2018-00606 - Post-Doctoral Research Visit / Numerical schemes and simulations / Parallel anisotropic mesh adaptation: application to Immersed Boundary Method (IBM)

Contract type: Public service fixed-term contract  
Renewable contract: Oui  
Level of qualifications required: Graduate degree or equivalent  
Function: Post-Doctoral Research Visit  
Level of experience: Recently graduated

Context
Scientific context
Inside the European H2020 project, ExaQute (Exascale quantification of uncertainties for technology and science simulation), Inria is the leader of the work package parallel mesh generation and adaptivity. The ExaQute project aims at constructing a framework to enable Uncertainty Quantification and Optimization under Uncertainties on exascale systems. The goal will be addressed by combining State-of-the-art dynamic task-scheduling technologies with space-time accelerated solution approaches, in which parallelism is harvested both in space and time.

The stochastic problem will be tackled by employing a novel Multi Level MonteCarlo approach thus allowing considering a high number of stochastic variables. New theoretical developments will be carried out to enable the use of aggressive mesh refinement approaches in combination with the MLMC approach. Both octree mesh adaptation and tetrahedral anisotropic adaptation will be considered as alternatives.

The developments will be open-source friendly and will follow a modular approach, thus maximizing future impact.

Assignment
During this 3 years project, the aim of CARDAMOM team is to provide a parallel anisotropic remeshing library: ParMmg. To achieve this goal, a two years post-doc position is offered inside CARDAMOM team, Inria Bordeaux Sud-Ouest. The candidate will develop and validate the parallel remeshing tool based on Mmg Platform (http://www.mmgtools.org). ParMmg will then be coupled to AEROSOL, the Inria Computational Fluid Dynamics (CFD) platform for preliminary tests and to the code of our European partner CIMNE (Barcelona).

Main activities
Post-doc objectives
The work performed will follow those steps:

- ParMmg developments based on MPI and Mmg3D. This part will be done in collaboration with the Mmg consortium.
- 3D analytical validation test cases will be performed.
- In the context of IBM, 3D parallel adaptation to the level-set function (signed distance) will be done.
- To prepare the coupling of the library to existing CFD codes, the candidate will develop API functions.
  - Testing will be done with the code of CIMNE (part of the ExaQute deliverables).
  - And testing will be done with AEROSOL. This task involved IBM for the resolution of compressible flows. The field of application is in-flight ice accretion.

Skills
Requirements
Candidates are required to have a PhD in engineering, CFD or applied mathematics. Preferable qualifications for candidates include proven research talent, an excellent level in C or C++ programming. Knowledge in parallel programming (MPI) and CFD is mandatory. Candidates must be able to work in a team and interact with many people from different backgrounds.

For further details and applications, please contact Cecile Dobrzynski (cecile.dobrzynski@math.u-bordeaux.fr).

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave

Remuneration
Duration of the contract: 12 months
2653 € / month (before taxs)