香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

土木及環境工程學系
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Jointly Organized with
The Hong Kong Society for Transportation Studies

SEMINAR

TRAFFIC SIGNAL PERIMETER CONTROL AND RIDE-HAILING REBALANCING STRATEGIES FOR LARGE-SCALE MULTI-MODAL URBAN NETWORKS

Speaker

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Abstract

Human mobility in congested city centers is a complex dynamical system with high density of population, many transport modes to compete for limited available space and many operators that try to efficiently manage different parts of this system. New emerging modes of transportation, such as ride-hailing and on-demand services create additional opportunities, but also more complexity. This talk will investigate hierarchical control strategies for two important applications, large-scale traffic signal control and repositioning of idle vehicles in ride-hailing systems (RHVs). First, we will design and investigate the effectiveness of a two-layer adaptive signal control framework for network-wide application, combining centralized macroscopic fundamental diagram (MFD)-based perimeter control with Max Pressure distributed control. Then, we will present a hierarchical control strategy for the repositioning of idle RHVs by integration of proactive macro-repositioning strategies and micro-management of vehicles partaking in such activities. The upper-layer utilizes an MFD aggregated model. Aggregated models for fleet management require more sophisticated MFD-based models describing mixed dynamics of private vehicles and RHVs. In the lower-layer, a coverage control scheme is employed to distribute the vehicles within the region to achieve a demand-aligned configuration, which provides each vehicle with relatively detailed position guidance. Results will be presented for both frameworks compared with traditional benchmark control strategies.

Biography

Prof. Nikolas Geroliminis is a Full Professor at EPFL and the head of the Urban Transport Systems Laboratory (LUTS). Before joining EPFL he was an Assistant Professor on the faculty of the Department of Civil Engineering at the University of Minnesota. He has a diploma in Civil Engineering from the National Technical University of Athens (NTUA) and a MSc and Ph.D. in civil engineering from University of California, Berkeley. His research interests focus primarily on urban transportation systems, traffic flow theory and control, public transportation and on-demand transport, car sharing, Optimization and Large Scale Networks. Among his recent initiatives is the creation of an open-science large-scale dataset of naturalistic urban trajectories of half a million vehicles that have been collected by one-of-a-kind experiment by a swarm of drones (https://open-traffic.epfl.ch). Among other editorial responsibilities, he is currently the Editor-In-Chief of Transportation Research part C: Emerging Technologies.

7 December 2024
Saturday

4:00 pm - 5:00 pm

Civil Engineering Conference Room
Room 3574 (Lift 27/28)

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