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MESHFREE AND PARTICLE METHODS: THEORY, FORMULATION AND APPLICATIONS

J. BELINHA[1,*], R.M. NATAL JORGE[1] AND G.R. LIU[2]

[1] Faculty of Engineering of the University of Porto
Rua Dr. Roberto Frias, 4200-465 Porto, Portugal
jorge.belinha@fe.up.pt ; rnatal@fe.up.pt

[2] Department of Aerospace Engineering and Engineering Mechanics
University of Cincinnati – Ohio - USA
liugr@uc.edu

* Corresponding organizer: jorge.belinha@fe.up.pt

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ABSTRACT

This Minisymposium intends to present and discuss recent applications in computational mechanics using meshfree and particle methods. Over the past two decades, meshless methods and particle methods became one of the major interest subjects in computational mechanics. Since then, several meshfree numerical approaches were developed and applied to various fields of computational mechanics, and as expected only the most stable and accurate prevailed. Nowadays meshless methods, using approximation or interpolation functions, collocations techniques and particle methods are used by the scientific community to solve several engineering problems, from fluid mechanics to biomechanics.

The simulation of the extrusion or the material moulding, in which it is necessary to consider an excessively large deformation of the computational mesh, require meshfree techniques in order to avoid the locking phenomenon or a constant mesh rearrangement. The prediction of the crack propagation path, the simulation of interface dynamics in multiphase flows or the cellular growth in biomechanics, demand a flexible and mesh independent numerical techniques. In addition, recent advanced discretization meshfree techniques permitted to reduce significantly the simulation computational cost, allowing the analysis of more realistic applications.

This Minisymposium is interested in research works dealing with the theoretical formulation of new or improved meshfree/particle methods and demanding numerical applications meshfree or particle methods. Nevertheless, developments and applications in several other advanced discretization techniques are welcome. Such as: advanced finite element versions (XFEM, High-order and smoothed FEM, Least-squares FEM, Virtual Elements, Stochastic FEM); particle methods: (Particle Finite Element Method, Smoothed Particles Hydrodynamics, Molecular Dynamics, Material Point Method, Discrete Element Method); isogeometric elements; Boundary Element Methods; etc.

This Minisymposium aims to attract meshfree researchers from various fields with the objective to exchange ideas and identify challenges and advantages in this important numerical field.