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Neighborhood Controller-Local Observer in Adaptive Control Approach for Heterogeneous Vehicle Platoon Formation

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Abstract



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Document Sections

- I. Introduction
- II. System Description
- III. Distributed Model Reference Adaptive Control Based On Neighborhood Controller-Local Observer
- IV. Numerical Simulation and Analysis
- V. Conclusion

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Abstract:

This paper studies a distributed model reference adaptive control which designed based on neighborhood controller-local observer. The controller will be applied in each follower which has limited-output information and uncertainty. The proposed control composes of four main parts, namely local observer, reference model, adaptive controller and neighborhood controller. Local observer is used to obtain full-state estimation of each follower by utilizing the internal output estimation error. While, the rest of the control parts responsible for simultaneously eliminate the effects of the uncertainty and tracking the leader state. The proposed control will be simulated by using heterogeneous vehicle platoon under two-predecessorfollowing-leader topology, and the tracking error to the reference model are approached is achieved.

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☰ Contents

I. Introduction

Cooperative driving is predicted to be one of the potential features in the future smart vehicles. Vehicle will have capability to share information to the other road users including other vehicles. One type of the cooperative driving is called as vehicle platoon, where a number of vehicles form a train-like cooperative driving by keeping the distance between consecutive vehicles. Once the platoon is formed, all vehicles will move with a synchronous velocity and acceleration. Nowadays, vehicle platoon become active research due to potential application in the future commercial and passenger vehicles. In addition, the potential benefits have been identified such as maximizing road capacity, saving fuel and reducing congestion [1].

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