Dr. Zhibin Chen

COST-EFFECTIVENESS OF MODULAR TRANSIT SYSTEMS

Biography

Dr. Zhibin Chen is an Assistant Professor at New York University Shanghai and Global Network Assistant Professor at New York University. Prior to this appointment, he was a research fellow at Department of Civil and Environmental Engineering, University of Michigan, Ann Arbor. Dr. Chen received his Ph.D. in transportation engineering from the University of Florida in 2017. His research interests include the study of electric vehicle behavior, policies, and charging infrastructure; innovative and sustainable transportation system design; transportation network modeling and optimization, and AI in transportation. His research has been published in a series of transportation journals including Transportation Science, Transportation Research Part B/C/D/E, IEEE ITS, and EJOR. He is the editorial board member of Transportation Research Part C and was the recipient of the Stella Dafermos Best Paper Award and the Ryuichi Kitamura Paper Award at the 95th TRB Annual Meeting.

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Abstract

Modular autonomous vehicles (MAVs), due to the capability of en-route (de)coupling and in-motion transfer, have caused paradigmatic changes in transit system design and operation. A comprehensive cost-effectiveness analysis is critical to assessing the potential costs and benefits of adopting such a disruptive technology in transit services. In this study, we design an MAV-based transit system consisting of a corridor service complemented by multiple locally operated pick-up-and-delivery routes, thereby leveraging the advantages offered by MAVs while simultaneously taking into account their operational requirements. Based on the proposed MAV-based transit system, we then develop a continuum approximation (CA) model to quantify the system's performance in terms of passenger and agency costs, as well as the intricate relationship between system parameters and operation variables. Comparable CA models for a fixed-route service and an on-demand service based on the same settings are also established. We use the models to analyze the properties of these service modes and uncover the subtle interactions between the system performance and various parameters and variables. Moreover, comparisons across service modes reveal the favorable operation regime for each mode, thereby offering managerial insights and guidance for modular transit system design and operation.