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Controlling Ground Vehicle Nonlinear Dynamics by the Use of Automobile Traction Models

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Abstract

The objective of this investigation is to assess and comprehend longitudinal ground vehicle traction nonlinear dynamics. Particularly, it explains the operation of vehicles using rubber tires in longitudinal accelerating and braking environments by utilizing two automobile-traction models. Specifically, it considers a two-wheel model and a single-wheel model and assesses their nonlinear properties. In addition, the wheel oscillation rate and forward automobile velocity are considered to be dynamic states. This paper contributes to beneficial formulation in which slip of the wheel, which is a dimensionless value of the variation between the tire circumference velocity and vehicle velocity in relation to center of the wheel substitutes the tire angular speed as dynamic state. This investigation contributes to more additional information about vehicle traction dynamic nature and in every model investigated, the specific properties of the modelling technique enable easy understanding of the dynamic responses of both the two-wheel and single-wheel traction models. Finally, it introduces an ADRC controller to precisely manage the direction and velocity.

Keywords: Direction, speed, ground vehicle, coordinates