Invitation to Submit

Application of Computational Fluid Dynamics in Mechanical Engineering

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Artificial-Intelligence-Based Methods for Structural Health Monitoring

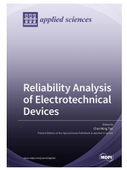
Guest Editor: Prof. Dr. Mohammad Noori

Additive Manufacturing of Metal Components

Guest Editors: Dr. Lonnie Love and Dr. Ryan R. Dehoff

Special Issue Reprints

Modelling and Control of Mechatronic and Robotic Systems, Volume II



Reliability Analysis of Electrotechnical Devices

Algorithms and Methods for Designing and Scheduling Smart Manufacturing Systems

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Section Mechanical Engineering

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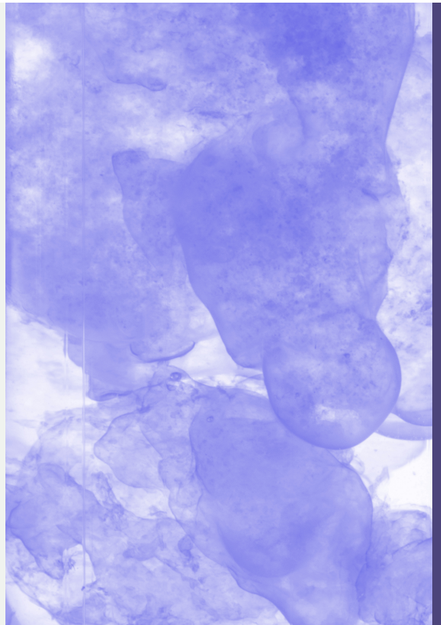

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Section Information

The Mechanical Engineering Section is open to receive high-quality papers reporting state-of-the-art technology in the fields of solid mechanics, machine design, advanced manufacturing processes as well as other basic phenomena in this field. The section welcomes rudimentary and challenging studies concerning the basic and advanced design of components and structures subjected to in-service loading conditions. Fluid dynamics and thermodynamics are included in this section.

Section Editor-in-Chief
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Selected Papers

A Review on Vibration-Based Condition Monitoring of Rotating Machinery

Authors: Monica Tiboni, Carlo Remino, Roberto Bussola and Cinzia Amici

Abstract: Monitoring vibrations in rotating machinery allows effective diagnostics, as abnormal functioning states are related to specific patterns that can be extracted from vibration signals. Extensively studied issues concern the different methodologies used for carrying out the main phases (signal measurements, pre-processing and processing, feature selection, and fault diagnosis) of a malfunction automatic diagnosis. In addition, vibration-based condition monitoring has been applied to a number of different mechanical systems or components. In this review, a systematic study of the works related to the topic was carried out. A preliminary phase involved the analysis of the publication distribution, to understand what was the interest in studying the application of the method to the various rotating machineries, to identify the interest in the investigation of the main phases of the diagnostic process, and to identify the techniques mainly used for each single phase of the process. Subsequently, the different techniques of signal processing, feature selection, and diagnosis are analyzed in detail, highlighting their effectiveness as a function of the investigated aspects and of the results obtained in the various studies...

https://doi.org/10.3390/app12030972

Structural Assessment under Uncertain Parameters via the Interval Optimization Method Using the Slime Mold Algorithm

Authors: Ramin Ghiasi, Mohammad Noori, Sin-Chi Kuok, Ahmed Silik, Tianyu Wang, Francesc Pozo and Wael A. Altabey

Abstract: Damage detection of civil and mechanical structures based on measured modal parameters using model updating schemes has received increasing attention in recent years. In this study, for uncertainty-oriented damage identification, a non-probabilistic structural damage identification (NSDI) technique based on an optimization algorithm and interval mathematics is proposed. In order to take into account the uncertainty quantification, the elastic modulus is described as unknown-but-bounded interval values and the proposed new scheme determines the upper and lower bounds of the damage index. In this method, the interval bounds can provide supports for structural health diagnosis under uncertain conditions by considering the uncertainties in the variables of optimization algorithm. The model updating scheme is subsequently used to predict the interval-bound of the Elemental Stiffness Parameter (ESP). The slime mold algorithm (SMA) is used as the main algorithm for model updating. In addition, in this study, an enhanced variant of SMA (ESMA) is developed, which removes unchanged variables after a defined number of iterations...

https://doi.org/10.3390/app12041876

Design of a Smart Factory Based on Cyber-Physical Systems and Internet of Things towards Industry 4.0

Authors: Mutaz Ryalat, Hisham ElMoaqet and Marwa AlFaouri

Abstract: The rise of Industry 4.0, which employs emerging powerful and intelligent technologies and represents the digital transformation of manufacturing, has a significant impact on society, industry, and other production sectors. The industrial scene is witnessing ever-increasing pressure to improve its agility and versatility to accommodate the highly modularized, customized, and dynamic demands of production. One of the key concepts within Industry 4.0 is the smart factory, which represents a manufacturing/production system with interconnected processes and operations via cyber-physical systems, the Internet of Things, and state-of-the-art digital technologies. This paper outlines the design of a smart cyber-physical system that complies with the innovative smart factory framework for Industry 4.0 and implements the core industrial, computing, information, and communication technologies of the smart factory. It discusses how to combine the key components (pillars) of a smart factory to create an intelligent manufacturing system. As a demonstration of a simplified smart factory model, a smart manufacturing case study with a drilling process is implemented, and the feasibility of the proposed method is demonstrated and verified with experiments.

https://doi.org/10.3390/app13042156

Overview of Predictive Control Technology for Permanent Magnet Synchronous Motor Systems

Authors: Jingyao Peng and Ming Yao

Abstract: Permanent magnet synchronous motors (PMSMs) are commonly used in the automation industry. With the speedy development of digital system processors, predictive control as a modern control scheme has been applied to improve the dynamic performance and work efficiency of PMSMs. This paper provides an overview of the research status of PMSM-based predictive control strategies. The deficiencies of the three most popular predictive schemes, deadbeat predictive control, finite-control-set model predictive control, and continuous-control-set model predictive control, and existing improvement strategies such as delay compensation schemes, robust control schemes, and multi-vector control schemes, are summarized. Finally, current technological trends are discussed, emphasizing future research directions for predictive control in PMSM drive systems.

https://doi.org/10.3390/app13106255