

# Geospatial analysis of moving routes of bicycles using probe data

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Various policies have been recently taken to promote the use of bicycles as urban traffic in many cities around the world. However, for implementing such bicycle use promotion policy, building a bicycle road network concerning the improvement of the bicycling environment should be carefully assessed. The OD (origin to destination) data have often been utilized in many study cases on the traffic performance of the bicycle. However, since actual cyclists may take various routes, not only the shortest one but a longer route where the cyclists feel comfortable. In this research, therefore, network analysis on the actual bike movement trajectory is analyzed using the probe data (Strava Metro) which summarizes the movement of cyclists for each road segment, whose tracks are recorded by GNSS receivers. We then try to provide objective information which can be the basis of the discussion for building optimal bicycle roads encouraging the comfortable use of bicycles in cities.

Along with the probe data of bicycles, topographic environments and land use data were collected for five cities including Melbourne (Australia), New York (USA), Austin (USA), Chicago (USA), and Paris (France). Spatial analysis was performed using these data. Regarding the bicycle trajectory, the three points, including commuting use, weekend use, and use ratio on weekdays and weekends, were focused to be compared with the urban structure. Characteristic features of bicycle use for each city, as well as common features among the cities, were clarified: for instance, in Melbourne, commuting users tend to pass curved roads near parks more frequently rather than straight roads. Also, the use of roads in suburban areas is more frequent in weekends. Like this, it is observed that the frequent use of bicycles is found in or near parks, or characteristic topographical environments such as rivers and ridges, suggesting that the bicycle use strongly depends on the urban environments. Classification of bicycling networks is possible for different existing urban structures. It was also shown that the use ratio of bicycles in the central and peripheral areas is different for each city. These findings can be used for promoting future bicycle policies, including the construction of a wide-area bicycle network that incorporates existing urban structures, and optimal routes and connection distances.

Keywords: Bicycle, Probe data, GNSS, Spatial analysis