Controlling Electrohydraulic Systems Fluid Power And Control

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Fluid Power

Proceedings of the Second Bath International Fluid Power Research Workshop held in September 1989. Contributors address recent developments in the control of valves, pump design and performance, pressure ripple and noise, servo-systems, modelling and simulation and circuits for mobile systems.

Fluid Power 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.

Fluid Power and Transmission and Control

Force and motion control systems of varying degrees of sophistication have shaped the lives of all individuals living in industrialized countries all over the world, and together with communication technology are largely responsible for the high standard ofliving prevalent in many communities. The brains of the vast majority of current control systems are electronic, in the shape of computers, microprocessors or programmable logic controllers (PLC), the nerves are provided by sensors, mainly electromech anical transducers, and the muscle comprises the drive system, in most cases either electric, pneumatic or hydraulic. The factors governing the choice of the most suitable drive are the nature of the application, the performance specification, size, weight, environ mental and safety constraints, with higher power levels favouring hydraulic drives. Past experience, especially in the machine tool sector, has clearly shown that, in the face of competition from electric drives, it is difficult to make a convincing case for hydraulic drives at the bottom end of the power range, specifically at fractional horsepower level. A further, and frequently overriding factor in the choice of drive is the familiarity of the system designer with a particular discipline, which can inhibit the selection of the optimum and most cost-effective solution for a given application. One of the objectives of this book is to help the electrical engineer overcome his natural reluctance to apply any other than electric drives.

Current Engineering Practice

Volume 2 focuses on the design and application aspects of hydraulic and pneumatic systems.

Fluid Power Engineering

Instrumentation and automatic control systems.

Winter Annual Meeting

A unique resource that demystifies the physical basics of hydraulic systems Hydraulic Control Systems offers students and professionals a reliable, complete volume of the most up-to-date hows and whys of today's hydraulic control system fundamentals. Complete with insightful industry examples, it features the latest coverage of modeling and control systems with a widely accepted approach to systems design. Hydraulic Control Systems is a powerful tool for developing a solid understanding of hydraulic control systems that will serve the practicing engineer in the field. Throughout the book, illustrative case studies highlight important topics and demonstrate how equations can be implemented and used in the real world. Featuring exercise problems at the end of every chapter, Hydraulic Control Systems presents: A useful review of fluid mechanics and system dynamics Thorough analysis of transient fluid flow forces within valves Discussions of flow ripple for both gear pumps and axial piston pumps Updated analysis of the pump control problems associated with swash plate type machines A successful methodology for hydraulic system design—starting from the load point of the system and working backward to the ultimate power source Reduced-order models and PID controllers showing control objectives of position, velocity, and effort

Hydraulic Power System Analysis

Develop high-performance hydraulic and pneumatic power systems Design, operate, and maintain fluid and pneumatic power equipment using the expert information contained in this authoritative volume. Fluid Power Engineering presents a comprehensive approach to hydraulic systems engineering with a solid grounding in hydrodynamic theory. The book explains how to create accurate mathematical models, select and assemble components, and integrate powerful servo valves and actuators. You will also learn how to build low-loss transmission lines, analyze system performance, and optimize efficiency. Work with hydraulic fluids, pumps, gauges, and cylinders Design transmission lines using the lumped parameter model Minimize power losses due to friction, leakage, and line resistance Construct and operate accumulators, pressure switches, and filters Develop mathematical models of electrohydraulic servosystems Convert hydraulic power into mechanical energy using actuators Precisely control load displacement using HSAs and control valves Apply fluid systems techniques to pneumatic power systems

Plant Engineering's Fluid Power Handbook, Volume 2

The use of hydraulic control is rapidly growing and the objective of this book is to present a rational and well-balanced treatment of its components and systems. Coverage includes a review of applicable topics in fluid mechanisms; components encountered in hydraulic servo controlled systems; systems oriented issues and much more. Also offers practical suggestions concerning testing and limit cycle oscillation problems.

Pneumatic and Hydraulic Components and Instruments in Automatic Control

Hydraulic and Electro-Hydraulic Control Systems

Nonlinear Control Techniques for Electro-Hydraulic Actuators in Robotics Engineering meets the needs of those working in advanced electro-hydraulic controls for modern mechatronic and robotic systems. The non-linear EHS control methods covered are proving to be more effective than traditional controllers, such as PIDs. The control strategies given address parametric uncertainty, unknown external load disturbance, single-rod actuator characteristics, and control saturation. Theoretical and experimental validations are explained, and examples provided. Based on the authors' cutting-edge research, this work is an important resource for engineers, researchers, and students working in EHS.

Controlling Electrohydraulic Systems

Simulation of Fluid Power Systems with Simcenter Amesim

This up-to-date book details the basic concepts of many recent developments of nonlinear identification and nonlinear control, and their application to hydraulic servo-systems. It is very application-oriented and provides the reader with detailed working procedures and hints for implementation routines and software tools.

Fluid Power Pumps and the Electrification

Hydraulic Control Systems

The Jan. 1956 issue includes Fluid power engineering index, 1931-55.

Engineering Applications of Pneumatics and Hydraulics

This book illustrates numerical simulation of fluid power systems by LMS Amesim Platform covering hydrostatic transmissions, electro hydraulic servo valves, hydraulic servomechanisms for aerospace engineering, speed governors for power machines, fuel injection systems, and automotive servo systems.

Interfacing Microprocessors in Hydraulic Systems

This is the ninth in a series of books that reports on the International Fluid Power Workshops held annually at the University of Bath. Each workshop is based on a topic of current interest in the field of Fluid Power.

Tank, Combat, Full-tracked, 105-mm Gun, M1 (2350-01-061-2445) General Abrams, Turret

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 3 is to provide a major interdisciplinary forum for the presentation of new approaches from Electrical Power Systems and Computers, to foster integration of the latest developments in scientific research. 133 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. Xiaofeng Wan. 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 Electrical Power Systems and Computers.

Dynamic Systems and Control

Pneumatic and Hydraulic Components and Instruments in Automatic Control covers the proceedings of the International Federation of Automatic Control (IFAC) Symposium. The book reviews papers that tackle topics relating to the use of pneumatic and hydraulic equipment in automatic control. This text discusses topics such as dynamic behavior analysis of pneumatic components by numerical techniques and application of bond graphs to the digital simulation of a two-stage relief valve dynamic behavior. Topics including mathematical modeling of cavitation in hydraulic pumps; pro and contra electro-fluid analogies in digital simulation of fluid circuits; and improvement in accuracy of pneumatic delay are covered as well. This book will be of great use to researchers and professionals whose work involves the designing of automatic control systems.

Hydraulic Control Systems

On Electrohydraulic Pressure Control for Power Steering Applications

This textbook surveys hydraulics and fluid power systems technology, with new chapters on system modeling and hydraulic systems controls now included.The text presents topics in a systematic way, following the course of energy transmission in hydraulic power generation, distribution, deployment, modeling, and control in fluid power systems.

Hydraulic Servo-systems

Assuming only the most basic knowledge of the physics of fluids, this book aims to equip the reader with a sound understanding of fluid power systems and their uses in practical engineering. In line with the strongly practical bias of the book, maintenance and trouble-shooting are covered, with particular emphasis on safety systems and regulations.

Fluid Power Troubleshooting, Second Edition,

Fluid Power Systems and Technology--1996

Hydraulics & Pneumatics

Engineers not only need to understand the basics of how fluid power components work, but they must also be able to design these components into systems and analyze or model fluid power systems and circuits. There has long been a need for a comprehensive text on fluid power systems, written from an engineering perspective, which is suitable for an u

The Mechatronics Handbook - 2 Volume Set

This book provides readers with a very broad introduction to the basic concepts of electrohydraulics control systems specifically, and motion control in general. It includes both the mechanical and electrical aspects of the various types of valves, and methods of controlling them. Other chapter topics include reviews of basic fluid power and electricity, sensors,

programmable logic controllers, and robotics. This book serves as a solid foundation upon which to build and apply more specialized knowledge. For technicians involved in the industry—an industry which desperately needs this type of background.

Fluid Power Circuits and Controls

The excitement and the glitz of mechatronics has shifted the engineering community's attention away from fluid power systems in recent years. However, fluid power still remains advantageous in many applications compared to electrical or mechanical power transmission methods. Designers are left with few practical resources to help in the design and

A Microcomputer Controlled Electrohydraulic Shaking Device

Presents practical methods for detecting, diagnosing and correcting fluid power problems within a system. The work details the design, maintenance, and troubleshooting of pneumatic, hydraulic and electrical systems and components. This second edition stresses: developments in understanding the complex interactions of components within a fluid power system; cartridge valve systems, proportional valve and servo-systems, and compressed air drying and filtering; noise reduction and other environmental concerns; and more.;This work should be of interest to mechanical, maintenance, manufacturing, system and machine design, hydraulic, pneumatic, industrial, chemical, electrical and electronics, lubrication, plastics processing, automotive, process control, and power system engineers; manufacturers of hydraulic and pneumatic machinery; systems maintenance personnel; and upper-level undergraduate and graduate students in these disciplines.

Nonlinear Control Techniques for Electro-Hydraulic Actuators in Robotics Engineering

This book discusses the pump's role in electrohydraulic systems and its use as a power source to a control loop, and provides a good understanding of the basics, complemented by working knowledge of the "real world." It is intended for engineers and students who have studied feedback control theory.

Electrical Power Systems and Computers

Fundamentals of Fluid Power Control

Control Engineering

This exciting reference text is concerned with fluid power control. It is an ideal reference for the practising engineer and a textbook for advanced courses in fluid power control. In applications in which large forces and/or torques are required, often with a fast response time, oil-hydraulic control systems are essential. They excel in environmentally difficult applications because the drive part can be designed with no electrical components and they almost always have a more competitive power/weight ratio compared to electrically actuated systems. Fluid power systems have the capability to control several parameters, such as pressure, speed, position, and so on, to a high degree of accuracy at high power levels. In practice there are many exciting challenges facing the fluid power engineer, who now must preferably have a broad skill set.

Designer's Handbook for Electrohydraulic Servo and Proportional Circuits and Systems

Fluid Power Systems and Technology

Electrohydraulic Control Systems

Basics of Hydraulic Systems, Second Edition

Mechatronics has evolved into a way of life in engineering practice, and indeed pervades virtually every aspect of the modern world. As the synergistic integration of mechanical, electrical, and computer systems, the successful implementation of mechatronic systems requires the integrated expertise of specialists from each of these areas. De

Fluid Power Systems

Hydraulic and Electric-Hydraulic Control Systems

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Paper

More and more vehicles are being electrified. Mobile working machines and heavy trucks are not excluded, and these machines are often hydraulically intense. Electrification entails new requirements for the hydraulic system and its components, and these requirements must be taken into consideration. Hydraulic systems have looked similar for a long time, but now there is an opportunity to advance. Many things change when a diesel engine is replaced with an electric motor. For example, variable-speed control becomes more relevant, electric regeneration becomes possible, and the use of multiple prime movers becomes an attractive alternative. The noise from the hydraulic system will also be more noticeable when the diesel engine is gone. Furthermore, the introduction of batteries to the system makes the energy more valuable, since batteries are heavy and costly compared to a diesel tank. Therefore, it is commercially viable to invest in the hydraulic system. This thesis revolves around the heart of the hydraulic system, that also is the root of all evil. That is the pump. Traditionally, a pump has had either a fixed displacement or a continuously variable displacement. Here, the focus is on something in between, namely a pump with discrete displacement. The idea of discrete displacement is far from unique, but has not been investigated in detail in combination with variable speed before. In this thesis, a novel design for a quiet pump with discrete displacement is presented and analysed. The results show that discrete displacement is relevant from an energy perspective for machines working extensively at high pressure levels and with low flow rates, and that a few discrete values are enough to make a significant difference. However, for other cycles, the possible energy gains are very limited, but the discrete displacement can be a valuable feature if downsizing the electric machine is of interest.

Controlling Electrohydraulic Systems

Proceedings of the November 1996 symposium. Contains 18 papers on topics such as the computer simulation of the performance of digital-displacement pump-motors; a study on the dynamics of a load sensing system; an automatic shut-off valve for hydraulic accumulators; a modified orifice flow formula f

Proceedings of the ASME Fluid Power Systems and Technology Division

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