Multi-objective optimal torque allocation strategy for hub motor electric vehicles considering road conditions

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March 28, 2024

Abstract

Improved hybrid genetic particle swarm optimization (IGPSO) algorithm-based optimal torque allocation technique is suggested to enhance the overall performance of hub motor electric vehicle (HMEV) under various road conditions. The strategy adopts a hierarchical control structure, using PID to track the speed signal in the upper controller to obtain the demand longitudinal torque, designing the objective functions of handling stability, energy saving, and comfort in the lower controller, and designing a fuzzy controller to determine the weight coefficients of different optimization objective functions of the strategy, and proposing the IGPSO algorithm to solve the final optimization problem to obtain the optimal torque distribution results. The results of the New European Driving Cycle (NEDC) condition with different road adhesion coefficients show that the IGPSO strategy can significantly improve the maneuvering stability, energy economy, and comfort of the HMEV compared to the Even Distributed (ED) strategy.

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