Document details

Back to results | 1 of 1

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Swarm - Intelligence Tuned Current Reduction for Power - Assisted Steering Control in Electric Vehicles (Article)

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Abstract

View references (25)

In electric vehicle technology, battery energy conservation is paramount due to the dependency of all system operations on the available battery. The proportional, integral and derivative (PID) controller parameters in the electric power assisted steering system for electric vehicle need to be tuned with the optimal performance setting so that less current is needed for its operation. This proposed two methods under the umbrella of swarm-intelligence technique namely particle swarm optimization (PSO) and ant colony optimization (ACO) in order to reduce current consumption and to improve controller performance. The investigation involves an analysis on the convergence behavior of both techniques in search for accurate controller parameters. A comprehensive assessment on the assist current supplied to the assist motor of the system is also presented. Investigation reveals that the proposed controllers, PID-PSO and PID-ACO are able to reduce the assist current supplied to the assist motor as compared to the conventional PID controller. This study also demonstrate the feasibility of applying both swarm-intelligence tuning method in terms of reduced time taken to tune the PID controller as compared to the conventional tuning method. © 1982-2012 IEEE.

Author keywords

Ant colony optimization (ACO) | electric power steering system | electric vehicle | particle swarm optimization (PSO)

Indexed keywords

Engineering controlled terms: Ant colony optimization | Artificial intelligence | Automobile steering equipment | Axles | Controllers | Damping | Electric batteries | Electric control equipment | Electric machine control | Electric power system control | Electric vehicles | Mathematical models | Proportional control systems | Secondary batteries | Steering | Swarm intelligence | Three term control systems | Torque | Traction motors | Tuning | Vehicles

Compendex keywords: Ant Colony Optimization (ACO) | Comprehensive assessment | Controller performance | Electric power steering system | Power-assisted steering | Proportional , integral and derivative controllers | Roads | Swarm intelligence techniques

Engineering main heading: Particle swarm optimization (PSO)

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