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  
**Fonction:** 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**

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**General Information**

- **Theme/Domain:** Numerical schemes and simulations  
- **Scientific computing (BAP E)**  
- **Town/city:** Talence  
- **Inria Center:** CRI Bordeaux - Sud-Ouest  
- **Starting date:** 2018-09-01  
- **Duration of contract:** 12 months  
- **Deadline to apply:** 2018-06-30

**Contacts**

- **Inria Team:** CARDAMOM  
- **Recruiter:** Dobrzynski Cecile / cecile.dobrzynski@inria.fr

**The keys to success**

**About Inria**

Inria, the French National Institute for computer science and applied mathematics, promotes "scientific excellence for technology transfer and society". Graduates from the world's top universities, Inria's 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

**Conditions for application**

Thank you to send:

- CV  
- Cover letter  
- List of publications  
- letters of recommandation (when appropriate)

**Defence Security**

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST.

An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

**Recruitment Policy**

As part of its diversity policy, all Inria positions
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 taxes)