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Università degli Studi di Pavia
Computational Mechanics & Advanced Materials Group - DICAr

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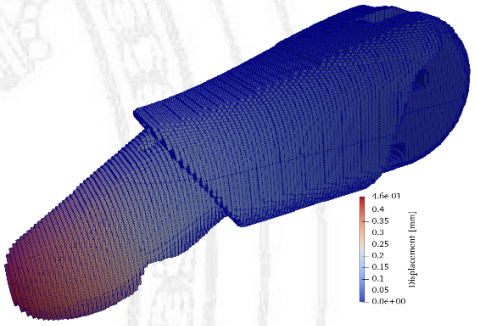
Virtual Modeling and Additive Manufacturing for Advanced Materials

SEMINAR

Performance analysis of AM-parts by Fused Filament Fabrication



In this work, we strive to characterize the material properties of the components additively manufactured by Fused Filament Fabrication (FFF) in order to analyse the mechanical performance of the structure. To accurately characterize the anisotropy introduced into the material properties, the objects are partitioned according to their printing pattern into three zones: the contour, the cover and the inner structure. In the numerical simulation, homogenization technique using Representative Volume Element (RVE) is adopted for characterizing the inner (in-fill) structure. Experimentally, uniaxial tensile tests on various dog-bone samples are performed to characterize the material of the contour and the cover. Contour and cover are portrayed by anisotropic material constitutive behaviour. For validation of the numerical model, experimental tests on square cross-section and door-handle demonstrators under pure bending and bending and torsion loadings are realized. For calibrating the material properties to be used in the numerical model optimization software is employed minimizing the difference between the numerical and experimental structural stiffness. A geometrical relationship between the material properties at different orientation is found. The impact of layer deposition in printing of differently oriented pieces and process parameters on the material conduct is studied. It is shown that the material conduct of different parts of the structure is not the same and depends on the printing orientation and parameters.

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November 26, 2.30pm (sharp)
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