Fighting For Curb Space: Parking, Bike Sharing, Urban Freight Deliveries, Ride-Hailing, And Other Users

This research fills a gap by conducting empirical analyses to quantify total curb demand.

WHAT IS THE NEED?

In many urban areas, curb space management is a key determinant towards a sustainable transportation system. This is because new trends in passenger and freight transportation demand require access to this limited asset. On the passenger side, in addition to efforts to increase pedestrian and bicycle traffic, and transit ridership, the advent of ride-hailing services has created a surge in curb demand.

As a reference, a few years ago, taxis represented around 1% of the vehicle trips in San Francisco, ride-hailing trips are 15% of the total today. Similarly, electronic commerce growth (double-digits yearly) and residential deliveries require more curb access for freight loading/unloading activities. Aggravating the issue, ride-hailing companies are offering goods delivery services pressuring an already contested and congested system.

WHAT ARE WE DOING?

The work is conducted in three main fronts. First, the team reviewed the literature on parking and curbside management policies, strategies, and guidelines. Moreover, the team reviewed the general literature about curb and parking demand.

Second, the team has been estimating aggregate generation models for demand of different services, e.g., residential deliveries, commercial deliveries, and ride-hailing, by finding the relationship between aggregate demand and socio-economic variables of the study area. The team have used different sources...
of data such as aggregate ride-hailing pick-ups and drop-offs, estimates from (passenger, freight, and bike) trip generation models, and socio-demographics of the location.

Finally, the team is designing various scenarios to evaluate the impacts of different parking assumptions and curb management strategies. They will evaluate these scenarios by combining micro-simulation based on the results from an activity-based and agent-based models.

**WHAT IS OUR GOAL?**

This project leverages ongoing research on the development of a bike-sharing system, transit access programs through ride-sharing, and freight trip generation to develop an integrated spatial simulation framework to quantify curb demand.

**WHAT IS THE BENEFIT?**

There is evidence of the impacts of curbside and parking management for the design and planning of urban areas. While this problem may affect dense urban areas, particularly access to the final destination (either for goods or people) will impact other transportation decisions that span over the boundaries of the urban core. Whether the impacts of ride hailing for the sustainability of the transportation system are not completely understood, these services offer a mobility option for a proportion of the population, offer accessibility to others, could replace single-occupancy vehicles, and increase transit ridership.

Some of these benefits would not be realized in the long-run if the quality of service degrades, or if access to it gets difficult. Access to the curb for passenger loading and unloading is an important contributor to the efficiency of these services. Some of these aspects have implications in the planning geographic scope of urban, regional, and state level agencies, such as California Department of Transportation.

Similarly, access to the curb for commercial goods delivery affect the efficiency of the operations with cascading impacts on decisions, such as type of vehicle used, vehicle technology, distribution routes, and facility location, among others. These decisions, again, have implications beyond the urban level.

This project will develop a framework that, using the results from aggregate and approximate estimation and simulation analyses, estimates curb demand from different services.

**WHAT IS THE PROGRESS TO DATE?**

The research team completed the following as of September 2019:

- Selected a set of locations in San Francisco representing residential, commercial, and mixed land uses, to develop the micro-simulation tool.
- Extracted the trip information from the Metropolitan Transportation Commission Activity Based Model.
- Used the daily trip data to generate inputs for the MatSim agent-based model for these locations.
- Ran the agent-based model to gather the preliminary data for the micro-simulation.
- Conducted analysis for the development of the parking rules and re-routing algorithms.
- Finalized the literature review, which concentrated on: Federal, Regional, and Local curb side management guidelines & Academic publications related to parking and curbside modeling.
- Summarized the key findings from the review considering the various users (pedestrians, ride-hailing, commercial deliveries, residential deliveries, micro-mobility, bike sharing, passenger vehicle parking, transit)
- Finished a draft version of the report describing the findings from the literature.

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Figure 1. Selected Areas in San Francisco

Figure 2: Micro-simulation Example

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