

The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



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Lecture Title: Decomposition-Based Design of Complex Engineering Systems

Friday, May 11, 2012, 2PM, Room 173 Light Engineering

Abstract

Optimal design of engineering systems often requires a decomposition approach to manage complexity: the design of the components that comprise the system is assigned to different individuals or teams according to disciplinary expertise. These distributed yet coupled engineering design activities must be defined and coordinated appropriately to ensure system consistency and optimality. This talk provides an overview of significant accomplishments in the development of rigorous methodologies for decomposition-based design of complex engineering systems. These methodologies utilize optimization techniques to derive component design optimization sub-problems from the optimal system design problem and coordinate their iterative solution to take account for interactions. We present formulations for both object-based and discipline-based decomposition approaches and consider applications in automotive, aerospace and manufacturing engineering. We also address the importance of uncertainty quantification and its accurate propagation within this decomposed multidisciplinary design optimization framework and conclude with a discussion of ongoing and future research efforts in simulation-based design optimization and validation.

Biography

Dr. Michael Kokkolaras is an Associate Research Scientist and Adjunct Associate Professor in the Department of Mechanical Engineering at the University of Michigan. He has additional appointments at the University of Michigan Transportation Research Institute as Associate Research Scientist and at the Department of Innovation and Design of Lulea University of Technology in Sweden as Visiting Professor. Dr. Kokkolaras holds a Diploma in Aerospace Engineering from the Technical University of Munich and a Ph.D. in Mechanical Engineering from Rice University. His research interests include engineering design, multidisciplinary optimization, decomposition and coordination methods for optimal system design, uncertainty quantification, design validation and platform-based design of product families. Dr. Kokkolaras serves as Associate Editor of the ASME Journal of Mechanical Design, and is a senior member of the American Institute of Aeronautics and Astronautics (serving on the Multidisciplinary Design Optimization Technical Committee) and a member of the American Society of Mechanical Engineers (active within the Design Automation Committee).

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