



DREXEL UNIVERSITY

Mechanical Engineering
and Mechanics

MEM SPRING
SEMINAR SERIES

Apr 6st (Fri) 11:00 am
MEM Seminar Room, Curtis 162

Pizza and Refreshments Served



TOPOLOGY OPTIMIZATION WITH GEOMETRIC CONSTRAINTS FOR MANUFACTURABILITY

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Abstract

Topology optimization is a powerful computational technique to design structures and architected materials. It determines the optimal distribution of material within a given design region with regards to structural performance and weight. Advances in this technology are fueled by a vibrant and growing research community, and off-the-shelf software is often used today in the design of structures across a wide variety of applications and industries. However, as I discovered during the course of my industry experience, mainstream topology optimization methods are still far from becoming standard work in the product 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 these methods, which is implicitly through a continuous density field or level set representation. These methods render highly optimal, organic designs; however, these designs cannot be readily realized with available stock material and/or economical manufacturing processes because they do not conform to certain geometric requirements. In this talk I will discuss ongoing research efforts in our group to advance methods that produce from the onset optimal topologies that incorporate desired geometric constraints. In particular, I will discuss our progress in designing structures made of stock material, and in design of synthetic bone scaffolds manufactured by direct ink writing.

Biography

Dr. Norato joined The University of Connecticut as an Assistant Professor in 2014. 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. Dr. Norato is a recipient of the 2017 ONR Young Investigator Program award and the 2018 NSF CAREER Award. He is also a Review Editor for the Journal of Structural and Multidisciplinary Optimization.