

HIGHLIGHTS OF LANE-FREE AUTOMATED VEHICLE TRAFFIC WITH NUDGING

Speaker

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Abstract

A novel paradigm (named TrafficFluid) for vehicular traffic in the era of connected and automated vehicles (CAVs) was recently proposed, which is based on two combined principles. The first principle is lane-free traffic, which renders the driving task for CAVs smoother and safer, as risky lane-changing manoeuvres become obsolete; increases the capacity of the roadway due to increased road occupancy; and mitigates congestion-triggering vehicle manoeuvres. Also, lane-free CAV traffic implies that incremental road widening (narrowing) leads to corresponding incremental increase (decrease) of capacity, and this opens the way for real-time internal boundary control to flexibly share the total width and capacity among the two traffic directions. The second principle is vehicle nudging, whereby vehicles may be influencing other vehicles not only behind, but also on the sides or in front of them; this allows for traffic flow to be freed from the anisotropy restriction, which stems from the fact that human driving is influenced only by downstream vehicles. Nudging leads to improved traffic flow capacity and stability. Some highlights of related work are outlined, such as: Nonlinear feedback control of CAVs in lane-free traffic with nudging; Optimal path planning for individual vehicles and vehicle groups; Forming of 1-D snake-like interruptible vehicle platoons and flexible 2-D vehicle flocks in lane-free traffic; Emerging macroscopic traffic flow modelling; Internal boundary control; Driving on large-scale lane-free roundabouts (Place Charles de Gaulle in Paris); Signal-free and lane-free urban intersection crossing of vehicles and platoons.

Biography

Markos Papageorgiou was a Professor of Automation with the Technical University of Munich, Germany, from 1988 to 1994. Since 1994 he has been a Professor (since 2021 Professor Emeritus) at the Technical University of Crete, Greece. Since 2021 he has also an appointment at Ningbo University, China. He was a Visiting Professor with the Politecnico di Milano, the École Nationale des Ponts et Chaussées, MIT, UC Berkeley, Sapienza University of Rome, and Tsinghua University. His research interests include automatic control, optimisation and applications to transportation systems, water systems, and further areas. He served as Editor-in-Chief of Transportation Research - Part C (2005-2012). He is Life Fellow of IEEE and Fellow of IFAC. He received several distinctions and awards, including the 2020 IEEE Transportation Technologies Award and two ERC Advanced Investigator Grants..



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