

Innovative Vehicle and Traffic Control in the Next Generation of Road Transportation

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Abstract

This research focusses on innovative control technologies for the vehicles of the next generation aiming at improved safety, less congestion, lower emissions and reductions in overall costs. The interaction among vehicles frequently causes congestion as well as bottlenecks of road capacity. In dense traffic, waves of traffic density propagate backward as drivers try to keep a safe distance with frequent acceleration and braking. A smart vehicle driving system in a model predictive control framework is developed that effectively improves traffic flows by controlling a single vehicle. In the traditional paradigm, traffic flows at intersections are regulated by traffic lights or signs that restrict the traffic handling capacity of intersections and increase inconveniences of frequent stops and idling. A coordination scheme of automated vehicles at an intersection without using any traffic lights is proposed. Using a two-way communication network, vehicles approaching the intersection from all sections are globally coordinated in order to achieve smooth flows during crossing the intersection. Observations under different traffic flow conditions reveal that the proposed schemes significantly improve performances of traffic, intersection-capacity, trip-time and fuel consumption. Such control technologies in the next generation of road transportation would greatly improve its sustainability and the quality of social life.

Keywords

Intelligent transportation systems, model predictive control, automatic driving and sustainability.

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Biography

M.A.S. Kamal is currently working as a researcher at Institute of Industrial Science, The University of Tokyo under a research project “FIRST Aihara Innovative Mathematical Modelling Project” of Japan Science and Technology (JST) Agency. His research theme is the innovative control for the next generation vehicles. Previously he worked at Kyushu University as researcher, at International Islamic University (IIUM) as an Assistant Professor, and at Khulna University of Engineering and Technology (KUET) as a Lecturer. He received his bachelor degree from KUET, and Master and Doctor degrees from Kyushu University. He has published more than fifty technical papers including journal and conference proceedings, and delivered nine keynote/invited speeches in various international forums. He is a member of conference organizing committee of ICIEV, ICGET, ICIEB, ICOM and EICT. His research interests include intelligent transportation systems (ITS), model predictive control (MPC) and reinforcement learning. He is a member of IEEE and SICE.