Dwell time specifications for switched control mode in platooning

Etienne Gorski*[1], Irinel-Constantin Morarescu , Vineeth Varma , and Lucian Busoniu

[1]Centre de Recherche en Automatique de Nancy – Université de Lorraine - CRAN CNRS UMR 7039 – France

Résumé

This work addresses the challenge of maintaining string stability in a platoon where each vehicle can switch between two control modes: Adaptive Cruise Control (ACC), based on local sensing, and Cooperative Adaptive Cruise Control (CACC), which incorporates vehicle-to-vehicle (V2V) communication for improved coordination.
Switching between these modes introduces dynamics that can destabilize the platoon if not carefully managed. To mitigate this, we investigate dwell time specifications, which impose a minimum time that a vehicle must remain in a given mode before switching. These conditions are formulated as Linear Matrix Inequalities (LMIs) and are computationally efficient to solve.
The proposed approach is validated through numerical simulations, demonstrating its ability to ensure string stability across various switching scenarios.

Mots-Clés: Platooning, individual stability, string stability, switched system, ACC/CACC

*Intervenant