

Geovisualization of Human Mobility Patterns in Los Angeles Using Twitter Data

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Abstract : The capability to move around places is doubtless very important for individuals to maintain good health and social functions. People's activities in space and time have long been a research topic in behavioral and socio-economic studies, particularly focusing on the highly dynamic urban environment. By analyzing groups of people who share similar activity patterns, many socio-economic and socio-demographic problems and their relationships with individual behavior preferences can be revealed. Los Angeles, known for its large population, ethnic diversity, cultural mixing, and entertainment industry, faces great transportation challenges such as traffic congestion, parking difficulties, and long commuting. Understanding people's travel behavior and movement patterns in this metropolis sheds light on potential solutions to complex problems regarding urban mobility. This project visualizes people's trajectories in Greater Los Angeles (L.A.) Area over a period of two months using Twitter data. A Python script was used to collect georeferenced tweets within the Greater L.A. Area including Ventura, San Bernardino, Riverside, Los Angeles, and Orange counties. Information associated with tweets includes text, time, location, and user ID. Information associated with users includes name, the number of followers, etc. Both aggregated and individual activity patterns are demonstrated using various geovisualization techniques. Locations of individual Twitter users were aggregated to create a surface of activity hot spots at different time instants using kernel density estimation, which shows the dynamic flow of people's movement throughout the metropolis in a twenty-four-hour cycle. In the 3D geovisualization interface, the z-axis indicates time that covers 24 hours, and the x-y plane shows the geographic space of the city. Any two points on the z axis can be selected for displaying activity density surface within a particular time period. In addition, daily trajectories of Twitter users were created using space-time paths that show the continuous movement of individuals throughout the day. When a personal trajectory is overlaid on top of ancillary layers including land use and road networks in 3D visualization, the vivid representation of a realistic view of the urban environment boosts situational awareness of the map reader. A comparison of the same individual's paths on different days shows some regular patterns on weekdays for some Twitter users, but for some other users, their daily trajectories are more irregular and sporadic. This research makes contributions in two major areas: geovisualization of spatial footprints to understand travel behavior using the big data approach and dynamic representation of activity space in the Greater Los Angeles Area. Unlike traditional travel surveys, social media (e.g., Twitter) provides an inexpensive way of data collection on spatio-temporal footprints. The visualization techniques used in this project are also valuable for analyzing other spatio-temporal data in the exploratory stage, thus leading to informed decisions about generating and testing hypotheses for further investigation. The next step of this research is to separate users into different groups based on gender/ethnic origin and compare their daily trajectory patterns.

Keywords : geovisualization, human mobility pattern, Los Angeles, social media

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