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Research Results

Demand Responsive Transit Operation Based on Dynamic Passenger

The IDTO system is intended to enable T-CONNECT, T-DISP and D-RIDE services and real-time transit information for transit operations and travelers.

Modal

MAY 2019

Project Title:
Demand Responsive Transit Operation Based on Dynamic Passenger Information

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WHAT IS THE NEED?

Transit agencies in suburban regions in California and the U.S. are facing enormous challenges to improve transit operation efficiency and to provide cost-effective operations, due to the fact that the traveling populations are distributed in large geographic regions. Therefore, transit agencies must assign a limited number of vehicles on routes to ensure geographic coverages, resulting in long headways between vehicles and long waiting time for travelers. This significantly discourages choices to take public transit.

WHAT WAS OUR GOAL?

The Integrated Dynamic Transit Operations system is intended to enable enhanced connectivity, reduced travel time and improved transit operations by providing transit connection protection (T-CONNECT), dynamic dispatch (T-DISP) and dynamic ride-sharing (D-RIDE) applications.

WHAT DID WE DO?

The IDTO Phase One effort can be summarized as follows: The concept of operations (ConOps) and conceptual design are specified based on the definition of sponsors' requirements, and the IDTO system architecture is designed with details of functional components. Based on the system design, the researchers developed the essential functional components including the IDTO server, dispatch interface and the IDTO mobile app for passengers. The above components were tested separately and then integrated into the IDTO prototype, which has been verified by field operational testing (FOT) on selected BART and Tri-Delta Transit bus routes at selected connection

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points during the demonstration phase. For the phase one effort, the demonstration focused on the implementation and testing of the T-CONNECT application. Benefits and impacts of IDTO were evaluated in terms of connection needs detection, correspondence with passengers' needs, trip time savings and the improvement on the connection success rate, using the data collected from the FOT.

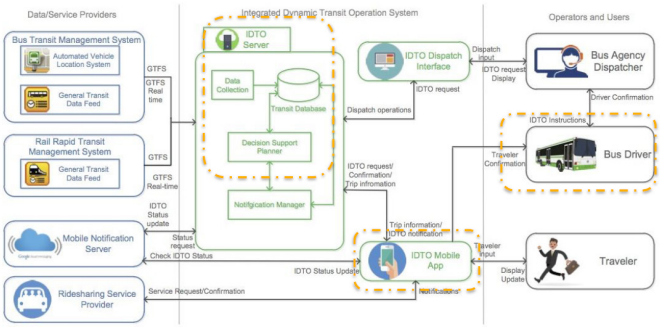
WHAT WAS THE OUTCOME?

The evaluation shows that the IDTO prototype can correctly identify 85.5% of all trip delays involving connection failures during the FOT, and the precision of T-CONNECT requests of IDTO prototype reaches 72.3%, indicating that the IDTO prototype system can effectively detect trip delays and submit T-CONNECT requests to hold the connecting bus. Due to the vehicle holding service provided by the IDTO T-CONNECT function, the passengers' waiting time decreases by 23.78 minutes and 30.71 minutes on average as a result of connections being successfully protected, for bus-bus and BART-bus scenarios respectively. The success rate of connections can be increased from 80.21% to 97.12% by implementing T-CONNECT. In addition, FOT results indicate that the IDTO system-submitted T-CONNECT request matches the passengers' manual connection protection requests well, indicating that the IDTO prototype is able to fulfil passengers' actual needs for requesting connection protection services, where T-Connect requests can be automatically submitted without passengers' interventions.

WHAT IS THE BENEFIT?

The promising results of the FOT indicate that the IDTO prototype and the T-CONNECT application have the potential to improve connectivity, reduce travel time and enable efficient and cost-effective transit operations. Therefore, it can be concluded that a potential extension of development and implementation of a fully-functional IDTO prototype would be necessary to further investigate the benefits of T-CONNECT, T-DISP and D-RIDE applications and the impacts of the fully-deployment of IDTO system and operations.

IMAGES



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