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ADVANCES IN MESHLESS IN COMPUTATIONAL MECHANICS AND BIOMECHANICS

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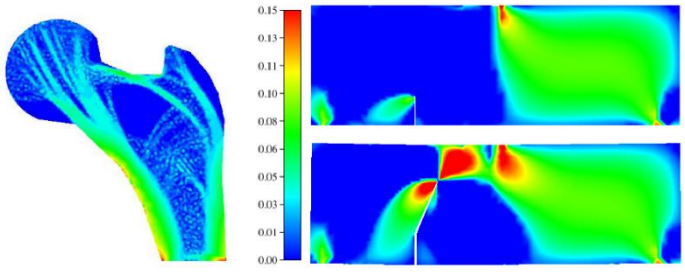
ABSTRACT

Over the past twenty years, meshless and particle methods, along with weakened weak formulations, became one of the major interest focus in computational mechanics. Since then, several meshless formulations were developed and applied to various fields of computational mechanics and biomechanics, and as expected only the most stable and accurate prevailed. Nevertheless, even today there is room for innovation and improvement in this field. Within the classical meshless approach, researchers seek daily for more efficient test functions, as well as new numeric integration schemes, capable to provide more stable and accurate solutions. Due to its discretization flexibility and its numeric stability, meshless and weakened weak formulations are suited to analyse demanding phenomena, such as the simulation of fluid flow and fluid/solid interaction in biomechanics or crack tip propagation modelling.



(a) (b)

Figure 1 – Meshless methods in (a) bone tissue remodelling analysis and (b) crack propagation

Nowadays meshless, particle and weakened weak formulations are used by the scientific community to solve several engineering problems, from fluid mechanics to structural biomechanics. The capability of handling efficiently large deformations of the computational mesh and the re-meshing low computational cost explain the variety of scientific fields covered by meshless techniques. Weakened weak formulation are capable to produce smoother and more accurate variable fields. This session focuses in the recent development and improvement of existent meshless and weakened weak formulations, as well as in the presentation of new advanced discretization approaches and application fields.