Parametric evaluation of part distortion in additive manufacturing processes

Giacomo Quaranta[1, a)], Eberhard Haug[1, b)], Jean Louis Duval[1, c)], Elias Cueto[2, d)]
Francisco Chinesta[3, e)]

[1] *ESI Group*
a) Giacomo.Quaranta@esi-group.com
b) Eberhard.Haug@esi-group.com
c) Jean-Louis.Duval@esi-group.com
[2] *I3A, university of Zaragoza*
d) ecueto@unizar.es
[3] *ESI Chair, PIMM Lab, ENSAM ParisTech*
e) Francisco.Chinesta@ensam.eu

Corresponding author: Francisco.Chinesta@ensam.eu

Abstract. Additive manufacturing is the more and more considered in industry, however efficient simulation tools able to perform accurate predictions are still quite limited. The main difficulties for an efficient simulation are related to the multiple scales, the multiple and complex physics involved, as well as the strong dependency on the process trajectory. This paper aims at proposing a simplified parametric modeling and its subsequent parametric solution for evaluating parametrically the manufactured part distortion. The involved parameters are the ones parametrizing the process trajectories, the thermal shrinkage intensity and anisotropy (the former depending on several material and process parameters and the last directly depending on the process trajectory) and the deposited layers. The resulting simulation tool allows evaluating in real-time the impact of the parameters just referred on the part distortion, and proceed to the required geometrical compensation.