

Ten years of global digital volume correlation: What has been achieved?

François Hild and Eikology team

Laboratoire de Mécanique et Technologie (LMT)

ENS Paris-Saclay, CNRS, University of Paris-Saclay, Cachan, France

The presentation aims at reviewing the major developments in global Digital Volume Correlation (DVC) over the past ten years. In addition to its wider use with local approaches, DVC has been extended to global approaches in which the displacement field is defined in a dense way over the region of interest. Kinematic bases using finite element discretizations have been selected. To further add mechanical content, elastic regularization has been introduced. Last, integrated approaches use kinematic fields that are constructed from finite element simulations with chosen constitutive equations. The material parameters (and/or boundary conditions) then become the quantities of interest. These various implementations assume different degrees of integration of mechanical knowledge about the analyzed experiment. First, DVC can be considered as a stand-alone technique, which has seen its field of applications grow over the last ten years. The measured displacement fields and post-processed strain fields are reported. However, given the fact that it shares common kinematic bases with numerical simulations, it can be easily combined with the latter. One route is to require local satisfaction of equilibrium via mechanical regularization. Another route is to fully merge DVC analyses and numerical simulations via integrated approaches. Different examples will illustrate how these various integration steps can be tailored and what are the current challenges associated with various approaches.