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CURVED MESH GENERATION FOR HIGH-ORDER METHODS

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ABSTRACT

In the last decades, the interest in developing high-order methods on unstructured meshes has been markedly increased. This interest has been prompted by the higher accuracy these methods provide when compared with low-order methods, for a fixed element size. To exploit these advantages, curved meshes that reproduce the curved domain boundaries have to be generated. However, several challenges have still to be solved to generate valid and high-quality curved meshes in a fully automatic manner. Solving these challenges is mandatory to allow the adoption of high-order methods by the research and industrial communities.

To generate curved elements two main challenges have to be solved. First, the mesh has to be composed by elements that are the image of a reference element through a smooth and one-to-one map with a smooth inverse (valid). That is, the elements should be smooth and cannot be tangled, inverted, or folded on other elements. Second, the elements have to approximate with the adequate accuracy both the curved domain boundary (e.g. CAD surfaces) and the solution (quality). There are other important challenges to be solved such as how to generate adapted, anisotropic, and moving meshes.

In this mini-symposium, we invite talks related with the generation of valid curved meshes for high-order methods with: approximated boundary representation, such as the iso-parametric versions of the continuous and Discontinuous Galerkin methods; and with exact boundary representation, such as the p-FEM, the iso-geometric analysis, and the NEFEM. In this framework, we invite talks in broad areas ranging from mesh validity and quality assessment, h-p adaption, anisotropy, moving meshes, geometry representations (B-splines, NURBS, T-splines, subdivision surfaces, polynomials), approximation theory, to the generation of curved meshes for real industrial applications.