

Research Article

A Dynamic Design Methodology for Large-Scale Complex Nonlinear Systems Based on Orthogonal Decomposition Technique

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HSRS is taken as a typical research case of large-scale complex nonlinear systems, and the re-innovation of associated imported technologies needs to be combined with the particularities of Chinese HSR practices, seeking a more suitable dynamic design methodology to conduct the self-adaptive improved design. Different from the troublesomeness of the primary hunting phenomenon, the self-adaptive improved design can decrease considerably the impact of car body instability on ride comfort merely by applying the semiactive damping technique between intervehicles, to promote scientifically the limit and construction speeds under the rational conditions of wheel-rail matching, i.e., $\lambda_{1,2} \geq \lambda_{\text{limit}}$, $\lambda_{\text{limit}} = (0.00-0.05)$. The researching viewpoint of hunting kinematics makes the investigations on the geometric nonlinearity of the wheel-rail contacts contrary to the hypothesis of small creepage and no spin. Since the technical prototype of German ICE3 serial bogies has the design default of the primary hunting phenomenon, the improved design of the wheel-rail relationship has simply abandoned the high-quality technical resources of wheel-rail matching conditions at low conicity. On the contrary, the dynamic simulation analyses of MCO1-TC02-MCO3 three-vehicles trainset show that the semiactive damping technique between intervehicles takes advantage of $I_{\text{in}} \gg I_{\text{ex}}$ to improve the impacts of car body instability on ride comfort, and the self-adaptive improved design has consequently the ability to achieve the technical goal of uniform wear at low conicity. On the premise of meeting the requirements of crossing over different speed grade dedicated lines and realizing the running operations on three-speed levels of 160/250/350 km/h, the self-adaptive higher-/high-speed bogies can conditionally satisfy the economic reprofiling requirements of wheelsets through the optimal routing planning.

1. Introduction

The application of a large number of analysis software is one of the main technical characteristics in postindustrial societies. Nevertheless, large-scale complex nonlinear systems such as high-speed rolling stock (HSRS) must also rely on big data mining techniques such as orthogonal decomposition or modal modification so as to carry out the dynamic design. The optimal configuration of higher-/high-speed bogies can be guided instructively with the analysis graphs of full vehicle stability properties and variation patterns,

realizing the goal of scientifically promoting the limit and construction speeds under rational conditions of wheel-rail matching at the minimum cost. Therefore, the HSRS operation and maintenance practice for High-Speed Rails (HSR) has become an incredible engineering in postindustrial societies, which actively boosts the formation and development of dynamic design methodology.

Uniform wear at low conicity should be one of the necessary technical conditions for worldwide HSR practices. The commercial application vision of future HSR transport is necessary to be clarified in the planning for HSR

Methodology For Large Scale Systems

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Software Engineering for Large-Scale Multi-Agent Systems Alessandro Garcia, Carlos Lucena, Franco Zambonelli, Andrea Omicini, Jaelson Castro, 2003-08-03 Nowadays engineering large scale software systems means dealing with complex systems composed of pervasive software components that move around and adapt to nondeterministic and open environments like the Internet in order to achieve systems design goals through the coordination of autonomously distributed services The agent metaphor in particular software agents and multi agent systems MAS constitutes a promising approach for covering most of the software development life cycle from conceptual modeling and requirements specification to architectural definition design and implementation This book presents 17 carefully reviewed papers arranged in order to provide a coherent survey of how to exploit agent properties and MAS issues in today s software systems The book offers the following topical sections software engineering foundations requirements engineering and software architecture coordination and mobility reuse dependability empirical studies and applications

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Basic and Applied General Systems Research Robert Trappl, Werner Horn, George J. Klir, 1985 Research and development of a methodology for industry functional modeling Kent D. Wall, 1979 A Methodology for Optimizing Power Generation-water Desalination Systems Using Mathematical Programming Decomposition Meir Carasso, 1971 *Cybernetics Abstracts*, 1971

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Large Scale Systems Theory and Applications, 1983 A. Straszak, International Federation of Automatic Control, International Federation of Operational Research Societies, 1984 A beloved folk performer gathers uninhibited tales and ballads from the Appalachians Full of lively stories jokes and games for performance the folklore in this book reflects the hardships humor and creative instincts of the robust men and women from the hills of Carolina Tennessee and Kentucky The 40 songs features melody and guitar chords Includes 44 illustrations

Systems & Control Encyclopedia: M-O, 1987 This comprehensive reference work provides information on what systems thinking comprises and how it is being used to understand and to attack a wide spectrum of diverse problems ranging from for example the control of servo mechanisms to applications of space technology

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