

system design

detail design

validation

system simulation

modification

System optimization

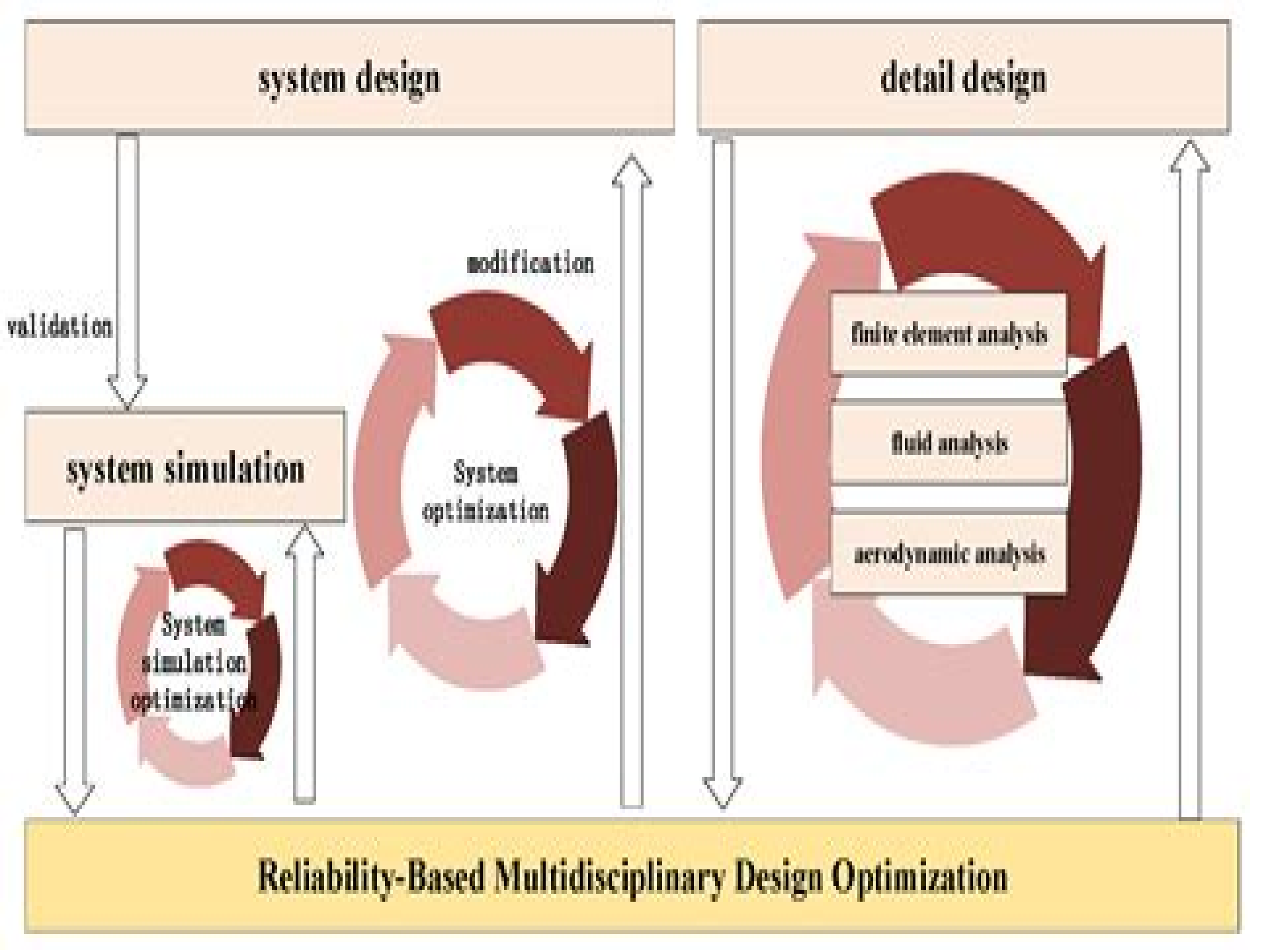
finite element analysis

fluid analysis

aerodynamic analysis

System simulation optimization

Reliability-Based Multidisciplinary Design Optimization



A Reliability Based Multidisciplinary Design Optimization

Chao Zhang



A Reliability Based Multidisciplinary Design Optimization:

Multidisciplinary Design Optimization and Its Application in Deep Manned Submersible Design Binbin Pan, Weicheng Cui, 2020-08-28 This book investigates Reliability based Multidisciplinary Design Optimization RBMDO theory and its application in the design of deep manned submersibles DMSs Multidisciplinary Design Optimization MDO is an effective design method for large engineering systems like aircraft warships and satellites which require designers and engineers from various disciplines to cooperate with each other MDO can be used to handle the conflicts that arise between these disciplines and focuses on the optimal design of the system as a whole However it can also push designs to the brink of failure In order to keep the system balanced Reliability based Design RBD must be incorporated into MDO Consequently new algorithms and methods have to be developed for RBMDO theory This book provides an essential overview of MDO RBD and RBMDO and subsequently introduces key algorithms and methods by means of case analyses In closing it introduces readers to the design of DMSs and applies RBMDO methods to the design of the manned hull and the general concept design The book is intended for all students and researchers who are interested in system design theory and for engineers working on large complex engineering systems

Multidisciplinary Design Optimization Supported by Knowledge Based Engineering Jaroslaw Sobieszczanski-Sobieski, Alan Morris, Michel van Tooren, 2017-05-08 Multidisciplinary Design Optimization supported by Knowledge Based Engineering supports engineers confronting this daunting and new design paradigm It describes methodology for conducting a system design in a systematic and rigorous manner that supports human creativity to optimize the design objective s subject to constraints and uncertainties The material presented builds on decades of experience in Multidisciplinary Design Optimization MDO methods progress in concurrent computing and Knowledge Based Engineering KBE tools Key features Comprehensively covers MDO and is the only book to directly link this with KBE methods Provides a pathway through basic optimization methods to MDO methods Directly links design optimization methods to the massively concurrent computing technology Emphasizes real world engineering design practice in the application of optimization methods Multidisciplinary Design Optimization supported by Knowledge Based Engineering is a one stop shop guide to the state of the art tools in the MDO and KBE disciplines for systems design engineers and managers Graduate or post graduate students can use it to support their design courses and researchers or developers of computer aided design methods will find it useful as a wide ranging reference

Sequential Optimization and Reliability Assessment for Multidisciplinary Systems Design Harish Beeram, 2005 Motivated by the need of high reliability and safety in complex engineering systems recently reliability based design has been increasingly applied in multidisciplinary design optimization MDO However a direct integration of reliability based design that has been successful in many single disciplinary fields into MDO may present tremendous implementation and numerical difficulties The reliability analysis and reliability based designs are highly expensive for MDO considering various disciplines that are dependent on each other or coupled Hence the present work

proposes a methodology of Sequential Optimization and Reliability Assessment for multidisciplinary systems design to improve the efficiency of reliability based MDO The central idea is to decouple the reliability analysis from MDO with sequential cycles of reliability analysis and deterministic MDO and hence to reduce the computational demand Abstract leaf

iii **Multidisciplinary Design Optimization of Complex Structures Under Uncertainty** Debiao Meng, Shun-Peng Zhu, 2024-09-02 In the realm of engineering structures design the inevitability of uncertainties poses a significant challenge Uncertainty Based Multidisciplinary Design and Optimization UBMDO stands out for its dual ability to precisely quantify the impact of uncertain variables and harness the potential of multidisciplinary design and optimization thereby attracting considerable attention From basic theory to advanced applications this book helps readers achieve more efficient and reliable design optimization in complex systems through rich case studies and practical technical guidance The book systematically expounds the fundamental theories and methods of UBMDO encompassing crucial techniques such as uncertainty modeling sensitivity analysis approximate modeling and uncertainty based optimization It also introduces various uncertainty analysis methods such as stochastic non probabilistic and hybrid approaches aiding readers in comprehending and managing uncertainty within systems Through diverse practical engineering cases in fields like machinery aerospace and energy it illustrates the specific application and implementation process of the UBMDO method Rich graphics algorithms and simulation results augment the practicality and applicability of the theoretical knowledge Furthermore it explores in depth the future development trends and challenges of UBMDO sparking innovative thinking and research interests among readers in this field Multidisciplinary Design Optimization of Complex Structures Under Uncertainty caters to a diverse audience Engineers specializing in multidisciplinary design optimization are given the tools to master uncertainty management and researchers in related fields will gain important theoretical insights and practical guidance in uncertainty analysis Additionally scholars and educators can utilize the book as a comprehensive resource for advanced courses enabling students to grasp the latest UBMDO applications Decision makers and managers handling complex systems can extract methods from the book facilitating improved risk assessment and strategic development through uncertainty based optimization

Multidisciplinary Design Optimization Supported by Knowledge Based Engineering Jaroslaw

Sobieszczanski-Sobieski, Alan Morris, Michel van Tooren, 2015-09-28 Multidisciplinary Design Optimization supported by Knowledge Based Engineering supports engineers confronting this daunting and new design paradigm It describes methodology for conducting a system design in a systematic and rigorous manner that supports human creativity to optimize the design objective s subject to constraints and uncertainties The material presented builds on decades of experience in Multidisciplinary Design Optimization MDO methods progress in concurrent computing and Knowledge Based Engineering KBE tools Key features Comprehensively covers MDO and is the only book to directly link this with KBE methods Provides a pathway through basic optimization methods to MDO methods Directly links design optimization methods to the massively

concurrent computing technology Emphasizes real world engineering design practice in the application of optimization methods Multidisciplinary Design Optimization supported by Knowledge Based Engineering is a one stop shop guide to the state of the art tools in the MDO and KBE disciplines for systems design engineers and managers Graduate or post graduate students can use it to support their design courses and researchers or developers of computer aided design methods will find it useful as a wide ranging reference Reliability and Robust Design in Automotive Engineering ,2004

Multidisciplinary Design Optimization for High Reliability and Robustness ,2005 Optimization and uncertainty analysis considering multiple design criteria involves seamless integration of often conflicting disciplines Over the last 3 years Wright State University has been applying analysis tools to predict the behavior of critical disciplines to produce highly robust torpedo designs using robust multi disciplinary design optimization Multidisciplinary optimization and system reliability analysis were emphasized during the third year of the grant period and more reliable torpedo designs were obtained for all the different disciplines An optimal configuration of a supercavitating torpedo model that fits in a cavity generated by the cavitator was obtained An evidence theory based method to determine the reliability of the cavitator is presented Structural optimization of the lightweight torpedo model was done for it to be safe from underwater explosions and to reduce the acoustic signature Also reliability based optimization was performed for the lightweight torpedo model using system reliability constraints Reliability-based Design Optimization of Series Structural Systems Johannes Ovrelid Royset,2002 **Proceedings of the ... ASME Design Engineering Technical Conferences** ,2006 AIAA Journal American Institute of Aeronautics and Astronautics,2007 International Journal of Materials & Product Technology ,2006

Proceedings of the ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conferences--2005 ,2005 **CUSTOM (Center for Uncertain Systems: Tools for Optimization and Management Conference)** Center for Uncertain Systems: Tools for Optimization and Management,2004 Journal of Engineering Mechanics ,2006 Advances in Fracture and Damage Mechanics XV Jesús Toribio,Vladislav Mantič,Andrés Sáez,M.H. Aliabadi,2016-09-30 Selected peer reviewed papers from the 15th International Conference on Fracture and Damage Mechanics September 14 16 2016 Alicante Spain Aerospace America ,2007

Research Into Design Amaresh Chakrabarti,2009 International Journal of Vehicle Design ,2001 Efficient Sequential Reliability-based Design Optimization with Adaptive Kriging Inverse Reliability Analysis Richard Walter Fenrich,2018 In this thesis new methods for reliability based design optimization RBDO are presented The Adaptive Kriging Inverse Reliability Analysis AKIRA algorithm and a multifidelity sequential RBDO algorithm are introduced and demonstrated on a complex multidisciplinary supersonic nozzle design problem AKIRA demonstrates competitive performance with other reliability analysis algorithms while also benefiting from the solution of the inverse reliability analysis problem during RBDO The proposed sequential RBDO algorithm mitigates the cost of solving the RBDO problem by decoupling the optimization and

reliability analyses thereby reducing its solution to a series of deterministic optimizations The method is motivated by anchored decomposition has guaranteed convergence inherited from trust region methods and is shown in certain cases to be a generalization of existing sequential RBDO methods It also derives enhanced efficiency by incorporating lower fidelity models when available The final demonstration of the proposed algorithms on an industrial type problem the supersonic nozzle shows that the solution of RBDO problems for complex realistic engineering applications is well within reach **41st AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit 10-13 July 2005, Tucson, Arizona: 05-3700 - 05-3749** ,2005

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