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NOVEL METHODS AND ALGORITHMS IN TOPOLOGY OPTIMIZATION: BRIDGING DESIGN, MATERIALS, SIMULATIONS, AND MANUFACTURING

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NICOLA FERRO[*], MARCO MONTEMURRO[†], MATTEO BRUGGI[‡], MATTEO GIACOMINI[§¤], JULIAN A. NORATO[‡],

[*] MOX, Dipartimento di Matematica, Politecnico di Milano
Piazza Leonardo da Vinci 32, I-20133, Milano (Italy)
e: nicola.ferro@polimi.it

[†]Université de Bordeaux, Arts et Métiers Institute of Technology, Bordeaux INP, CNRS, INRA, HESAM Université, I2M UMR 5295
F-33405, Talence, France
e: marco.montemurro@ensam.eu w: https://www.i2m.u-bordeaux.fr/

[‡]Department of Civil and Environmental Engineering, Politecnico di Milano
Piazza Leonardo da Vinci 32, I-20133, Milano (Italy)
e: matteo.bruggi@polimi.it

[§] Laboratori de Càlcul Numèric (LaCàN), E.T.S. de Ingeniería de Caminos, Canales y Puertos, Universitat Politècnica de Catalunya, Barcelona (Spain)

[¤] Centre Internacional de Mètodes Numèrics en Enginyeria (CIMNE), Barcelona, Spain
e: matteo.giacomini@upc.edu

[‡]Department of Mechanical Engineering, The University of Connecticut
191 Auditorium Road, U-3139, CT 06269, Storrs (USA)
e: julian.norato@uconn.edu

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ABSTRACT

In the last decades, topology optimization (TO) has been developing at a fast pace, reaching remarkable advancements, also thanks to the employment of cutting-edge computational methods and enhanced production technologies. In particular, the synergy between the design optimization phase, with the involved spatial scales and materials, and the fabrication method, especially when resorting to Additive Manufacturing (AM), has become crucial to foster the application of TO towards diverse fields.

The recent research in TO is engaged both in the methodological formalization of the optimization problem and in the hands-on implementation aspects. Specifically, novel methods

for topology optimization are complementing the already established ones, in order to attack some of the challenges that the TO community is facing. For instance, special interest has been attracted by methodologies that permit to accurately and smoothly describe the topological changes occurring during the optimization process and to provide designs that can be immediately integrated in CAD software (e.g., Computer Aided Design (CAD)-compatible density-based algorithms, Moving Morphable Components, Moving Morphable Voids, and Geometry Projection). On the implementation side, many efforts are deployed to devise algorithms that allow to efficiently tackle the complexity arising in diverse case studies, possibly involving multi-physics, multi-scale, multi-material, multi-constrained and multi-objective scenarios.

In this mini-symposium, we aim to gather recent contributions on different topics regarding TO and the related manufacturing processes. With the aim of providing a stage for innovative ideas and fruitful collaborations, we encourage the presentation of original results on:

- Emerging methods for topology optimization;
- Multi-scale and multi-material topology optimization techniques, with emphasis on the manufacturing phase via traditional or AM fabrication processes;
- Efficient and scalable numerical methods for large-scale multi-objective and multi-physics topology optimization;
- Topology optimization for industry-driven case studies.

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