

# 学术报告会

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## Highlights of Lane-Free Automated Vehicle Traffic with Nudging



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### 摘要:

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 on highways and arterials to flexibly share the total (both directions) road width and capacity among the two traffic directions in dependence of the bi-directional traffic conditions, so as to maximize the total system efficiency. 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.

After presenting the TrafficFluid motivation and general features, some highlights of related work will be outlined, such as: Nonlinear feedback control of CAVs in lane-free traffic with nudging; Optimal path planning for individual vehicles and vehicle groups; 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 intersection crossing.

### 简介:

Markos Papageorgiou received the Diplom-Ingenieur and Doktor-Ingenieur (honors) degrees in Electrical Engineering from the Technical University of Munich, Germany, in 1976 and 1981, respectively. He was a Free Associate with Dorsch Consult, Munich (1982-1988), and with Institute National de Recherche sur les Transports et leur Sécurité (INRETS), Paris, France (1986-1997). From 1988 to 1994 he was a (tenured) Professor of Automation at the Technical University of Munich. Since 1994 he has been a Professor (since 2021 Professor Emeritus) at the Technical University of Crete, Chania, Greece. He was a Visiting Professor at the Politecnico di Milano, Italy (1982), at the Ecole Nationale des Ponts et Chaussées, Paris (1985-1987), at MIT, Boston (1997, 2000); at University of Rome La Sapienza, Italy (2018); Distinguished Visiting Professor at Tsinghua University, China (2018-2021); and a Visiting Scholar at the University of California, Berkeley (1993, 1997, 2001, 2011) and other universities.

Dr. Papageorgiou is author or editor of 7 books and of some 600 technical papers. His research interests include automatic control and optimisation theory and applications to traffic and transportation systems, water systems and further areas. He was the Editor-in-Chief of Transportation Research – Part C (2005-2012). He also served as an Associate Editor of IEEE Control Systems Society – Conference Editorial Board, of IEEE Trans on ITS and other journals. He is a Life Fellow of IEEE and a Fellow of IFAC. He received a DAAD scholarship (1971-1976), the 1983 Eugen-Hartmann award from the Union of German Engineers (VDI), and a Fulbright Lecturing/Research Award (1997). He was a recipient of the IEEE ITS Society Outstanding Research Award (2007) and Outstanding Application Award (2018); and recipient of the IEEE Control Systems Society Transition to Practice Award (2010). He is the recipient of the 2020 IEEE Transportation Technologies Award. He was presented the titles of Honorary Visiting Professor by the University of Belgrade, Serbia (2010); TUM Ambassador by the Technical University of Munich (2021); and Doctor honoris causa by the Aristotle University of Thessaloniki (2023). The Dynamic Systems and Simulation Laboratory he was heading, received the IEEE ITS Society Institutional Lead Award (2011). He was awarded two ERC Advanced Investigator Grants (2013-2018 and 2019-2025).