

Intro to Web Maps and OSM

Spatial Data and Cartography on the Internet

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March 13th 2019

Topics

What are web maps?

- Browser-based

- Panning, Zooming, & Interactivity

- Your data is served

Some Distinctions

- Raster vs. Vector tiles

- Open vs. Proprietary

- Authoritative vs. Crowdsourced

- Etc

OpenStreetMap

- The Wikipedia of Geodata

- Schema

- Completeness & Data Quality

- Editing

What are web maps? -

Some common characteristics:

- ▶ Rendered in a web browser (e.g. Firefox)
- ▶ Data is hosted remotely and sent over the Internet
- ▶ Map is interactive
- ▶ Often has a global extent

What are web maps? - Browser-based

What is a web browser?

e.g.

- ▶ Firefox
- ▶ Chrome
- ▶ Opera

What are web maps? - Panning, Zooming, & Interactivity

JavaScript interactivity in-browser

Example: UTSC Commuters

What are web maps? - Your data is served

Remote data is hosted on a *server*, perhaps in a *database*.

Dynamic queries (e.g. a remote PostGIS connection)

e.g. (NextBus map)

What are web maps? - Your data is served

Pre-computed map tiles: (e.g. OSM)

`https://a.tile.openstreetmap.org/{z}/{x}/{y}.png`



Some Distinctions - Raster vs. Vector tiles

Raster - pixel-based image

Vector - image made of points, lines, polygons

Compare [OpenStreetMap](#) vs. [OpenSkiMap](#)

Some Distinctions - Raster vs. Vector tiles

Types can be combined!

OpenSkiMap

Some Distinctions - Raster vs. Vector tiles

Benefits of **raster tiles**

- ▶ Map renders consistently in all browsers
- ▶ Simpler client-side rendering
- ▶ Easier to hide source data
- ▶ Less need to simplify

Some Distinctions - Raster vs. Vector tiles

Benefits of **vector tiles**

- ▶ Client can customize rendering
- ▶ Finer zoom resolution
- ▶ Can query data directly

Potential limitations

- ▶ Simplification absolutely necessary
- ▶ Client has more access to data
- ▶ Client responsible for rendering correctly

Some Distinctions - Open vs. Proprietary

Licensing matters!!

Case Study: Google Streetview vs. Mapillary

Which one can you use in a report?

Some Distinctions - Authoritative vs. Crowdsourced

Authoritative maps distribute information from a central authority, often a government agency

- ▶ City of Toronto
- ▶ US Geological Survey

Some Distinctions - Authoritative vs. Crowdsourced

Crowdsourced maps: all data is contributed by volunteers

- ▶ OpenStreetMap
- ▶ Wikimapia

Some Distinctions - Authoritative vs. Crowdsourced

Mixed types exist as well!

- ▶ Yelp
- ▶ Google Maps
- ▶ Craigslist
- ▶ MapBox

Crowdsourced data + authoritarian control

Some Distinctions - Etc

Non-tiled vector maps

Non-map tiled images

Static maps on the web

OpenStreetMap - The Wikipedia of Geodata

OpenStreetMap is:

- ▶ Open
- ▶ Crowdsourced
- ▶ Accessible
- ▶ Global
- ▶ Flexible
- ▶ A work in progress

OpenStreetMap - Schema

Node (point)

Way (a series of nodes)

Relation (a collection of ways and/or nodes and/or relations)

Ways may share nodes (i.e. may be connected)

OpenStreetMap - Schema

Uses a flexible **Key=Value** schema for describing all objects

For example, you might describe a person with:

- ▶ sex = male
- ▶ height = 6'2"
- ▶ hair = brown
- ▶ hobby = sewing
- ▶ favourite_food = salmon

Examples of common attributes

OpenStreetMap - Tagging Schema

```
<node id="436886614" lat="43.7850779" lon="-79.1869664"  
  version="6" timestamp="2015-11-17T03:55:05Z"  
  changeset="35367433" uid="2550748" user="jamaps">  
  <tag k="amenity" v="fast_food"/>  
  <tag k="cuisine" v="sandwich"/>  
  <tag k="name" v="Subway"/>  
  <tag k="note" v="in UTSC student centre"/>  
  <tag k="website" v="http://subway.com/en-ca"/>  
</node>
```

OpenStreetMap - Tagging Schema

```
<node id="553539827" lat="43.7867562" lon="-79.1880301"  
  version="4" timestamp="2018-05-03T01:30:21Z"  
  changeset="58632390" uid="1108251" user="Nate_Wessel">  
  <tag k="highway" v="bus_stop"/>  
  <tag k="note" v="new shelter - away"/>  
  <tag k="operator" v="Toronto Transit Commission"/>  
  <tag k="public_transport" v="platform"/>  
  <tag k="shelter" v="yes"/>  
  <tag k="wheelchair" v="yes"/>  
</node>
```

OpenStreetMap - Tagging Schema

```
<way id="609341357" version="1"  
  timestamp="2018-07-19T22:29:41Z" changeset="60885386"  
  uid="2550748" user="jamaps">  
  <nd ref="5771842917"/>  
  <nd ref="5771842918"/>  
  <nd ref="5771842919"/>  
  <tag k="highway" v="service"/>  
  <tag k="service" v="driveway"/>  
</way>
```

OpenStreetMap - Completeness & Data Quality

OpenStreetMap may never be done

Incompleteness may be more obvious than on other maps

What does completeness even mean?

OpenStreetMap - Editing

Anyone with an account can edit

Several tools available for editing

Edit history is saved for all to see

Fini