

# Dynamics and model-based control of electric power steering systems

**Abstract.** This paper presents the modelling, control and analysis of an axle parallel electric power steering system used for autonomous driving. The purpose of the controller is to ...

We report a model and controller for an active front-wheel steering (AFS) system. Two integrated dynamics control (IDC) systems are designed to investigate the performance of the AFS system when integrated with braking and steering systems. An 8-degrees-of-freedom vehicle model was employed to test the controllers. The controllers were inspected and ...

In this thesis, a neuromusculoskeletal driver and a high-fidelity vehicle model are developed in MapleSim to provide realistic simulations to study the driver-vehicle interactions and EPS ...

The operating principle of the electric power steering system is based on the signal of the torque sensor located in the power steering. ... The bus steering dynamics were simulated by Trucksim based on input/output data, which are needed to verify the closed-loop control strategy, and the developed two-stage control approach was programmed in ...

The rack force transmitted to a rack bar through a tie-rod is regarded as a major external force to the electric power steering (EPS) system. However, since road torque generated between the tire and the road surface is transmitted to the rack bar under the influence of road wheels and various linkages and bushings, it is difficult to equalize the rack force and road ...

The steering feel is mostly indirectly adjusted by directly modifying the assist's magnitude of the electric power steering system. The adjustment is complex, and workload is large, and the ...

This paper analyzes the hysteresis curve based on the electric power steering model. The shape of the hysteresis curve is characterized by a transfer function consisting of the system and a ...

The simulation results to validate the performance of the control method are shown in section VI, while conclusion can be found in section VII. II. SYSTEM MODELING A. Dynamic Model of EPAS System The dynamic model of the EPAS establishes relation between steering mechanism, electric dynamics of the motor and tire/road contact forces.

The steering feel is mostly indirectly adjusted by directly modifying the assist's magnitude of the electric power steering system. The adjustment is complex, and workload is large, and the steering feel is highly dependent on the performance of the hardware.

As this required steering torque is very large, a device that assists the steering torque applied by the driver was developed, which recognizes the driver's steering direction and compliments it so as to achieve the desired

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torque using a hydraulic device attached to either the pinion or the rack [1], [2]. However, the hydraulic assistive system has several disadvantages: it ...

Increasing use of electric power steering (EPS) systems, which affect vehicle dynamic behaviour, has prompted the need for a more effective method of analysing control systems coupled with ...

The interaction of the steering system with the driver is principally governed by the EPAS control method. This paper proposes a control concept for designing the steering feel with a model ...

**ABSTRACT:** Electric power assisted steering (EPAS) system is a current state of the art technology for providing the steering torque support. The interaction of the steering system with the

Electric power steering (EPS) system has been greatly developed in the last decade. Control strategy design is the core technology, which decides the man-machine interface performance of EPS.

**Abstract.** Many automobile manufacturers are switching to Electric Power Steering (EPS) systems for their better performance and cost advantages over traditional Hydraulic Power Steering ...

For safe operation of a vehicle, the driver must be able to maintain absolute control of the vehicle's serious operating dynamics. To achieve this, extensively power steering systems have been ...

**Abstract** Increasing use of electric power steering (EPS) systems, which affect vehicle dynamic behaviour, has prompted the need for a more effective method of analysing control systems coupled with detailed vehicle models. This paper develops an integrated simulation of an EPS control system with a full-vehicle dynamic model. Using a cosimulation ...

Based on the principle analysis of the electric power steering system (EPS), a simulation platform for electric power steering system (EPS) test is proposed, and use Matlab/Simulink to build a ...

In order to analyze dynamic characteristic accurately during steering, electric power steering system is selected as research object and dynamic equation of steering system is established. Combined with eleven degrees of freedom vehicle model and tire model at combined conditions of longitudinal slip and side slip, the integral-simulation model of electric power ...

Electric-power steering (EPS) systems have attracted much attention for their advantages with respect to improved fuel economy and have been widely adopted as automotive power-steering equipment in recent years. The article introduces a new EPS control system that reduces steering torque during static steering (i.e., while a vehicle is at rest) as a means of further improving ...

Steering feel delivers torque feedback from the steering wheel of a vehicle to the driver and plays a critical

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role in communicating useful information related to road and vehicle dynamics. The steering feel of a conventional vehicle is generally evaluated using on-center handling, which is the steering behavior at high speed and a low lateral acceleration boundary. The hysteresis ...

In this paper, a methodology to capture the model-based haptic feedback control reference for closed-loop steering systems is demonstrated. The parameterisation is based on the measurements of ...

This paper presents a new control strategy of Electric Power Assisted Steering (EPAS) systems to ensure several control objectives. First, a reference model is employed to generate ideal motor ...

Hu C, Zhao L, Cao L et al (2020) Steering control based on model predictive control for obstacle avoidance of unmanned ground vehicle. Meas Control 53(3-4):501-518. Article Google Scholar Ma X, Guo Y, Chen L (2018) Active disturbance rejection control for electric power steering system with assist motor variable mode.

Driver's steering feel for back force of road is an important characteristic performance for electric power steering (EPS) system, except for the characteristic of convenient of steer wheel rotating and safety of driving. In this paper, a model of EPS system is set up, and a new low-pass filter is introduced. A controller is designed by using disturbance observer ...

system is mainly dynamics model of the system, and main motor control strategy is power steering control pattern. Zhao et al. verified the accuracy of a power-assisting motor

We present a time-delayed control (TDC) approach that applies it to the electric power steering (EPS) system for the first time. The TDC approach uses a one-sample delayed information of the ...

In recent years, vehicle electric power-assisted steering system and its control strategy have been researched both at home and abroad, and some intelligent algorithms have been applied to vehicle ...

The electric power steering system (EPS) is playing an increasingly important part with the development of the smart driving and unmanned driving of cars. 1 EPS is characterized in energy saving, light weight and being easy to control. In the process of the operation of EPS, there are some main problems, including model uncertain and external interference.

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