Udacity_OpenStreetMap

Project

This is a project where I needed to choose an area of the world in the
    OpenStreetMap and use data munging techiques, such as assessing the
    quality of the data for validity, accuracy, completeness, consistency
    and uniformity, to clean the OpenStreetMap data for a part of the world
    that you care about. Choose to learn SQL or MongoDB and apply your
    chosen schema to the project.

Code Organization:

There are two folders one for the code I used to analyze my area and other
    for the Use Case example.

Map Area

São Paulo, SP, Brazil

- [https://www.openstreetmap.org/relation/298285#map=10/-23.6824/-46.5957]
    (link for Sao Paulo Map on OpenStreetMap)
- [https://mapzen.com/data/metro-extracts/metro/sao-paulo_brazil/](link for
    Sao Paulo OSM)

This area is my hometown, so I'm more interesetd to see what database
    querying reveals and I'd like to contribute to it's improment o
    OpenStreetMap.org.

The small area I whose their coordinates are: min lat: -23.6246 , max lat:
    -23.6162 , min lng: -46.6421 max lng: -46.6193.

Problems Encountered in the map:

Challenges Encountered:
- Street Names:
    - I found that some street names they were written in caps letters and
        other wasn't. So I tried to uniformalize those. Example: "RUA","rUa"
        when the correct and most commom used is "Rua".
    - I also found that some street names there wasn't a type on them.
        Example: "Angelo Meneguesso", "Oito". So we cannot know if it a
        street, avenue or a road.

- Example of Problems:
    - Misstyping street names: "RUA","rUa" instead of "Rua"
    - Missing type of street: "Oito" (so it would be "Rua Oito", "Avenida
        Oito". I don't know.).

- PostCode:
    - Post Codes from São Paulo City is 5 numbers and than be follow by a
        hiffen and more three numbers and must have: less than 0600 or in
        between 0800 and 0850.
    - I found that some places were from anothers cities like: "Santos",
        "Santana de Parnaíba". "São Caetano"
    - I also found that some postcodes were incomplete like: from "Rua
        Bresser": "1194"

  – Example of Problems:
    – Others cities in dataset: Mauá,Jundiai, Cotia, Santos.
    – Some postcodes are incomplete.

Query:

```sql
Select nt.value,COUNT(nt.value) from nodes_tags nt, (Select id,value from
    nodes_tags where key='postcode' and ((value > '0600' and value < '0800')
    or (value > '0850'))) ps where ps.id = nt.id and nt.key = 'city' group
    by nt.value Having COUNT(nt.value)> 1 order by COUNT(nt.value) DESC;
```

```
          nt.value               COUNT(nt.value)
          ---------------------  ---------------
          São Bernardo do Campo  117
          Guarulhos               81
          Mairiporã              66
          Mauá                   58
          Santo André            37
          Osasco                  36
          Santos                  33
          Suzano                  30
          São Caetano do Sul     28
          Diadema                 11
          São José dos Campos    10
          Barueri                 7
          Arujá                  6
          Cotia                   6
          São Roque              6
          Franco da Rocha         5
          Jundiaí                5
          Taboão da Serra        5
          Várzea Paulista        5
          Itupeva                 4
          São Paulo              4
          Ferraz de Vasconcelos   3
          Guarujá                3
          ITARIRI                 3
          Jundiai                 3
          Araçariguama           2
          Carapicuíba            2
          Itapevi                 2
          Salto                   2
          Santo Andre            2
```

I also noticed that, were 4 points in this query there which the city is
    allocated to 'Sao Paulo'.
After a investigation n those points (doing some more queries and using
    Google Maps), I noticed that some points actually are located in other
    cities and others in the postcode are incomplete.

Problems are Cleaned Programmaticaly:

– I solved the uniformatly probem for street names and removing from dataset
    those with no mapping correspondent and those with wrong Postcodes.

Overview of the data:

OSM XML Size:

```
sao-paulo_brazil.osm ......... 907 MB
database_OSM.db.........658.3 MB
nodes.csv ............. 346.6 MB
nodes_tags.csv ........ 9.5 MB
ways.csv .............. 34.5 MB
ways_tags.csv ......... 51.1 MB
ways_nodes.cv ........ 132 MB
```

Oversize statistics:

- number of unique users:
```sql
sqlite> SELECT COUNT(DISTINCT(e.uid))
FROM (SELECT uid FROM nodes UNION ALL SELECT uid FROM ways) e;
```

There are 2178 users.
- number of nodes and ways:

- Number of Nodes:

```sql
sqlite> SELECT COUNT(*) FROM nodes;
```

4003764 Nodes

- Number of ways:
```sql
sqlite> SELECT COUNT(*) FROM ways;
```

553876 ways

- number of chosen type of nodes, like cafes, shops etc.

Top 10 contributing users
```sql
sqlite> SELECT SUM(num)
FROM(
    SELECT e.user, COUNT(*) as num
    FROM (SELECT user FROM nodes UNION ALL SELECT user FROM ways) e
    GROUP BY e.user
    ORDER BY num DESC
    LIMIT 10);
```

```
Bonix-Mapper,2345049
AjBelnuovo,262639
cxs,191624
MCPicoli,106375
"O Fim",105778
johnmogi,95857
ygorre,91096
patodiez,85006
naoliv,84366
"Roberto Costa",65525
```

Responsable for 3433315 points, which is 75% of data.

Number of user appering only once

```sql
  sqlite> SELECT COUNT(*) FROM (SELECT e.user, COUNT(*) as num
  ...> FROM (Select user from nodes union all select user from ways) e
  ...> Group by e.user
  ...> Having num = 1)
```

There are 476 users with only 1 post.

```sql
  SELECT COUNT(*) FROM (SELECT e.user, COUNT(*) as num
  FROM (Select user from nodes union all select user from ways) e
  Group by e.user
  Having num < 5) ;
```

There are 847 users with less than 5 posts.

Contributor statistics and gamification suggestion

The contributions of users seems incredibly skewed, possibly due to
automated versus manual map editing (the word "bot" appears in some
usernames). Here are some user percentage statistics:

Top user contribution percentage ("Bonix-Mapper") 51.45%
Combined top 2 users' contribution ("Bonix-Mapper" and "AjBelnuovo") 57.21%
Combined Top 10 users contribution 75.3%
There were 0.38% (847) of users that did less than 5 posts.

Additional Data Exploration

Top 10 appearing amenities

```sql
sqlite> SELECT value, COUNT(*) as num
FROM nodes_tags
WHERE key='amenity'
GROUP BY value
ORDER BY num DESC
LIMIT 10;
```

```
    restaurant|1132
    bank|685
    fuel|615
    fast_food|477
    school|473
    parking|427
    pharmacy|410
    pub|379
    place_of_worship|359
    bicycle_rental|274
```

Ideas to Improve the dataset:

- As showed above the dataset contained some points from others cities (like
  Santos) it will be nice it had some way to verify the new points when

they are created. Google Maps could be used in this process. But this
may also cause a legal issue or something like that since it is using
data from another source

– Due to the low number of users contributions to Open Street Map I think
that another idea would be if it had an app with gamifications to
incentivate differents users to contribute to the system. Alhough it can
improve the participation of new users the developer that creates the
app may have collected the data and use to another task.

References:
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Sao Paulo OSM)
– [https://thiagorodrigo.com.br/artigo/cep-sao-paulo-lista-de-cep-por-
bairro-e-cidade-da-grande-sao-paulo/](Sao Paulo PostCodes)