



Paris, February 3, 2015

Ph.D. position INRIA Paris-Rocquencourt & Ecole de Ponts ParisTech

Context: INRIA project-team SERENA (Pomdapi II) / Ecole des Ponts / ERC consolidator grant GATIPOR

Subject: Adaptive multilevel solvers with a posteriori error control for porous media flows

Contents of the Ph.D. thesis

Introduction

Many environmental and physical phenomena are described by partial differential equations (PDEs). Their simulation bridges distinct scientific branches such as PDE analysis, numerical analysis, numerical linear algebra, and scientific computing. Conjointly, the overall simulation error is composed of different components, like the discretization error (linked to the choice of the numerical method and of the size of the computational mesh) and the algebraic error linked to solvers of large sparse systems of linear equations.

Contents

In this Ph.D. thesis, one shall use the theory of *a posteriori error estimation* to assess the overall error of a numerical simulation, identify its different components, and develop and analyse novel algebraic solvers of the multilevel type. These shall be tailored to porous media simulations, yield mass balance on all grid levels, and be steered by local adaptive stopping criteria. Both theoretical proofs of convergence of the new algorithms and practical applications to current environmental problems shall be tackled. The work will be carried out in the framework of the European Research Council consolidator grant GATIPOR (Guaranteed fully adaptive algorithms with tailored inexact solvers for complex porous media flows), in the SERENA (Pomdapi II) project of INRIA, in collaboration with CERMICS at Ecole de Ponts ParisTech.

References

<http://cermics.enpc.fr/>

<https://www.rocq.inria.fr/pomdapi/index.en.htm>

<http://www.inria.fr/en/centre/paris-rocquencourt/news/erc-consolidator-grant-for-martin-vohralik>

Candidate profile

Master in research or engineering degree with very good level in functional analysis, numerical methods, and programming (Matlab, C, C++).

Practicalities

Timing: 3 years, starting autumn 2015.

Location: INRIA Paris-Rocquencourt <http://www.inria.fr/en/centre/paris-rocquencourt/>, doctoral school of the Pierre and Marie Curie (Paris 6) University, Jacques-Louis Lions Laboratory, <https://www.ljll.math.upmc.fr/en/index.html>.

The knowledge of French language is welcome but not compulsory.

Application

To apply, send CV highlighting your background in numerical analysis, scientific computing, and programming, a list of courses and notes, and a short motivation letter to Ph.D. supervisors Martin Vohralík (INRIA) martin.vohralik@inria.fr and Alexandre Ern (Ecole des Ponts) ern@cermics.enpc.fr.