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

Mechanical Engineering Seminar

Julian A. Norato
Assistant Professor, Department of Mechanical Engineering
University of Connecticut

Lecture Title: Bringing Structural Design Exploration Closer to Realization

Friday, January 29, 2016 at 1:30 PM, Room 173 Light Engineering Building

Abstract

Topology optimization is a field that explores the computational design of structures and materials, with a vibrant and growing research community. In it, an optimal distribution of material is determined within a design envelope with regards to structural performance and weight. This technology has achieved a degree of maturity that has seen it make it to off-the-shelf software and be used for design of structures across a wide variety of applications and industries. However, as I discovered during the course of a long industry tenure, topology optimization is still away from becoming a standard step in the structural design development process, and the customary design-analysis iteration remains the norm in most cases. At the root of this shortcoming is the way in which designs are represented in topology optimization methods today: implicitly through a continuous density field or level set representation. This representation (and the methods that use it) render highly optimal, organic designs; however, in general these designs cannot be readily realized with available stock material and/or economical manufacturing processes. As a result, engineers spend significant effort `translating' the optimal topology into a design that can be realized. In doing so, a significant departure is often made from the optimal topology that leads to increased weight and/or unsatisfactory structural performance. In some cases, this departure can be so drastic and the effort to `fix' the topology optimization so involved, that the designer may find it far more efficient to resort to the usual trial-and-error process. In this talk I will discuss ongoing research efforts in my group to develop methods that produce from the onset optimal topologies that conform to stock material. These methods are based on the smooth projection of an analytical representation of stock elements, such as bars and plates, onto a fixed analysis grid.

Biography

Dr. Norato joined The University of Connecticut as an Assistant Professor in 2014, where he directs the Structural Optimization Laboratory. Prior to joining UConn in 2014, he worked for nine years for Caterpillar, where he was responsible for the Product Optimization Group, in charge of research, development, deployment and application of optimization technologies. He received his PhD from the University of Illinois at Urbana-Champaign, with specialization in Computational Science and Engineering. His current research interests lie in incorporating manufacturing, cost and geometric constraints in the design exploration of structures and materials via topology optimization, with the aim of exploring efficient structures that are tailored to a specific manufacturing process, and with applications across domains, from machine components, to composite and architected materials, to bone scaffolds. In particular, he is interested in the incorporation of geometry models into topology optimization that accommodate the imposition of geometric requirements that render closer-to-manufacturing optimal topologies.

Directions: Please refer to website: http://www.sunysb.edu or call 631-632-8310 for more information.
Check http://me.eng.sunysb.edu for any changes to location or time.

Stony Brook University