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Research Results

# Designing a Transit-Feeder System Using Bike sharing and Peer-to-Peer Ridesharing

A mobile app incorporates bikeshare stations to connect commuters to and from transit stops and increase public transportation ridership

Modal

MARCH 2018


**Project Title:**
Designing a Transit-Feeder System Using Bike sharing and Peer-to-Peer Ridesharing

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## WHAT WAS THE NEED?

Public transit plays a vital role in alleviating urban congestion, but it doesn't capture its full mode share because many travelers do not have close access to a station. The first-mile, last-mile problem in terms of proximity to a transit stop keeps many commuters in their vehicles, often driving solo. When strategically placed, bike sharing services complement and enhance transit by offering travelers a convenient one-way trip to and from stations.

Riders can check out a bike from the docking station and not worry about loading it on a bus or metro car or bringing it into the workplace. The bikes can extend transit coverage, linking disconnected bus and metro stops without added infrastructure costs. In a previous project, the researchers developed a mobile application for the Los Angeles Metro that suggests travel routes in real time that combine ride sourcing options and transit schedules to make public transportation more efficient and attractive. This research broadens the transportation alternatives to include bike sharing as a transit feeder.

## WHAT WAS OUR GOAL?

The goal was to expand the transit-feeder application to include bike sharing as one of the multimodal itineraries with routes, cost, and travel time to promote public transit use.

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## WHAT DID WE DO?

Caltrans, in partnership with the University of California Center on Economic Competitiveness in Transportation (UCCONNECT), added bike sharing location to a recently developed transit-feeder mobile application to investigate the potential contribution biking can have on public transit ridership.

Using the LA Metro Red Line and the city's newly launched downtown bikeshare system as a case study, the researchers developed algorithms to estimate and compare routes, travel time, and cost between driving to a destination or using ride sourcing or bike sharing, or a combination of the two, to connect with a transit stop. To address the ongoing fluctuating supply and demand for bicycles among stations, a redistribution program periodically rebalances the docking stations by optimally routing vans for pick up and drop off.

## WHAT WAS THE OUTCOME?

The multimodal network scheme finds comprehensive optimal routes for travelers, expanding the coverage of public transit. Ridesharing and bike sharing could be effective transit feeders when properly designed and integrated into the transit system. Simulations showed that by coordinating bike sharing with metro schedules, bike usage could initially grow by 1.7%. This number can increase significantly if bus transit systems are also included, as proposed in a follow-up project. For this limited case study, the availability of bike sharing and ride sourcing options increased metro usage by about 2%. The algorithm for rebalancing bike docking stations confirmed that three vans are needed to serve 63 stations and optimized the routing to reduce travel times, which is necessary as the bike system expands

## WHAT IS THE BENEFIT?

The expanded transit-feeder system presents alternative options to efficiently connect travelers with transit, addressing the first-last mile hurdle and making public transportation more attractive, efficient, and accessible. Including bike sharing as a transit component also promotes healthier modes of transportation and boosts biking in general as a means of transportation, encouraging infrastructure improvements to provide protected lanes and other safety measures.

## LEARN MORE

To view the final report:
www.its.uci.edu/~jaykay/Final-Report-Ucconnect-Task_2964.pdf

## IMAGES

Image 1: A Network for Bike sharing, P2P ridesharing, and LA Metro Red Line stations

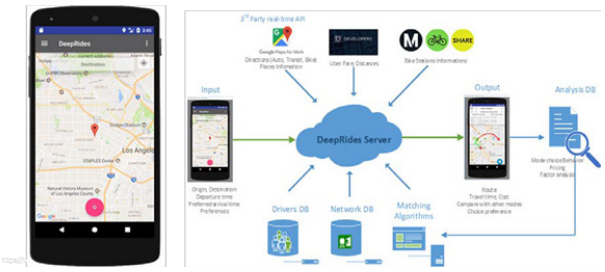


Image 2: Passenger mobile app (left) and its system framework

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