

Automobile

Adaptive Vehicle Suspension Using Inverse Reinforcement Learning

Technology Domain: Automobile

Patent Application Number: 202441028168

Status (Patent/TRL): Patent Pending / TRL 3

Technology Summary:

This invention presents a novel system and method for controlling an active vehicle suspension system, significantly enhancing passenger comfort and road handling. The key technical solution integrates a controller with an advanced reinforcement learning (RL) system. The core of this system is its key inventive feature: an Inverse Reinforcement Learning (IRL) model that, in conjunction with a Higher Order Sliding Mode Observer (HOSMO) and a neural network, *learns and computes an optimal reward function* for various road profiles. This reward function then trains a separate RL model.

As a result, the system adaptively controls the active suspension to minimize chassis vibrations and maximize passenger comfort, even on uneven, bumpy, or potholed roads. The HOSMO estimates unmeasured states, reducing sensor needs and making the data-driven approach robust to system nonlinearities. The use of this technology provides a sophisticated, adaptive, and energy-efficient solution for vehicle suspension, offering a superior and continuously improving driving experience across diverse road conditions.

