Second International Conference Math 2 Product (M2P 2025)
Emerging Technologies in Computational Science
for Industry, Sustainability and Innovation
June 4th-6th, 2025, Valencia, Spain

MESH HANDLING TECHNIQUES: MATHEMATICAL INSIGHTS AND ENGINEERING INNOVATIONS

N. FERRO*, E. TEMELLINI* AND S. PEROTTO*

* MOX-Department of Mathematics, Politecnico di Milano
Piazza L. da Vinci, 32, 20133, Milano, Italy
{nicola.ferro, erika.temellini, simona.perotto}@polimi.it

ABSTRACT

In many engineering and scientific fields, such as fluid dynamics, structural analysis, geophysics, and biomedical applications, mathematical models can provide critical insights into system behavior, aid in optimizing performance, and facilitate decision-making. However, solving such models numerically is often computationally intensive due to the complexity of the underlying equations and the high resolution needed to accurately capture fine-scale details. As a result, it is crucial to develop efficient numerical techniques that reduce the computational effort while preserving solution accuracy.

The choice of the computational mesh is undoubtedly a key step in this direction. For this reason, many commercial software packages, as well as academic codes, include tools for generating computational meshes tailored to the problem at hand. Adaptive meshes play an important role here and are now commonly used in numerical modeling. It is common to distinguish between isotropic and anisotropic adaptive meshes, which are constructed using heuristic criteria or rigorous mathematical procedures, with particular attention to 3D contexts where mesh generation becomes more complex, so that efficient parallelization strategies are often required to ensure that codes run effectively without introducing excessive computational overhead.

This invited session will explore the latest developments in mesh generation and adaptation techniques and their implementation with a focus on engineering applications at large. We invite contributions that demonstrate both theoretical advances and practical applications, particularly in large-scale, 3D, or parallelized environments, where the benefits of an application-specific selection of the computational mesh can be fully realized.