

Local-Global DVC Analyses Confirm Theoretical Predictions for Deformation and Damage Onset in Torsion of Pantographic Metamaterial

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Abstract

Pantographs are a special class of metamaterials that do not obey theories of first gradient continua. In the present work, a pantographic metamaterial was printed and subjected to in situ torsion. The experiment was designed in order to investigate damage onset modalities in large torsional deformations of pantographic mesostructures. To account for the presence of true pivots, multiple point constraints were implemented in the DVC procedure. Local-global DVC was validated thanks to a series of steps accounting for numerous pivots. It was possible to determine the dominant damage mechanism in torsion. Damage was detected thanks to the strain and residual fields. Moreover, important modeling indications were obtained to guide further theoretical and experimental investigations.