

# Spatio-Temporal Road Coverage of Probe Vehicles: A Case Study on Crowd-Sensing of Parking Availability with Taxis

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**Abstract** Finding a parking space is a key mobility problem in urban scenarios. Parking Guidance Information (PGI) systems could mitigate this issue, but they require information about on-street parking availability. An encouraging solution discussed in the literature is crowd-sensing by a fleet of probe vehicles, which can continuously scan the current state of parking lanes during their regular trips. Nevertheless, the achievable spatio-temporal coverage of such a fleet is still an open point. In this paper, we present an evaluation of the suitability of a fleet of taxis as probe vehicles for parking crowd-sensing. In particular, we exploited a dataset of real-world trajectories collected from about 500 taxis over 3 weeks in San Francisco (USA), to extract their movement patterns. The quality of achievable parking information is determined by combining these patterns with availability data collected from parking sensors in about 400 road segments. For that, the last sensing of a taxi is considered as an estimate of parking availability in a road segment. Results of movement patterns show a heterogeneous distribution in time and space. Nevertheless, already about 500 taxis are enough to provide availability information with a maximal deviation of one parking space per road segment in about 90% of time steps. Thus, taxis show a high suitability as probe vehicles for crowd-sensing parking information.

**Keywords** Parking search, On-street parking, Taxi trajectories, Crowd sourcing

