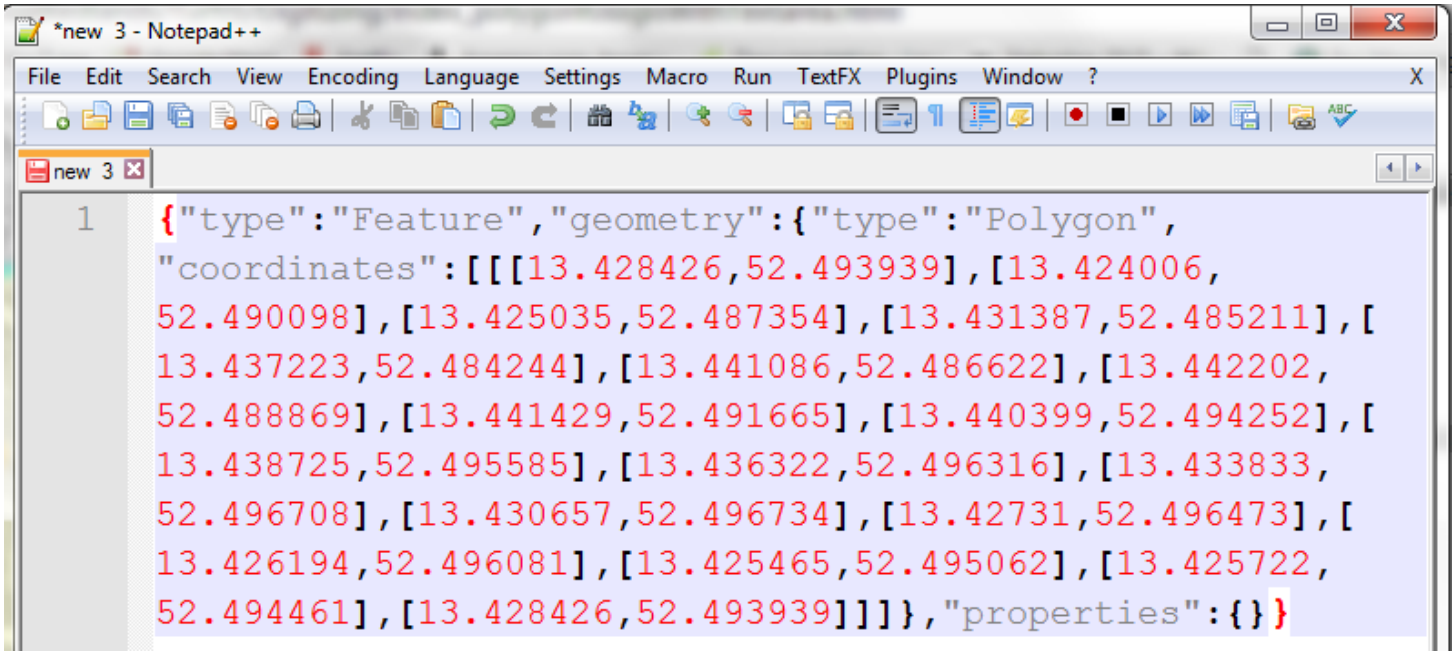
*new 3 - Notepad++
File Edit Search View Encoding Language Settings Macro Run TextFX Plugins Window ? X
new 3
1
{"type":"Feature","geometry":{"type":"Polygon",
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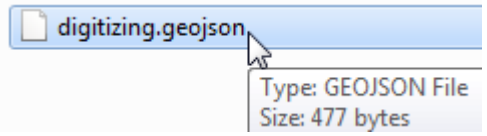
52.490098],[13.425035,52.487354],[13.431387,52.485211],[
13.437223,52.484244],[13.441086,52.486622],[13.442202,
52.488869],[13.441429,52.491665],[13.440399,52.494252],[
13.438725,52.495585],[13.436322,52.496316],[13.433833,
52.496708],[13.430657,52.496734],[13.42731,52.496473],[
13.426194,52.496081],[13.425465,52.495062],[13.425722,
52.494461],[13.428426,52.493939]]]},"properties":{}}


digitizing.geojson
Type: GEOJSON File
Size: 477 bytes

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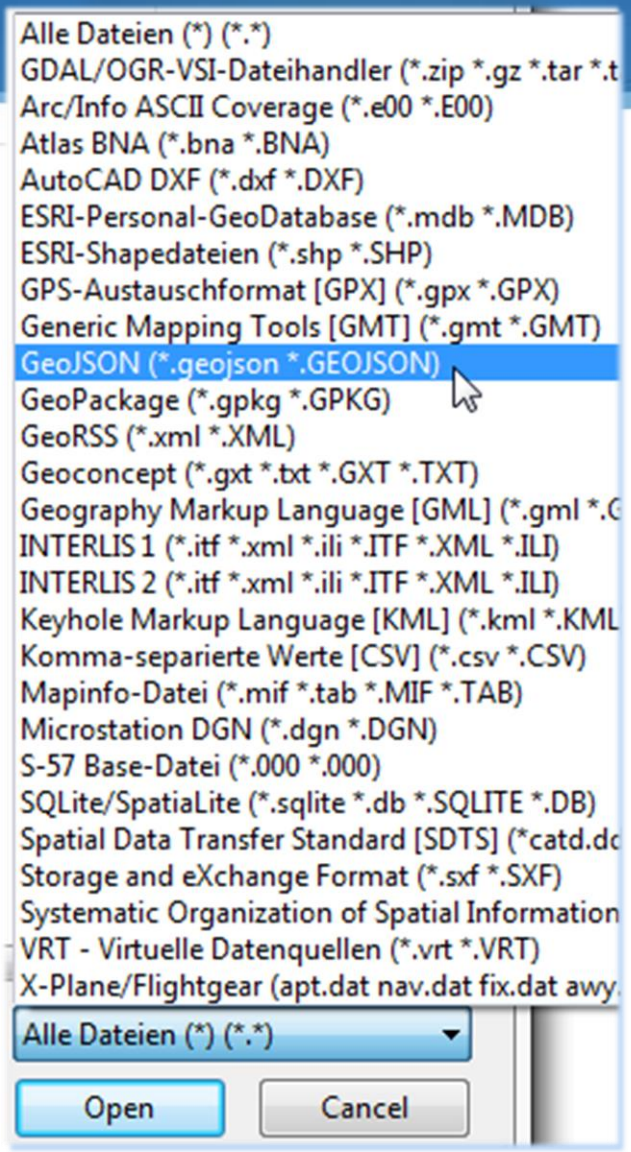
Alle Dateien (*) (*.*)
GDAL/OGR-VSI-Dateihandler (*.zip *.gz *.tar *.t
Arc/Info ASCII Coverage (*.e00 *.E00)
Atlas BNA (*.bna *.BNA)
AutoCAD DXF (*.dxf *.DXF)
ESRI-Personal-GeoDatabase (*.mdb *.MDB)
ESRI-Shapedateien (*.shp *.SHP)
GPS-Austauschformat [GPX] (*.gpx *.GPX)
Generic Mapping Tools [GMT] (*.gmt *.GMT)
GeoJSON (*.geojson *.GEOJSON)
GeoPackage (*.gpkg *.GPKG)
GeoRSS (*.xml *.XML)
Geoconcept (*.gxt *.txt *.GXT *.TXT)
Geography Markup Language [GML] (*.gml *.G
INTERLIS 1 (*.itf *.xml *.ili *.ITF *.XML *.ILI)
INTERLIS 2 (*.itf *.xml *.ili *.ITF *.XML *.ILI)
Keyhole Markup Language [KML] (*.kml *.KML
Komma-separierte Werte [CSV] (*.csv *.CSV)
Mapinfo-Datei (*.mif *.tab *.MIF *.TAB)
Microstation DGN (*.dgn *.DGN)
S-57 Base-Datei (*.000 *.000)
SQLite/SpatiaLite (*.sqlite *.db *.SQLITE *.DB)
Spatial Data Transfer Standard [SDTS] (*catd.dd
Storage and eXchange Format (*.sxf *.SXF)
Systematic Organization of Spatial Information
VRT - Virtuelle Datenquellen (*.vrt *.VRT)
X-Plane/Flightgear (apt.dat nav.dat fix.dat awy
Alle Dateien (*) (*.*)
Open
Cancel

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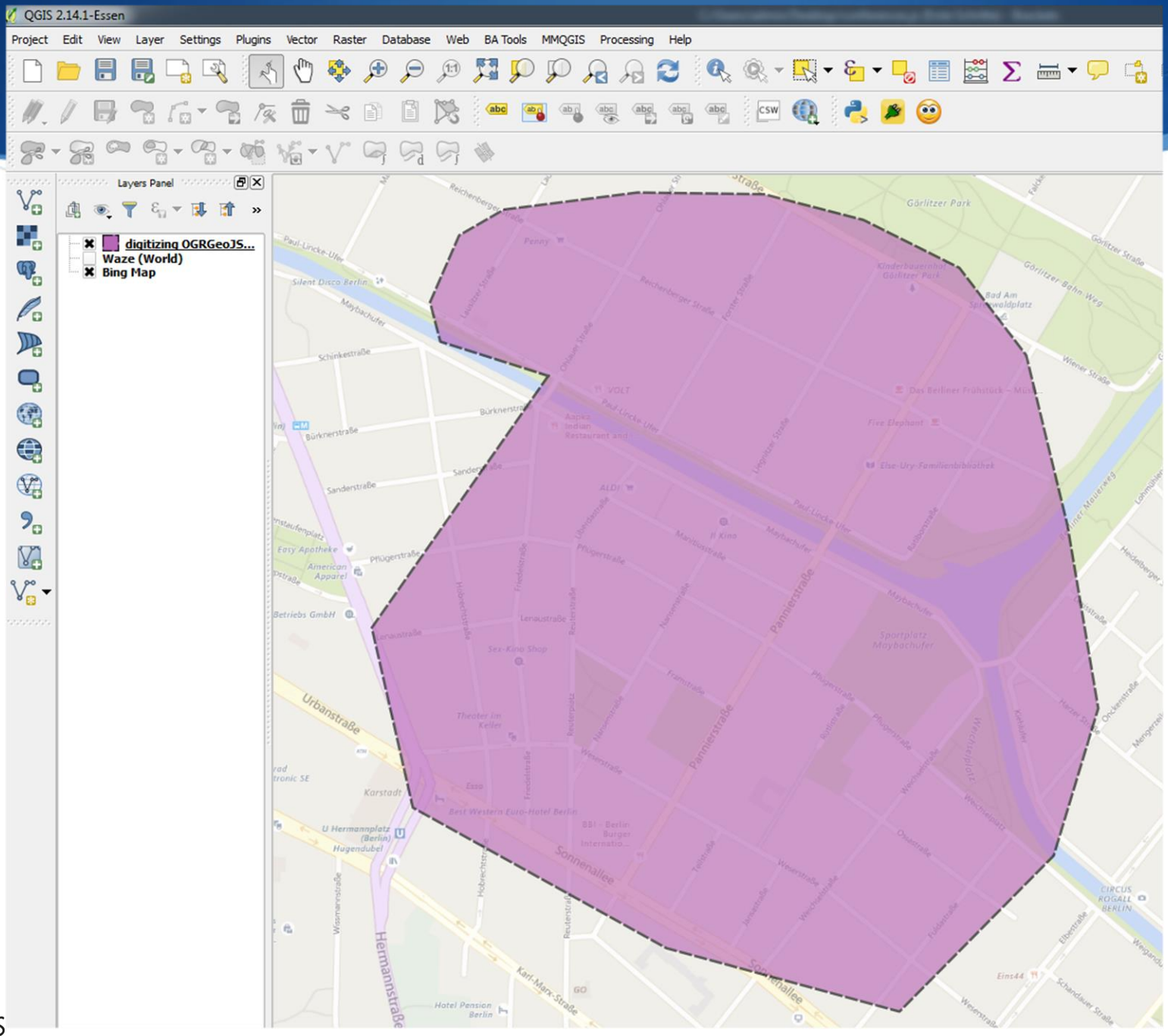
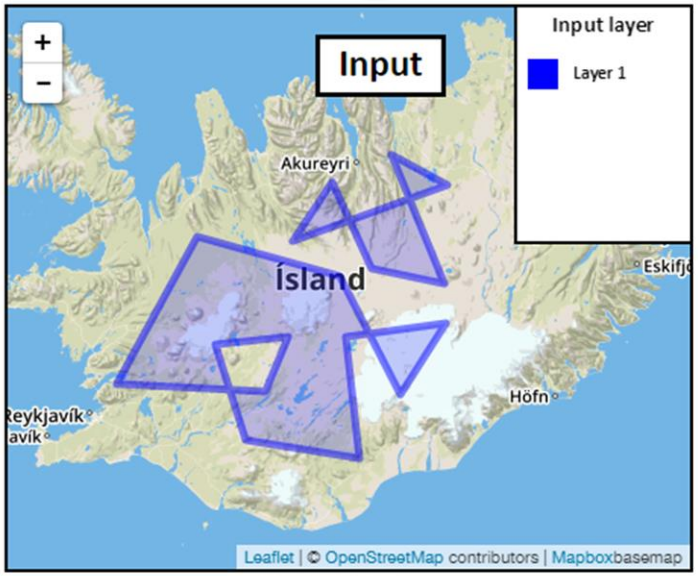
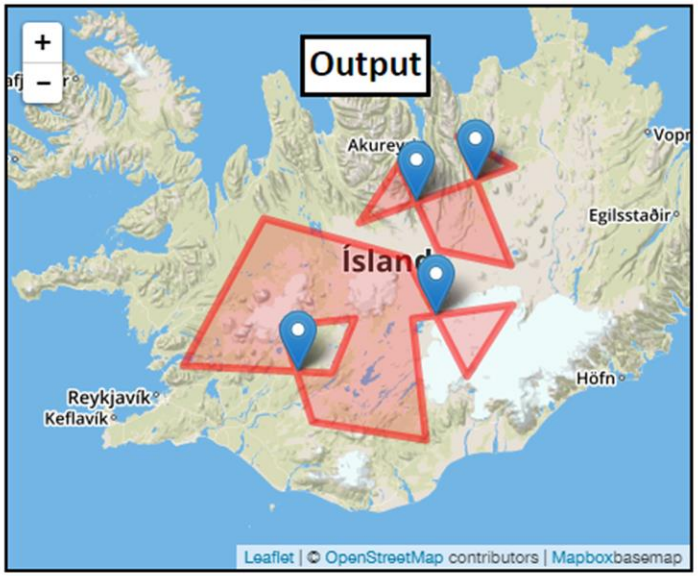

QGIS 2.14.1-Essen
Project Edit View Layer Settings Plugins Vector Raster Database Web BA Tools MMQGIS Processing Help
Layers Panel
digitizing OGRGeoJS...
Waze (World)
Bing Map
Pannierstraße
Urbanstraße
Sonnenallee
Hermannstraße
Karl-Marx-Straße
Görlitzer Park
Paul-Lincke-Ufer
Maybachufer
Schinkestraße
Bürknerstraße
Sanderstraße
Pflügerstraße
Lenaustraße
Weserstraße
Karstadt
Sportplatz Maybachufer
Else-Ury-Familienbibliothek
ALDI
Penny
Hotel Pension Berlin
Best Western Euro-Hotel Berlin

Dashboard






```
                ],
                [-17.874755859375,
                    65.04896759729846
                ],
                [-18.43505859375,
                    65.56754970214311
                ]
            ]
        ]
    }
}]
}
```

Output GeoJson

Add to map | Clear input | Generate output | Clear output

Intersect | Intersect 2

Erase

Union

Merge

Combine

Buffer | distance | unit

Simplify

Value:

Flip

Random

points/polygons | no. | xmin | ymin | xmax | ymax

Sample | Number of features

Kinks

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Europe Game

Next Round

Countries left: **3**

Find

Germany

CORRECT

You get **8** points.

8 seconds left.

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Nicht vergessen!

Workshop!

Morgen um 10:30 Uhr

Raum HS432

http://frab.fossgis-konferenz.de/de/2016/public/events/5083

Danke, Kontakt, Fragen

```
console.log('Danke! :-)!');
```

- gis.stackexchange.com/users/23263/britishsteel StackExchange
- numa.gremling@geosysnet.de
- twitter.com/Gremling89
- geosysnet.de

Die Folien: http://geosysnet.de/de/downloads.html

Impressum

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