

Preface

This volume contains the extended version of a selection of papers presented at the *First International Conference on Particle-Based Methods (PARTICLES 2009)*, held in Barcelona, Spain on November 25–27, 2009.

PARTICLES 2009 was a forum for practitioners in the computational mechanics field to discuss recent advances and identify future research directions for particle-based methods.

The different chapters in the book have been selected with the aims of providing both the fundamental basis and the applicability of state of the art and new particle-based computational methods for solving a variety of problems in engineering and applied sciences.

The content of the different chapters includes state of the art developments and applications of standard and innovative particle-based techniques such as the discrete element method (DEM), the smooth particle hydrodynamic method (SPH), the particle finite element method (PFEM), the material point method, and atomistic and quantum mechanics-based methods, among others. The coupling of these methods with standard numerical procedures, such as the finite element method and also with meshless techniques offers new possibilities to solve complex problems in engineering and sciences with an accurate representation of the physical phenomena at nano, micro and macro scales.

The applications of the particle-based methods compiled in the book cover geo-mechanical and mining problems, industrial forming processes, fluid-structure interaction problems accounting for free surface flow effects in civil and marine engineering (water streams acting on constructions, wave loads in harbours and marine structures, ship hydrodynamics, etc.), multi-fracturing processes in impact situations, nano-micro-macroscopic effects in material science and bio-medical engineering, molecular dynamics, quantum mechanics problems, melting of polymers in fire situations and many others.

This book includes contributions submitted directly by the authors. The editors cannot accept responsibility for any inaccuracies, comments and opinions contained in the text.

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