

Power Steering System Power Steering System Shiny

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. 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.

Improving Steering Feel in Electric Power Steering Systems

Robust Control Design of Electric Power Steering Systems

Steering Handbook

Ross Hydrapower Hydraulic Power Steering Trouble-shooting Manual

Modeling and Analysis of an Electric Power Steering System

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.

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.

An Investigation of the Dynamic Characteristics of Hydraulic Power Steering Systems Pneumatic, Steam Or Hydraulic Motor

Modeling, Analysis, and Control of Electric Power Steering (EPS) System of an Intelligent Vehicle

A New Power Steering System for Tractors

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.

This text covers both the theory and procedures related to the diagnosis and service of automotive suspension and steering systems, using a unique two-volume approach to optimize learning in both the classroom and the auto shop. The first volume (Classroom Manual) details the theory and application of suspension and steering systems, while the second (Shop Manual) covers real-world symptoms, diagnostics, and repair information. Known for its comprehensive coverage, accurate and up-to-date details, and abundant illustrations, the text is an ideal resource to prepare for success as an automotive technician or pursue ASE certification. Now updated with extensive information on new and emerging technology and techniques—including hybrid and electric vehicles, tire plus sizing, and computer-controlled suspensions—the Sixth Edition also aligns with area A4 of the ASE Education Foundation 2012 accreditation model, including job sheets correlated to specific AST and MAST tasks. Ideal for aspiring and active automotive professionals, TODAY'S TECHNICIAN: AUTOMOTIVE SUSPENSION & STEERING SYSTEMS, Sixth Edition, equips readers to confidently understand, diagnose, and repair suspension and steering systems in today's automobiles. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Robust Control for an Electric Power Steering System

Dynamics and Model-Based Control of Electric Power Steering Systems

Suppression of Noise and Vibration in Electric Power Steering Systems

Hornig's "direct Power" Steering System

Power Steering Systems

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.

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.

Today's Technician: Automotive Suspension & Steering Classroom Manual and Shop Manual

Steering Systems

A Follow-up Power Steering Mechanism for Transportation Equipment

An electric power steering systems

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

On Electrohydraulic Pressure Control for Power Steering ApplicationsActive Steering for Road VehiclesLinköping University Electronic Press

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

Design of an Electric Power Steering System Using a Model Reference Approach and Additional Column Or Rack Actuators

A Comparative Study of Power Consumption of Electric Power Steering System

Power Steering Failure Study. Volume I: Executive Summary. Final Report

Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles

Multifunctional Converter Drive for Automotive Electric Power Steering Systems

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.

Medium Duty Truck Power Steering Systems

Automobile Power Steering Systems

Trouble Shooting Power Steering Systems

Pressure Control in Hydraulic Power Steering Systems

Communication Systems and Information Technology