Missing Links - Closing the Circuit in Existing Cycle Networks

Challenge Provider: U-Shift

U-Shift is a research lab of CERIS - Civil Engineering Research and Innovation for Sustainability, at Instituto Superior Técnico.

We aim to:

- Provide technical and scientific research contributions in the urban mobility domain to promote behavior shifts to active modes, public transportation usage and sustainable technology adoption;
- Collaborate with different society stakeholders to develop innovative solutions to the problems of urban mobility;
- Disseminate new knowledge in this domain between students and professionals, either belonging to local or central authorities, entrepreneurs and industry.

Context

Planning of the infrastructure needed to change mobility patterns requires high quality evidence. Data and models are needed to ensure cost-effective investment, enabling new infrastructure to be planned where most needed. In the case of cycling, it has the greatest potential to replace unnecessary and unhealthy short motorised trips in more dense urban centres, which means designing efficient cycleways and safe street connections.

In many places, in particular low cycling maturity cities, several investments in infrastructure are sometimes made without considering the network impact, by placing a piece of network segment that does not connect to other cycling network parts, despite research showing that a cycle network retrieves more modal shift gains if well connected.

Goals

The goal of this challenge is to find the opportunities to create a stronger cycling network and help make cities easier to cycle. By doing so, the city will become more accessible, with better air quality and improved physical levels and health of the citizens.

Outcome

For this challenge we are looking for a data-driven framework/solution for finding the missing segments in a scattered cycling network of a city.

Available Resources

We provide you the data for the city of Lisbon, but you can use the data from any city and we also give you some pointers where you can find that data.

As a reminder, all the datasets can be found here: https://bit.ly/wdl-data. You can also use any open, free, and legally available data.

Cycling networks

Lisbon Cycling Network: Contains the traces of all the cycling ways in Lisbon. Ciclovias.pt is a collaborative map for cycling infrastructure in Portugal. It's data contains:

Column name	Description
id	id
nome	Designation of the main road
tipo	Type of infrastructure: *exclusiva* - dedicated cycle path; *partilhadacarros* - on-road with traffic; *partilhadapeoes* - off-road with pedestrians; *NA* (not assigned)
data_alt	timestamp of the last modification
length	length, in meters
geometry	LINESTRING, as WGS84 crs

Other cities with cycling networks openly available

- **UK:** https://data-sustrans-uk.opendata.arcgis.com/
- **Any place:** OpenStreetMap [http://download.geofabrik.de], filter "highway" = "cycleway"

Travel survey data

Origin - Destination Matrix by modes of transportation in Lisbon:
This dataset is based on the survey conducted by the national statistics institute of Portugal (INE). The first two columns represent the origin and destination district of Lisbon municipality (with an average of 3.6 km2 area). The other columns represent the number of trips by transportation mode. The geometry represents the desire line between both centroids of districts, weighted for where people live (aka mean coordinates).

Column name	Description	Source
DicofreOR	District code of Origin, as character	INE 2013 [2]
DicofreDE	District code of Destination, as character	INE 2013 [2]
Car	Number of trips made by car between OD	INE 2018 [1]
Bike	Number of trips made by bicycle between OD	INE 2018 [1]
Walk	Number of trips made by walking between OD	INE 2018 [1]

Other	Number of trips made by other transportation mode (transit, motorcycle, other) between OD	INE 2018 [1]
Total	Number of trips made between OD	INE 2018 [1]
geometry	Linestring between districts centroids, weighted by population	Ushift [3]

Polygon of Lisbon districts

Column name	**Description**	**Source**
Dicofre	District code, as character	INE 2013 [2]
DistrictName	District name	INE 2013 [2]
Population2011	Population resident, as census 2011	INE 2013 [2]
geometry	Polygons, as WGS84 crs	CAOP 2020 [4]

UK National Travel Survey:
https://www.gov.uk/government/collections/national-travel-survey-statistics#national-travel-survey-data-tables

Sydney Travel survey and cycling count data:
https://opendata.transport.nsw.gov.au/search?query=household%20travel%20survey
https://opendata.transport.nsw.gov.au/dataset/cycling-data

Digital Elevation Model

- **Lisbon**: https://github.com/U-Shift/Declives-RedeViaria/blob/main/raster/LisboaIST_clip_r1.tif (10m)
- **Europe**: https://land.copernicus.eu/imagery-in-situ/eu-dem/eu-dem-v1.1 (25 m)
- **Rest of the world**: https://www2.jpl.nasa.gov/srtm/ (30 m)

Submissions

Deadline: 15 - 05 - 2021 @ 14h00 GMT + 1

Don't forget that you will need to deliver the report **using the template provided** (see below) and a 1-minute summary.

Submission template: http://bit.ly/wdl-template

Tips

- The “missing-link” can be a geometry network problem or/and a problem that takes population behaviour and needs into account;
- Recommended datasets for solving the challenge:
    - Cycling network
    - Mobility survey data or manual bike counts data
    - Digital Elevation Model
    - Collision data reports
    - Home and workplaces density
- Try to fill in the template from start to finish with a straightforward dummy solution first and iterate afterwards. This is a challenge where is it easy to start simple;
- If possible, don’t forget to explain your decisions.

References

[1] https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_publicacoes&PUBLICACOESpub_boui=349495406&PUBLICACOESmodo=2&&fbclid=IwAR2QzUZK0mUSEdKySZe1HqmObblKWR62vIyVhtVAAxrQhyNllna-DDfp2bk&xlang=en
[2] https://censos.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=censos_quadros
[3] http://ushift.tecnico.ulisboa.pt/data/
[4] https://www.dgterritorio.gov.pt/cartografia/cartografia-tematica/caop?language=en