Predictive event-triggered control for string-stable platooning

Etienne Gorski*[1,2]

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

[2]Universitatea Tehnica din Cluj-Napoca – Roumanie

Résumé

This work presents an event-triggered control strategy for vehicle platoons that use Cooperative Adaptive Cruise Control (CACC). In contrast to classical CACC, which relies on continuous communication of each vehicle's control input to its next follower, we propose a framework in which each vehicle intermittently communicates a longer-horizon prediction of its control trajectory. A non-standard, predictive flavor of event-triggered control (ETC) results, in which these more informative predictions are used instead of the usual zero- or first-order-hold signal reconstruction. Communications are triggered by usual ETC rules, when the error between the real input trajectory and the predicted one exceeds a design threshold. By exploiting model-based predictions, we achieve a significantly reduced number of communications, while guaranteeing individual and string stability through a Lyapunov-based analysis. Numerical simulations with instantaneous and sustained perturbations on a seven-vehicle platoon illustrate the effectiveness of the proposed framework.

Mots-Clés: Platooning, Event, triggered control, Prediction, based control, String stability

*Intervenant