Invitation to Submit

Control and Optimization Technologies in Renewable Energy and Integrated Energy Systems
Guest Editors: Dr. Temitayo Olowu and Dr. Raghav Khanna
Deadline: 15 September 2024

High Performance Control and Industrial Applications
Guest Editors: Dr. Luis Gomes, Prof. Dr. Weichao Sun and Prof. Dr. Weiyang Lin
Deadline: 15 October 2024

Nonlinear System Identification and Soft Sensor Design
Guest Editors: Prof. Dr. Luca Patanè and Prof. Dr. Maria Gabriella Xibilia
Deadline: 15 November 2024

Advances in Decision Making for Complex Systems
Guest Editor: Dr. Constanta Zoie Radulescu
Deadline: 15 December 2024

Advances in Mobile Robots: Navigation, Motion Planning and Control
Guest Editor: Prof. Dr. Giuseppe Menga
Deadline: 15 January 2025

Special Issue Reprints

Automation, Operation and Maintenance of Control and Communication Systems

Sliding Mode Control in Dynamic Systems

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Systems & Control Engineering

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Section Information

The Systems and Controls section provides the field of electrical and computer engineering a unified paradigm for designing controllers in a variety of application domains. Initially developed in the context of electrical engineering, this dynamic field has come to represent an essential enabling and supporting technology for a wide range of sectors (energy, transport, manufacturing, biology, defense, robotics ...).

This section is devoted to publishing focused articles related to control aspects of electronics and engineering systems, more specifically including theoretical developments and applications of control engineering as embedded control systems, mechatronics, smart systems, power systems, electrical circuits, computer science, for the enhancement of electronics systems and processes. All submissions are subject to a peer-review process. We encourage the submission of original contributions derived from theoretical and/or application-oriented research studies.

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Selected Papers

FI-NPI: Exploring Optimal Control in Parallel Platform Systems

Authors: Ruiyang Wang, Qiuxiang Gu, Siyu Lu, Jiawei Tian, Zhengtong Yin, Lirong Yin and Wenfeng Zheng

Abstract: Typically, the current and speed loop closure of servo motor of the parallel platform is accomplished with incremental PI regulation. The control method has strong robustness, but the parameter tuning process is cumbersome, and it is difficult to achieve the optimal control state. In order to further optimize the performance, this paper proposes a double-loop control structure based on fuzzy integral and neuron proportional integral (FI-NPI). The structure makes full use of the control advantages of the fuzzy controller and integrator to improve the performance of speed closed-loop control. And through the feedforward branch, the speed error is used as the teacher signal for neuron supervised learning, which improves the effect of current closed-loop control. Through comparative simulation experiments, this paper verifies that the FI-NPI controller has a faster dynamic response speed than the traditional PI controller. Finally, in this paper, the FI-NPI controller is implemented in C language in the servo-driven lower computer, and the speed closed-loop test of the BLDC motor is carried out. The experimental results show that the FI-NPI double-loop controller is better than the traditional double-PI controller in performance indicators such as convergence rate and RMSE, which confirms that the FI-NPI double-loop controller is more suitable for BLDC servo control.

https://doi.org/10.3390/electronics13071168

Comprehensive Diagnosis of Localized Rolling Bearing Faults during Rotating Machine Start-Up via Vibration Envelope Analysis

Authors: Jose E. Ruiz-Sarrio, Jose A. Antonino-Daviu and Claudia Martis

Abstract: The analysis of electrical machine faults during start-up, and variable speed and load conditions offers numerous advantages for fault detection and diagnosis. In this context, diagnosing localized bearing faults through vibration signals remains challenging, particularly in developing physically meaningful, simple, and resampling-free techniques to monitor fault characteristic components throughout machine start-up. This study introduces a straightforward method for qualitatively identifying the time-frequency evolutions of localized bearing faults during the start-up of an inverter-fed machine. The proposed technique utilizes the time-frequency representation of the envelope spectrum, effectively highlighting characteristic fault frequencies during transient operation. The method is tested in an open-source dataset including transient vibration signals. In addition, the work studies the method limitations induced by the mechanical transfer path, when the bearing surroundings are not directly accessible for vibration acquisition. The proposed methodology efficiently identifies incipient localized bearing faults during inverter-fed machine start-up when the fault signature is not highly attenuated.

https://doi.org/10.3390/electronics13020375

Linear-Extended-State-Observer-Based Adaptive RISE Control for the Wrist Joints of Manipulators with Electro-Hydraulic Servo Systems

Authors: Junjie Mi, Wenxiang Deng, Jianyong Yao and Xianglong Liang

Abstract: Manipulators are multi-rigid-body systems composed of multiple moving joints. During movement, the Coriolis force, centrifugal force, and gravity of the system undergo significant changes. The last three degrees of freedom (DOFs) of the wrist joint of a manipulator control the end attitude. Improving the command tracking accuracy of the wrist joint is a key challenge in controlling the end attitude of manipulators. In this study, a dynamics model of the mechanical arm–wrist joint is established based on the Lagrange method. An adaptive continuous robust integral of the sign of the error (ARISE) controller is designed using the reverse step method. Additionally, a linear extended state observer (LESO) is employed to estimate the time-varying interference existing in the system and compensate for it in the designed control rate. The stability of the Lyapunov function and the boundedness of the observer are proven. The proposed control method for the wrist joint is compared with other controllers on an experimental platform of multi-DOF hydraulic manipulators. The results demonstrate that the proposed method improves the control performance of hydraulic manipulators. The application of this method offers a new strategy and idea for achieving high-performance tracking control in hydraulic manipulators.

https://doi.org/10.3390/electronics13061060