Wrangling Utah OpenStreetMap Data

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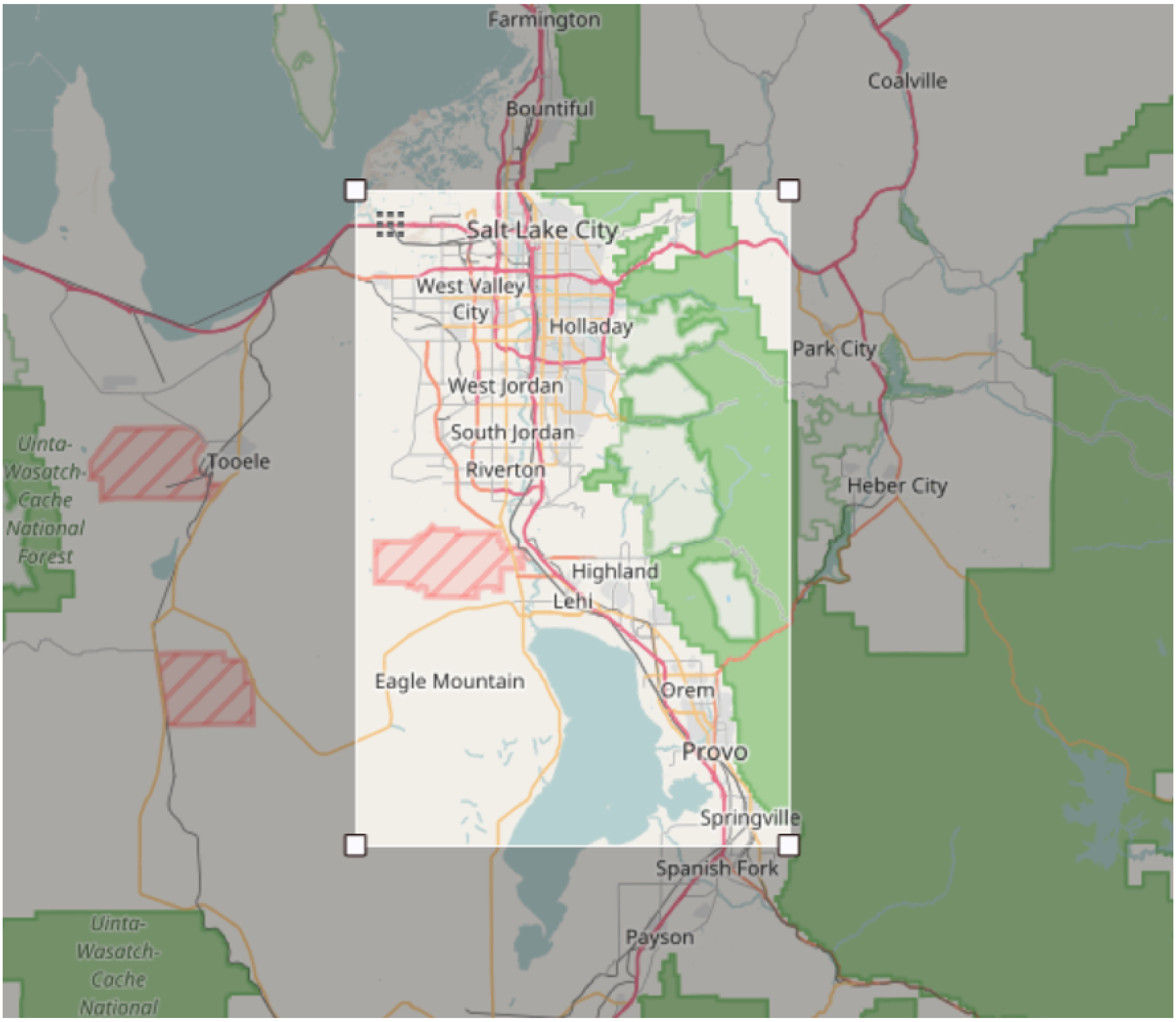
Map Area: Spans from North Salt Lake to Springville Utah

Salt Lake county and Utah county are the two largest counties in Utah, where I live. I thought it might be fun to check it out.



1. Problems Encountered in the Map

I followed a very similar process to the OpenStreetMap case study to get the data I wanted into MongoDB. After I inserted the collection, I used pipeline aggregation to clean the data further. These are a couple of things from the fields I was interested in.

County

Most county names show up as ", UT." But when I looked at all the unique values, I noticed some that looked like "Juab, UT:Millard, UT:, Utah, UT." I took each of those county fields and split them into arrays.

I also noticed that "Lincoln, LA" showed up in one "way." I looked it up on OpenStreeMap, found the actual county, and changed it. Here's the link for reference: http://www.openstreetmap.org/way/10147843

The county field was called "tiger:county" so I renamed it to "county" because I thought it looked better.

Building

Using the same trick as above, I looked at the distinct values for "building" and I found some had values of "no." I looked at pictures of these locations to try to see what happened. Here are two examples.

As you can see, those are definitely buildings. I changed all of the "building: no" entries to "building: yes."

Churches

Because I was interested in looking at different denominations, I wanted to make sure those were clean. There was one denomination that stuck in particular.

```
> db.with_churches.distinct('denomination')
[
        "mormon",
        "baptist",
        "methodist",
        "lutheran",
        "pentecostal",
        "foursquare",
        "catholic",
        "latter_day_saints,_mormon",
        "anglican",
        "jehovahs_witness",
        "presbyterian",
        "greek_orthodox",
        "seventh_day_adventist",
        "salvation_army",
        "scientist",
        "LDS",
        "roman_catholic",
        "latter_day_saints",
        "mormom",
        "united_methodist",
        "orthodox",
        "apostolic",
        "mormons;mormon",
        "lds"
]
```

`mormon`, `mormom`, `mormons;mormon`, `LDS`, `lds`, `latter_day_saints,_mormon`, and `latter_day_saints` all mean the same thing so I normalized the names using a MongoDB query:

```
> db.with_churches.updateMany({'denomination': {$in: ['mormon', 'mormom', 'mormons;mormon', 'LDS', 'lds', 'latter_day_saints,_mormon']}}, {$set: {'denomination': 'latter_day_saints'}})
```

2. Data Overview

File sizes

```
utah.osm ......... 208,716 KiB
utah.osm.json .... 208,717 KiB
```

I inserted the elements into MongoDB as I parsed and used `mongoexport` to create the JSON file, which explains the only 1 KiB difference. For a million documents, I don't think that's too bad.

Number of documents

```
> db.cleaned.find().count()
1032382
```

Number of nodes

```
> db.cleaned.find({'type': 'node'}).count()
918374
```

Number of ways

```
> db.cleaned.find({'type': 'way'}).count()
114008
```

Number of unique users

```
> db.cleaned.distinct('created.user').length
1022
```

Number of buildings

```
> db.cleaned.find({'building': {$exists: 1}}).count()
40000
```

Top building types

```
> db.cleaned.aggregate([
        {$match: {'building': {$exists: 1}}},
        {$group: {'_id': '$building', 'count': {'$sum': 1}}},
        {$sort: {count: -1}},
        {$limit: 5}
])
{ "_id" : "yes", "count" : 32850 }
{ "_id" : "house", "count" : 4317 }
{ "_id" : "apartments", "count" : 668 }
{ "_id" : "commercial", "count" : 385 }
{ "_id" : "church", "count" : 243 }
```

3. Other ideas about the dataset

Eighty-one percent of buildings are just labeled with `yes` instead of the building type. This sample reflects the overall percentage of all building tags. The OpenStreetMap wiki says to only use the `yes` value "where it is not possible to determine a more specific value."[1] I *highly* doubt that more than 80% of buildings can't be classified with a more specific value. I'm not certain there is a programmatic way to fix this, so I think it would be great to crowd source this to the community. Even getting that percentange down to 50% would be useful for looking for things like zoning in cities.

More queries

These are just some things I found interesting.

Top counties

```
> db.cleaned.aggregate([
        {'$unwind': '$county'},
        {'$group': {'_id': '$county', 'count': {'$sum': 1}}},
        {'$sort': {'count': -1}}
])
{ "_id" : "Salt Lake, UT", "count" : 17638 }
{ "_id" : "Utah, UT", "count" : 10234 }
{ "_id" : "Summit, UT", "count" : 185 }
{ "_id" : "Wasatch, UT", "count" : 23 }
{ "_id" : "Morgan, UT", "count" : 4 }
{ "_id" : "Millard, UT", "count" : 2 }
{ "_id" : "Juab, UT", "count" : 2 }
{ "_id" : "Davis, UT", "count" : 2 }
```

Top amenities

```
> db.cleaned.aggregate([
        {$group: {'_id': '$amenity', count: {$sum: 1}}},
        {$sort: {count: -1}},
        {$limit: 5}
])
{ "_id" : null, "count" : 1024496 }
{ "_id" : "parking", "count" : 2491 }
{ "_id" : "place_of_worship", "count" : 1105 }
{ "_id" : "restaurant", "count" : 1033 }
{ "_id" : "school", "count" : 550 }
```

Top churches

```
> db.with_churches.aggregate([
        {$group: {'_id': '$denomination', count: {$sum: 1}}},
        {$sort: {count: -1}},
        {$limit: 10}
])
{ "_id" : "latter_day_saints", "count" : 855 }
{ "_id" : null, "count" : 139 }
{ "_id" : "baptist", "count" : 31 }
{ "_id" : "catholic", "count" : 17 }
{ "_id" : "lutheran", "count" : 12 }
{ "_id" : "jehovahs_witness", "count" : 10 }
{ "_id" : "presbyterian", "count" : 8 }
{ "_id" : "methodist", "count" : 8 }
{ "_id" : "anglican", "count" : 5 }
{ "_id" : "foursquare", "count" : 5 }
```

Conclusion

OpenStreetMap has a lot of data not only entered by users, but also defined by users in a lot of cases. Auditing one aspect of the dataset at a time, like done above, and fixing errors seems like the best approach. I think if OpenStreetMap developed auditing tools for the community, they could crowd-source the cleaning of their data.

Footnotes

1. http://wiki.openstreetmap.org/wiki/Map_Features#Other_Buildings