A spatial accessibility analysis for cycling in Bari

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1 Context

Urban bike commuting is influenced by several factors that, along facilitating or hindering it, impact the choice of the route that cyclist travel. This is particularly relevant in accessibility studies considering that the shortest path, that is the path maximizing the accessibility reach of a urban rider, may not always be the selected route. This may be because of infrastructure- and built environment-related perceptions (e.g. safety concerns, enjoyableness of the ride) which drive riders away from the shortest path looking for a best option to ride. Our accessibility analysis is based in Bari. Bari is a medium-sized city in the south of Italy with limited but growing bike infrastructure supply. We deem important in this context to evaluate to what extent urban bike commuters deviate from their shortest paths. This will allow us to identify critical edges, that are the links of the road network that are sistematically avoided, and to identify the factors that lay behind such deviations.

2 Data and methods

2.1 Data

We mainly use two datasets. The first one is the OpenStreetMaps road network of Bari downloaded from the Overpass API[1]. The second dataset is a big-data GPS tracking set, provided by Pinbike[2], that contains almost 27,000 bike commuting trips in the city of Bari which are GPS-tracked every 3 seconds (resulting in a total of little more than 6,000,000 tracks).

2.2 Methods

The methodology includes three core preliminary steps:

1) road network is simplified and infrastructural redundancies, multi-lanes and crossing are removed to facilitate map-matching. Figure 1 summarizes the process;

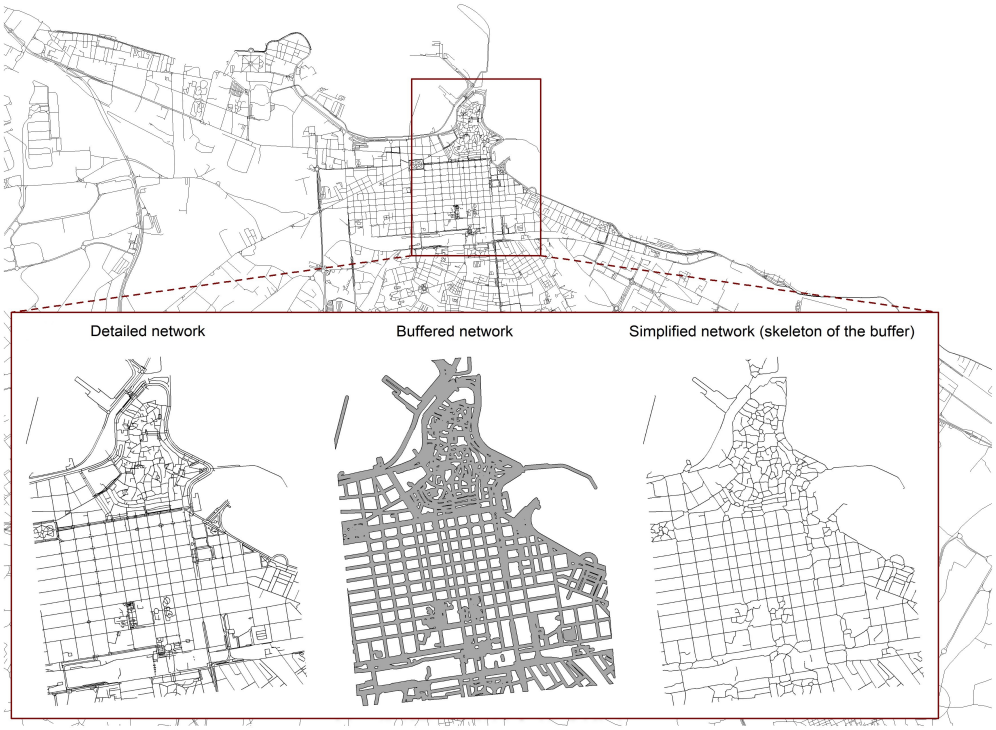

Figure 1: Steps of the network simplifying process

2) pre-processed GPS trajectories are map-matched to the simplified network routes as in figure 2;

[1] https://overpass-turbo.eu/

[2] Pinbike is a system delevoped by "FB Innovation srls" that tracks urban bike commuters and rewards them with monetary incentives to promote urban biking

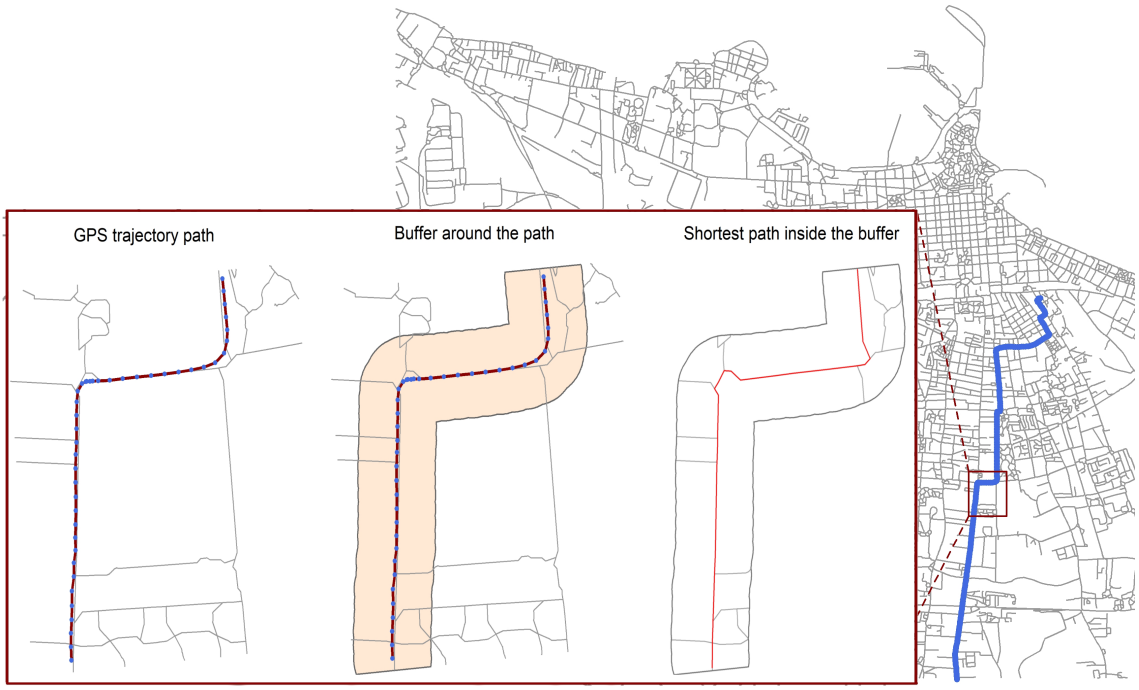

Figure 2: Process to map-match the GPS trajectories to the network

3) the shortest paths of every real trip is calculated and the percentage overlap between the shortest path and the real path is assessed.

After the preliminary steps and the analysis of the overlap, critical nodes of the shortest paths that are systematically avoided will be identified to provide an overview of the infrastructure preferences. Average speed on links will be calculated and correlation between it and deviation will be explored. Furthermore, the analysis will be broke down considering time-of-the-day, reason of the commuting (work vs school commuting) and sociodemographic characteristics of the users. As a second step, a set of possible drivers for deviation will be identified and modeled to study the association between them and the degree of deviation from the shortest path. In particular, sociodemographic characteristics, infrastructure and built environment features data will be collected and used in the analysis.

3 Expected results

The analysis will deliver two main output. First, critical links will be identified and data visualization tools will be used to give a graphical representation of them at a network level. Second, drivers explaining route choice and deviation from shortest paths will be identified and discussed. Both results may be useful for transport practitioners to better understand bikers preferences, weak network links and plan design strategies to maximize the accessibility reach of urban bikers.