CAL maps

These are the graphs available to the students enrolled in the CAL course unit (Algorithm Design and Analysis), a 2nd-year module of the MIEIC MSc Programme @FEUP. There are two different sorts of graphs available - Portugal Maps and Grid Graphs. Also, there are files with example tags for different application purposes. The instructions on each of these are explained below:

1. Portugal Maps

These graphs were extracted from OSM and represent several Portuguese cities. As they are more realistic, they are intended to be used for the group projects. The distribution of the data in the cities is as follows:

Graph characteristics

City	Number of Nodes	Number of Edges
Aveiro	3294	3135
Braga	20063	20371
Coimbra	21262	21729
Ermesinde	2949	3134
Fafe	2383	2504
Gondomar	7340	7504
Lisboa	74622	91587
Maia	8505	8692
Porto	10176	10765
Viseu	6193	6175
Portugal	**1803214**	**1874296**

Data Visualization

Below you find some snapshots of the rendered data:

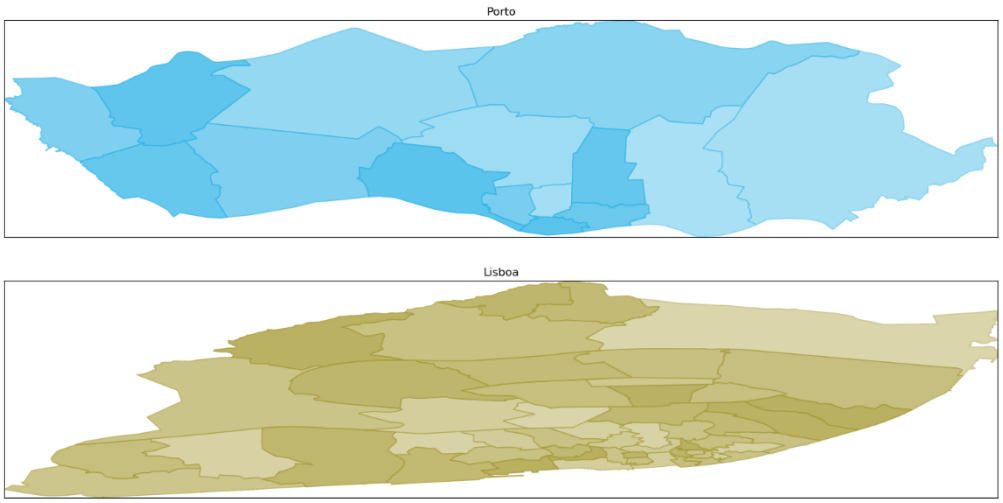

Figure 1: Administrative boundaries of the cities.

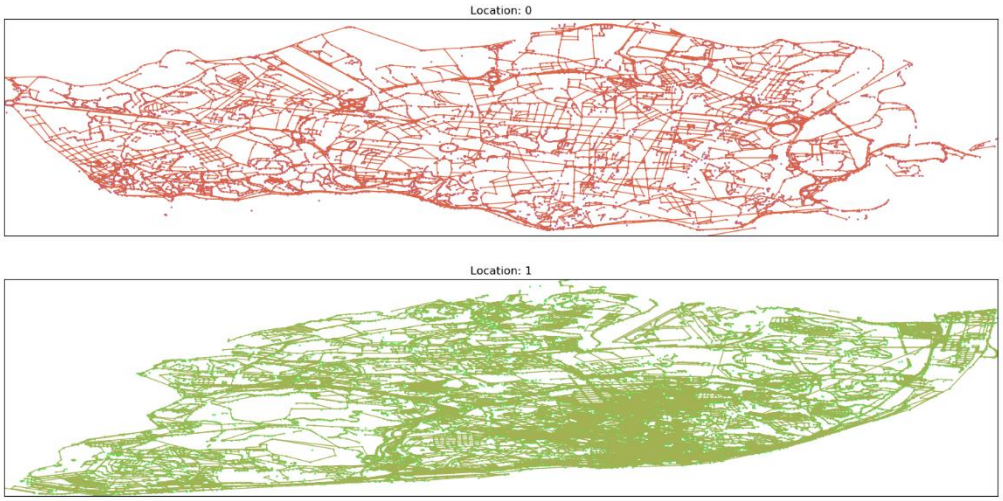

Figure 2: Graphs representing road networks.

2. Grid graphs

These graphs are much simpler than the previous ones, and they are NxN grids with (N+1)*2*N undirected edges. These could be used, for instance, for a better understanding of the algorithms implemented, for debugging any problems with them, or as a starting point for the projects. They are available in three different sizes, namely 4x4, 8x8 and 16x6.

3. Examples of Tags

There are also examples of tags associated with the Portugal Maps, by city. The table below presents examples of possible application domains in which they can be used to locate points of interest (PoI). Such PoI's may be used as origins and destinations for the algorithms to be implemented in the different group projects. Note, however, such PoI's are presented

as examples only. Groups are encouraged to adapt the tags and/or create new tags according to their project problems.

Tag Name	Application Examples	Tags from OSM
t01	Shared Mobility	"cycleway=shared_lane", "share_taxi=*", "cycleway=share_busway", "route=share_taxi", "amenity=boat_sharing", "amenity=car_sharing", "amenity=car_rental", "amenity=car_pooling", "amenity=bicycle_rental"
t02	Recycling & Garbage Collection	"amenity=waste_basket", "amenity=recycling", "amenity=waste_disposal", "bin=*", "landuse=landfill", "recycling_type=container", "recycling_type=centre", "amenity=waste_transfer_station", "waste=*"
t03	Tourism & Leisure	"tourism=information", "tourism=hotel", "tourism=attraction", "tourism=viewpoint", "tourism=guest_house", "tourism=picnic_site", "tourism=artwork", "tourism=camp_site", "tourism=museum", "tourism=*"
t04	Shopping, Groceries, & Departments	"building=warehouse", "industrial=warehouse", "landuse=industrial", "amenity=loading_dock", "shop=department_store", "shop=variety_store", "shop=supermarket", "shop=doityourself", "shop=convenience", "shop=clothes", "shop=hardware", "shop=furniture", "shop=electronics", "shop=mobile_phone", "shop=shoes", "shop=alcohol"
t05	Schools & Education	"amenity=school", "building=school", "amenity=driving_school", "school=*", "amenity=music_school", "amenity=language_school", "amenity=dancing_school", "amenity=ski_school"
t06	Stations & Airports	"aeroway=aerodrome", "aeroway=gate", "aeroway=terminal", "aerodrome:type=*", "aeroway=heliport", "iata=*", "landuse=military"
t07	Healthcare	"healthcare=*", "healthcare:speciality=*", "health_facility:type=*", "healthcare=dentist"
t08	Banks & Finance	"amenity=bank", "barrier=hedge_bank", "amenity=financial_advice", "amenity=atm", "office=tax_advisor", "government=audit", "shop=money_lender", "amenity=money_transfer", "shop=moneylender"

t09	Post Offices	"vending=parcel_mail_in", "amenity=post_box", "amenity=post_office", "post_box:type=*", "post_office=*", "amenity=post_depot"
t10	General Buildings	"building=construction", "construction=*", "landuse=construction", "highway=construction", "amenity=restaurant", "amenity=cafe", "amenity=fast_food", "amenity=bank", "amenity=pharmacy", "amenity=bar", "amenity=pub", "landuse=commercial"
t11	Multimodal Transport	"railway=subway", "railway=subway_entrance", "subway=*", "station=subway", "station=subway", "public_transport=platform", "railway=station", "building=train_station", "highway=bus_stop", "bus=*", "route=bus", "amenity=bus_station", "train=*", "building=train_station", "bicycle=*", "amenity=bicycle_parking", "bicycle_parking=*", "amenity=bicycle_rental", "aeroway=taxiway", "amenity=taxi", "taxi=*", "share_taxi=*"

There are also tags related with the STCP routes, where the lines, the stops, and the respective nodes are associated. However, these tags are only available for the city of Porto

How things are stored

As a way to facilitate reading the data, all maps are separated into 2 files: one for **nodes**; one for **edges**. While one the **Portugal maps** the edges are assumed to be **directed** (i.e. if the edge from x1 to x2 is birectional there are two entries on the file, one from x1 -> x2 and another from x2->1), in the **Grid Graphs** they are assumed to be all **undirected**. **Note:** As a bonus for the Portugal Maps, there are two **nodes** files, one with latitudes and longitudes and another with UTM coordinates (X/Y pairs) to ease portability.

On the other hand, the **tags** files map node entries on the Portugal Maps files to a possible application, for each city.

Example for Porto's data:

nodes_lat_lon_porto.txt:

```
10176                                   -- number of nodes
(90379359, 41.1552865, -8.6721342)      -- (ID of node, latitude, longitude)
(90379613, 41.1555912, -8.6727197)      -- ...
(90379614, 41.1553799, -8.6731542)
(90379615, 41.155288, -8.6732049)
```

nodes_x_y_Porto.txt:

```
10176                                                   -- number of nodes
```

```
(90379359, 527509.2187047654, 4556047.36820414)   -- (ID of node, latitude, longitude)
(90379613, 527459.9657422074, 4556081.008946291)  -- ...
(90379614, 527423.5976763209, 4556057.414999209)
(90379615, 527419.3820432525, 4556047.196960005)
```

edges_porto.txt:

```
10765                      -- number of edges
(560409305, 560409296)     -- (ID node origin, ID node destiny)
(1104140057, 428208843)    -- ...
(114312650, 114312651)
(428215421, 428215422)
```

Example for Tag t01:

t01_tags_porto.txt:

```
9                          -- number of tags
cycleway=shared_lane       -- tag name
101                        -- number of nodes in this tag
475561986                  -- ID of node
1097394695                 -- ...
```

Future work

- We plan to improve the quality of the data (eventually gathering data from other sources as well); please feel free to suggest other improvements! :-)

Questions and Doubts

Please contact **Margarida Silva** (margarida.rpds@gmail.com), the undergrad teaching assistant in charge of maintaining this repository.