

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



Dr. Ming Zhou, Senior Vice President

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Lecture Title: Some Frontiers of Optimization Technology in Research and Application

Wednesday, November 8, 2017 at 1:30 PM, Room 173 Light Engineering Building



Abstract

The speaker will address several research topics highly relevant to today's industrial trends.

1. Composite: Utilization of composite material entered a new era entering the new millennium when Boeing and Airbus took the leap of faith towards building essentially full composite airliners B787 and A350. Composite material offers unmatched design and manufacturing flexibility. The increased complexity also presents new challenges for engineering design and manufacturing. To serve broad industrial demand the author and his team have developed a comprehensive optimization process for composite laminate structures that leads the design from ply layout concept to detailed ply-book finish. This process is implemented in the commercial software OptiStruct and has gained increasing usage in a broad range of industries, including the above-mentioned airliner programs at Airbus and Boeing. This talk will highlight several more recent advancements: (a) Design of composite for ATL (automatic tape laying) manufacturing; (b) macro feature based fast design realization for F1 Racing industry; (c) Repeat laminates for improved structural robustness and manufacturing process.

2. Additive Manufacturing: In recent years 3D-Printing, also known as additive manufacturing, has become a broad technology movement. By large its fame is driven by rapidly growing consumer adoption. However, rapid growth has been seen in biomedical applications, and initial successes have also been showcased for aerospace and other fields. 3D-Printing offers almost unlimited freedom for designing shapes and form, hence offers the perfect combination with topology optimization for the creation of most efficient structures. Many successful designs created with topology optimization have been presented in a real product environment by leading global companies. The author and his team have developed an advanced solution for blended lattice structures. This talk will also highlight recent R&D on topology optimization considering support elimination or penalization.

3. Multi-material topology optimization: As E-mobility increasingly taking center stage automotive OEMs are under tremendous challenge to the light-weight design to accommodate the large weight increase from the battery pack. Integrating usage of multiple materials have become a trend in electric car design, as shown in the Opel Astra electric car. Hence topology optimization including multiple materials become highly relevant to the industry trend.

4. Fail-safe topology optimization: Failsafe robustness of critical load carrying structures is an important design philosophy for the aerospace industry. A structure should be designed to survive normal loading conditions when partial damage occurred. Such damage is quantified as the complete failure of a structural member, or a partial damage of a larger structural part. The author and his team have developed an efficient approach for fail-safe design within the context of topology optimization.

Biography

Dr. Ming Zhou joined Altair in 1998, and has been carrying the role of chief optimization technologist at Altair ever since. Since 2008 he has been VP responsible for R&D of software development related to structural analysis and optimization. Ming has published over 100 research papers in peer reviewed journals and at conferences, with over 3000 citations. His roles in the research community include Co-Editor of the journal 'Structural and Multidisciplinary Optimization', member of the Executive Committee of ISSMO (international society of structural and multidisciplinary optimization).

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