STRUCTURAL OPTIMIZATION FOR METAL 3D PRINTING

M. Bruggi [1], V. Laghi [2], M. Palermo [2], T. Trombetti [2]

[1] Department of Civil and Environmental Engineering, Politecnico di Milano, 20133 Milano, Italy, matteo.bruggi@polimi.it

[2] Department of Civil, Chemical, Environmental and Materials Engineering, University of Bologna, 40136 Bologna, Italy, vittoria.laghi2@unibo.it, michele.palermo7@unibo.it, tomaso.trombetti@unibo.it

Abstract

Wire-and-Arc Additive Manufacturing (WAAM) is a metal 3D printing technique that allows fabricating elements ranging from simple to extremely complex shapes. Layer-by-layer manufacturing produces a printed material with significant elastic anisotropy, whereas dot-by-dot printing requires funicular geometries. The design of WAAM components is addressed by formulating problems of structural optimizations that take into account the peculiar features of the printing process: topology optimization by distribution of anisotropic material is exploited to find optimal shapes and printing orientations in layer-by-layer manufacturing; a constrained force density method is proposed for gridshell design in dot-by-dot printing. In both cases, the arising multi-constrained formulation may be efficiently tackled through methods of mathematical programming. Preliminary results are shown in view of the extension of the algorithms to large-scale design.

Presentation time

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