Séminaire de mathématiques et leurs applications

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Title: Bringing multiphase CFD close to real scenarios: a level-set/moving mesh approach to study bubbles and drops in complex geometries.

Abstract: CFD techniques have proved to be effective tools to study multiphase flows, since most of the physical phenomena of these flows often happen on space and time scales where experimental methodologies are impossible in practice. Notwithstanding, numerical approaches are limited by the computational power of the present computers. In this sense, small improvements in the efficiency of the simulations can make the difference between an approachable problem and an unapproachable one. The conent of the present seminar is focused on the development of numerical algorithms to optimize the simulations of multiphase solvers based on single-fluid formulations, applied to three-dimensional unstructured meshes, in the context of a finite-volume discretization. In this sense, three paramount issues should be addressed in order to satisfactorily solve realistic scenarios involving multiphase flows: (i) the interface between fluids must be computed accurately while conserving integral properties, (ii) the computational cost should be kept within reasonable bounds, and (iii) the solid geometries, which can be complex and intricate, should be represented effectively and robustly. The present seminar will deepen into these topics, whilst a complete method to study bubbles and drops evolving through complex geometries will be progressively presented.