Non-Linear Control Based on State Estimation for the Convoy of Autonomous Vehicles

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Abstract : In this paper, a longitudinal and lateral control approach based on a nonlinear observer is proposed for a convoy of autonomous vehicles to follow a desired trajectory. To authors best knowledge, this topic has not yet been sufficiently addressed in the literature for the control of multi vehicles. The modeling of the convoy of the vehicles is revisited using a robotic method for simulation purposes and control design. With these models, a sliding mode observer is proposed to estimate the states of each vehicle in the convoy from the available sensors, then a sliding mode control based on this observer is used to control the longitudinal and lateral movement. The validation and performance evaluation are done using the well-known driving simulator Scanner-Studio. The results are presented for different maneuvers of 5 vehicles.

Keywords : autonomous vehicles, convoy, non-linear control, non-linear observer, sliding mode

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