Analysis of Comprehensive Multi-modal Shared Travel Systems with Transit, Rideshare, Carshare and Bikeshare Options

A comprehensive study that develops analysis and modeling methodologies as well as prototype mobile apps, for multi-modal shared travel systems in an urban area.

WHAT IS THE NEED?

Rise in demand for transportation followed by limited capacities on the street networks has led to growing congestion in large cities like Los Angeles. In such cities, public transportation plays a significant role in alleviating congestion on the street network. However, the problem of transporting people to and from public transport stations, also known as the last-mile problem, remains an issue. Commuters who would have otherwise used public transportation choose to drive their vehicles due to the difficulty of access to public transportation stations. Introducing sustainable transportation alternatives to provide access to public transportation allows the reduction of the negative side-effects of congestion. The private sector that now plays an increasing role as a component of urban transportation via Transportation Network Companies (TNCs) and Mobility Service Providers (MSPs) can augment public transportation options with solutions that include shared use of transportation capacity.

WHAT WAS OUR GOAL?

A primary goal of the study is to develop insights on efficiencies to be gained through the use of various shared mode travels. Further goals are to develop a mobile application that can provide trip plans across multiple modes that include several options such as shared cars, rides, bikes, and bus/rail transit, and to understand user response through limited field surveys.
WHAT DID WE DO?

This research extends the previous project by integrating multiple shared mobility alternatives. In this study, bike sharing will also be integrated into the transit feeder system, along with P2P ridesharing, in an attempt to increase accessibility to transit stations and improve transit ridership. Biking has several advantages compared to normal vehicle usage: (i) it is not affected by the street traffic conditions, and (ii) while drivers’ pre-specified schedules combined with the transit system’s fixed routes and schedules constrain the potential for matches, the route and schedule of bikes are flexible, as long as bikes are available at stations. By guiding riders to walk some distances to the nearby bike stations and P2P ridesharing go-points and hence aggregating the demand (Stig et. al. 2015), the ride matching rate could increase.

WHAT WAS THE OUTCOME?

This project introduces schemes to study sustainable transportation alternatives that provide access to public transportation. We design a transit feeder system by matching a ride to P2P ridesharing, bike-sharing, walk, and transit. Green transportation modes in the system can be mutually beneficial in terms of improving ridership, saving cost and increasing mobility. Following our earlier study (Phase 1 research in 2015-16), we further proposed schemes to integrate multiple transportation modes and methods to increase ride-matching rates. The proposed system is tested in LA County. Target modes are metro red line subway rail in the Metro bike-sharing program in Downtown LA, walk, and P2P ridesharing. Geographical analysis for accessibility indicates that both P2P ridesharing and bike-sharing enlarge the catchment area of the red line stations. In the morning peak, bikes are more effective in Downtown LA because bikes are generally not affected by downtown street congestion.
the Pasadena, and Venice. Integrating the LA Metro bike redistribution with that in the City of Santa Monica may also be beneficial for both cities and worth examining. Finally, a large component of the existing transit system, namely the bus system, needs to be incorporated into or studies to fully determine the full breadth of possibilities offered by the new shared-mobility alternatives in achieving green and sustainable transportation. This is expected to be a focus in our further research during the subsequent phase-III of the sequence of projects, in 2017-18.

WHAT IS THE BENEFIT?

The main components of such a comprehensive system are metro rail and bus lines, peer-to-peer ridesharing, bikesharing and carsharing. The multi-modal trip scheduling software developed in the past research will be utilized for this research, with enhancement to incorporate bus lines, and carshare systems. The framework is expected to be of critical importance for planning comprehensive future field implementation projects with multi-modal shared travel options.

As TNCs and MSPs are becoming a significant player in urban transportation and shared travel options are an important component of TNC/MSP operations, the algorithms and apps developed in this project will pave the way for larger field tests of comprehensive systems with public-private cooperation. The research may also help in developing modern schemes for transportation in the future when autonomous vehicles may provide further dimensions in shared travel options. The project will also help position the researchers and public and private transportation operators to consider developing comprehensive plans to utilize capacity-sharing to tide over significant changes in urban travel that may be caused by large events such as disasters or a possible Olympics in LA.