Controller Design for a Mixed Traffic System Travelling at Different Desired Speeds

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Abstract

In this work, we study a mixed traffic system moving along a single-lane open-road. This platoon includes a number of human-driven vehicles (HDVs) together with one connected and automated vehicle (CAV). The dynamics of HDVs are assumed to follow the optimal velocity model (OVM), and the acceleration of the single CAV is directly controlled by a static output-feedback controller. Due to different traffic conditions, the desired velocity of the platoon can change over time. Moreover, there are multiple system parameters that are uncertain. The ultimate goal of this work is to present a gain-scheduled robust control strategy that, with a varying desired speed, smooth the traffic flow in the presence of undesired disturbances and parametric uncertainties. In this direction, a gain-scheduled H_∞ static output-feedback controller is designed, and its efficiency is illustrated through numerical simulations.