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A Comparative Study of Power Consumption of Electric Power Steering System
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Power Steering Failure Study. Volume II: Technical Report. Final Report
Suppression of Noise and Vibration in Electric Power Steering Systems
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Reduced Effort Power Steering and Power Steering Backup Systems
On Electrohydraulic Pressure Control for Power Steering Applications
Lateral Stability of a Vehicle Equipped with a Hydraulic Power Steering System
Design of an Electric Power Steering System Using a Model Reference Approach and Additional Column Or Rack Actuators
Selected Papers from the 2011 International Conference on Electric and Electronics (EEIC 2011) in Nanchang, China on June 20-22, 2011, Volume 4
An Investigation of the Dynamic Characteristics of Hydraulic Power Steering Systems
A Model Reference Feedback Controller Approach

A Fault Tolerant Motor Drive for Electric Power Steering Systems
Automotive Power Steering System Cooling
Active Steering for Road Vehicles
Fault Tolerant Control for an Electric Power Steering System
Active Torque Control of Electric Power Steering System Using Composite Nonlinear Feedback Control
Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles
Hornig's "direct Power" Steering System
Automotive Steering, Suspension, and Alignment
Theoretical and Experimental Research on Automobile Steering Systems - a Mathematical Model of the Saginaw Power Steering System and Its Validation

DECKER ALANNAH

A Comparative Study of Power Consumption of Electric Power Steering System Springer Nature For courses in Automotive Steering, Suspension, and Alignment, and Automotive Chassis Systems. Today's automotive repair industry demands knowledge of diagnostic procedures and skill development as never before. Focusing primarily on problem diagnosis, this

clear and concise text is packed with examples of practical technical information, ideas, tips, and detailed service techniques. Troubleshooting and typical service problems are explored throughout. Halderman and Mitchell provide all essential material but weed out extraneous topics, and the text's real-world perspective reflects their extensive practical experience.

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Linköping University Electronic Press

Many automobile manufacturers are switching to Electric Power Steering (EPS) systems for their better performance and cost advantages over traditional Hydraulic Power Steering (HPS) systems. EPS compared to HPS offer lower energy consumption, lower total weight, and package flexibility at no cost penalty. Furthermore, since EPS systems can provide assistance to drivers independent of the vehicle driving conditions, new technologies can be implemented to improve the steering feel and safety, simultaneously. 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 systems. The vehicle model consists of MacPherson and multilink suspensions at front and rear equipped with a column-type EPS system. The driver model is a fully neuromusculoskeletal model of a driver arm

holding the steering wheel, controlled by the driver's central nervous system. A hierarchical approach is used to capture the complexity of the neuromuscular dynamics and the central nervous system in the coordination of the driver's upper extremity activities. The proposed motor control framework has three layers: the first layer, or the path-planning layer, plans a desired vehicle trajectory and the required steering angles to perform the desired trajectory, the second layer (or the force distribution controller) actuates the musculoskeletal arm, and the final layer is added to ensure the precision control and disturbance rejection of the motor control units. The overall goal of this thesis is to study vehicle-driver interactions and to design a model-based EPS controller that considers the driver's characteristics. To design such an EPS controller, the high-fidelity driver-vehicle model is simplified to reduce the computational burden associated with the multibody and biomechanical systems. Then, four driver types are introduced based on the physical characteristics of drivers such as age and gender, and the corresponding parameters are incorporated in the model. Last but not least, a new model-based EPS controller is developed to provide appropriate assistance to each of the predefined driver types. To do this, the characteristic curves are

tuned using a systematic optimization procedure to provide appropriate assistance to drivers with different physical strength, in order to have a similar road and steering feel. In this thesis, it is recommended that muscle fatigue be used as a measure of steering feel. Then, based on the tuned EPS characteristic curves, an observer-based optimal disturbance rejection controller, consisting of a linear quadratic regulator controller and a Kalman filter observer augmented with a shaping filter, is developed to deliver the assistance while attenuating external disturbances. The results show that it is possible to develop a model-based EPS controller that is optimized for a given driver population. Power Steering Failure Study. Volume II: Technical Report. Final Report Design of an Electric Power Steering System Using a Model Reference Approach and Additional Column Or Rack ActuatorsElectric power steering (EPS) systems have been adopted by the automotive industry principally because of potential fuel savings over the more conventional hydraulic power steering. EPS lends itself to improvements in automobile steering feel and vehicle response as well as ultimately leading to steer-by-wire systems. This thesis proposes two adaptations of the standard column mounted electric power steering (C-EPS) system. In the first new configuration, an additional motor is placed

between the C-EPS motor and the steering wheel for independent control of steering feel. In the second new configuration, an additional motor is placed between the rack and right tie rod for independent control of vehicle response. These new motors, combined with a model reference approach utilizing Proportional-Integral-Derivative (PID) control and linear quadratic regulator (LQR) control, allow for the independent tuning of desired steering feel and vehicle response, leading to new or improved functionality when compared to more traditional EPS systems: disturbance rejection, yaw damping, variable steering ratio, and increased linear tire behavior. Without additional motors, it can still be shown that the model reference approach is advantageous for various traditional EPS functions: assist, return to center, and inertia compensation. These new or improved functions are tested under various conditions with various inputs and compared to a more traditional EPS system.Steering Handbook

"This Information Report relates to a special class of automotive adaptive equipment which consists of modifications to the hydraulic control mechanism of Original Equipment Manufacturer (OEM) power steering systems provided as original equipment on personaly licensed vehicles. These modifications are generically called "reduced effort power

steering."--[p.1]. *Suppression of Noise and Vibration in Electric Power Steering Systems* Springer Electric power steering (EPS) systems have been adopted by the automotive industry principally because of potential fuel savings over the more conventional hydraulic power steering. EPS lends itself to improvements in automobile steering feel and vehicle response as well as ultimately leading to steer-by-wire systems. This thesis proposes two adaptations of the standard column mounted electric power steering (C-EPS) system. In the first new configuration, an additional motor is placed between the C-EPS motor and the steering wheel for independent control of steering feel. In the second new configuration, an additional motor is placed between the rack and right tie rod for independent control of vehicle response. These new motors, combined with a model reference approach utilizing Proportional-Integral-Derivative (PID) control and linear quadratic regulator (LQR) control, allow for the independent tuning of desired steering feel and vehicle response, leading to new or improved functionality when compared to more traditional EPS systems: disturbance rejection, yaw damping, variable steering ratio, and increased linear tire behavior. Without additional motors, it can still be shown that the model reference approach is advantageous for various traditional EPS functions: assist, return to

center, and inertia compensation. These new or improved functions are tested under various conditions with various inputs and compared to a more traditional EPS system.

Routledge

This volume includes extended and revised versions of a set of selected papers from the International Conference on Electric and Electronics (EEIC 2011) , held on June 20-22 , 2011, which is jointly organized by Nanchang University, Springer, and IEEE IAS Nanchang Chapter. The objective of EEIC 2011 Volume 4 is to provide a major interdisciplinary forum for the presentation of new approaches from Communication Systems and Information Technology, to foster integration of the latest developments in scientific research. 137 related topic papers were selected into this volume. All the papers were reviewed by 2 program committee members and selected by the volume editor Prof. Ming Ma. We hope every participant can have a good opportunity to exchange their research ideas and results and to discuss the state of the art in the areas of the Communication Systems and Information Technology.

An electric power steering systems

Springer Science & Business Media

The introduction of electric power steering (EPS) systems has allowed automotive OEM's to increase fuel efficiency and develop a myriad of driver assist functions

such as park assist and active lane keeping. However, one of the biggest complaints about EPS systems is the lack of good steering "feel". This paper introduces a model reference feedback control system aimed at improving steering feel. Detailed nonlinear models of column-mounted and rack-mounted EPS systems are derived using bond graphs to analyze the dynamics of the system. Reduced order linear model of the EPS systems are then derived for control development. A torque feedback controller is developed that allows engineers to quickly and easily tune the "feel" of the steering system via four tuning parameters on a reference model. A return-to-center controller is also developed to center the steering wheel whenever the driver releases it from an off center position. The two control systems are integrated together using fuzzy logic so as to determine when to use the return-to-center controller. It is shown through simulation studies that the final control system gives great tracking performance and that the use of fuzzy inference system allows the controllers to switch smoothly and appropriately thus showing potential to improve steering feel.

Robust Control for an Electric Power Steering System Jones & Bartlett Learning

This thesis deals with the Electrohydraulic Power Steering system for road vehicles, using electronic pressure control valves. With an ever increasing

demand for safer vehicles and fewer traffic accidents, steering-related active safety functions are becoming more common in modern vehicles. Future road vehicles will also evolve towards autonomous vehicles, with several safety, environmental and financial benefits. A key component in realising such solutions is active steering. The power steering system was initially developed to ease the driver's workload by assisting in turning the wheels. This is traditionally done through a passive open-centre hydraulic system and heavy trucks must still rely on fluid power, due to the heavy work forces. Since the purpose of the original system is to control the assistive pressure, one way would be to use proportional pressure control valves. Since these are electronically controlled, active steering is possible and with closed-centre, energy efficiency can be significantly improved on. In this work, such a system is analysed in detail with the purpose of investigating the possible use of the system for Boost curve control and position control for autonomous driving. Commercially available valves are investigated since they provide an attractive solution. A model-based approach is adopted, where simulation of the system is an important tool. Another important tool is hardware-in-the-loop simulation. A test rig of an electrohydraulic power steering system, is developed. This work has

shown how proportional pressure control valves can be used for Boost curve control and position control and what implications this has on a system level. As it turns out, the valves add a great deal of time lag and with the high gain from the Boost curve, this creates a control challenge. The problem can be handled by tuning the Boost gain, pressure response and damping and has been effectively shown through simulation and experiments. For position control, there is greater freedom to design the controller to fit the system. The pressure response can be made fast enough for this case and the time lag is much less critical.

Modeling and Analysis of a Hydraulic Power Steering System for Use in Vehicle Simulation

National Academies Press

Electric power steering (EPS) systems are rapidly replacing existing traditional hydraulic power steering systems due to fuel and cost savings. The reliability of a column mounted EPS is improved by adding an alternate control scheme that is tolerant to a torque sensor failure (FTC). To accomplish this, a motor model based observer is used to estimate the total torque on the motor shaft. An independent estimate of the road reaction torque is generated from vehicle navigation signals and subtracted from the total to estimate the torque sensor output. A Hardware-in-the-loop (HIL) simulation is described where the EPS model, road vehicle dynamics and developed control

scheme are simulated on an Opal RTTM real-time platform and a physical DC motor is placed in-the-loop. This simulation validates the developed method under more realistic operating conditions than using software simulation alone and is more repeatable and cost effective than a full in-vehicle test.

Pneumatic, Steam Or Hydraulic Motor

The best-selling automotive technology book for students and professionals. Revised and updated throughout to match C&G and IMI awards (4000 series) this book is the most comprehensive text for the FE market. It covers the needs of C&G 4001 and all of the underpinning knowledge required for motor vehicle engineering NVQs up to level 3. Copiously illustrated with over 1000 images, it is certain to remain a highly popular and valuable text for both students and practicing engineers. * Incomparable breadth and depth of coverage, over 1000 illustrations and Institute of the Motor Industry recommended: this is the core book for students of automotive engineering * Fully up to date with latest IMI and C&G 4000 series course requirements and provides all the underpinning knowledge required for NVQs to level 3 * New material covering latest development in electronics, alternative fuels, emissions and diesel systems

10th International Munich Chassis Symposium 2019

Design of an Electric

Power Steering System Using a Model Reference Approach and Additional Column Or Rack Actuators

Automotive Steering and Suspension

Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles evaluates various technologies and methods that could improve the fuel economy of medium- and heavy-duty vehicles, such as tractor-trailers, transit buses, and work trucks. The book also recommends approaches that federal agencies could use to regulate these vehicles' fuel consumption. Currently there are no fuel consumption standards for such vehicles, which account for about 26 percent of the transportation fuel used in the U.S. The miles-per-gallon measure used to regulate the fuel economy of passenger cars. is not appropriate for medium- and heavy-duty vehicles, which are designed above all to carry loads efficiently. Instead, any regulation of medium- and heavy-duty vehicles should use a metric that reflects the efficiency with which a vehicle moves goods or passengers, such as gallons per ton-mile, a unit that reflects the amount of fuel a vehicle would use to carry a ton of goods one mile. This is called load-specific fuel consumption (LSFC). The book estimates the improvements that various technologies could achieve over the next decade in seven vehicle types. For example, using advanced diesel engines in tractor-trailers could lower their

fuel consumption by up to 20 percent by 2020, and improved aerodynamics could yield an 11 percent reduction. Hybrid powertrains could lower the fuel consumption of vehicles that stop frequently, such as garbage trucks and transit buses, by as much 35 percent in the same time frame.

Modeling and Analysis of an Electric Power Steering System

The increasing automation of driving functions and the electrification of powertrains present new challenges for the chassis with regard to complexity, redundancy, data security,and installation space. At the same time, the mobility of the future will also require entirely new vehicle concepts, particularly in urban areas. The intelligent chassis must be connected, electrified, and automated in order to be best prepared for this future.

Steering Handbook

The patent describes a simplified design for a follow-up mechanism for the power steering systems of transportation equipment.

Automobile Power Steering Systems

Automotive Steering and Suspension, published as part of the CDX Master Automotive Technician Series, arms students with the basic knowledge and skills they need to accomplish a variety of tasks in the shop. Taking a “strategy-based diagnostics” approach, this book helps students master technical trouble-shooting in order to address the problem

correctly on the first attempt.

Handling Enhancement Due to an Automotive Variable Ratio Electric Power Steering System Using Model Reference Robust Tracking Control

This edited volume presents basic principles as well as advanced concepts of the computational modeling of steering systems. Moreover, the book includes the components and functionalities of modern steering system, which are presented comprehensively and in a practical way. The book is written by more than 15 leading experts from the automotive industry and its components suppliers. The target audience primarily comprises practicing engineers, developers, researchers as well as graduate students who want to specialize in this field.

Dynamics and Model-Based Control of Electric Power Steering Systems

Includes Standard and Power Steering

Structure-borne Sound Transmission Within Electric Power Steering Systems

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