

MULTI-PHYSICS MODELING WITH SPH METHOD

**XIANGYU HU, CHI ZHANG
AND MASSOUD REZAVAND**

Technical University of Munich
85748 Garching, Germany
E-mail xiagyu.hu@tum.de

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ABSTRACT

Multi-physics problem involves multiple, coupled physical process and mechanisms. These coupled physical process and mechanisms can include fluid flow, structure deformation, heat and mass transfer, diffusion, chemical reactions and more. Despite the complexity involved in the coupling, multi-physics problems are in many applications where traditional single-physics analyses are inadequate to account for the simulation of real events and processes. In this invited session, we focus on how smoothed particle hydrodynamics (SPH) method can contribute the modeling, algorithm and simulation of multi-physics problems. The perspective topics including:

1. Modeling of physical phenomena beyond the single phase flow. It could be multi-phase flow, non-Newtonian fluid, solid dynamics, mass and heat transfer, diffusion and chemical reaction, ...
2. SPH coupling between different physical phenomena. It could fluid-structure interaction, thermal-mechanics coupling, flow-reaction coupling, ...
3. Algorithms for coupling between SPH and other method. It could be the coupling to finite-element method (FEM), finite-volume method (FVM), and other particles methods, such as discrete element method (DEM), material particle method (MPM), moving particle semi-implicit (MPS) method, ...
4. Reduced dimension modeling using SPH method. It could be the SPH algorithm for thin structure and film or linear structure and filament, ...
5. Multi-resolution coupling in multi-physics problem, including the coupling between full dimension and reduced dimensions.
6. Unified modeling approaches which explore the limit capacity of SPH method.
7. Industrial applications with simulation and optimization using SPH method, ...

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