

Advances in particle-based methods for the simulation of coupled problems

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Classical numerical approaches such as the Finite Element Methods (FEM), the Finite Differences Methods (FDM) and Finite Volume Methods (FVM) are well established and widely used techniques both in the scientific and engineering communities. Nevertheless, they show some limitations when dealing with large displacements and deformations regimes or when the continuum mechanics hypothesis are not fulfilled. For this reason, recently, many particle-based techniques have been proposed, validated, and used all over the world to overcome these drawbacks and “enrich” classical approaches with novel features and capability.

With the term Particle-based techniques, we indicate all those approaches that use particles representing the material domain. Just to mention some of the most popular continuum-based technique we can have the Smoothed Particle Hydrodynamics (SPH), the Material Point Method (MPM), the Particle Finite Element Method (PFEM), the Moving Particle Semi-implicit (MPS) or in the discrete framework, the Discrete Element Methods (DEM).

The principal aim of this invited session is to present the most recent advances in Particle Methods in coupled and multiphysics problems and their application to scientific and engineering problems. Innovative formulations and new particles techniques are welcome, as well as their application to civil, mechanical, aeronautical, biomedical engineering and other applied sciences.