



Offre n°2023-06961

Post-Doctoral Research Visit F/M Structure preserving and multidimensional well balanced discretizations for conservation laws

Type de contrat : Fixed-term contract

Contrat renouvelable : Oui

Niveau de diplôme exigé : PhD or equivalent

Fonction : Post-Doctoral Research Visit

A propos du centre ou de la direction fonctionnelle

The Inria center at the University of Bordeaux is one of the nine Inria centers in France and has about twenty research teams. The Inria centre is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative SMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute...

Contexte et atouts du poste

This project takes place within ongoing collaborations between the Inria CARDAMOM team, the math department at University of Bordeaux (W. Basukow), SISSA in Italy (D. Torlo), TU Clausthal in Germany (P. Oeffner), Vellore Institute of Technology in India (Y Mantri), and University of Malaga in Spain (C. Parés).

The recruited person will be working in the CARDAMOM inria team in Bordeaux with strong interactions and exchanges with the mentioned collaborators.

Mission confiée

Context

This project follows the line of long term research on the development of improved discretizations for complex PDEs. Here the main focus are hyperbolic balance laws arising in many applications in physics and engineering. More particularly this project looks at so called structure preserving methods which embed genuinely discrete analogs of continuous constraints. Examples are solenoidal constraints and curl involutions, which also include the enhanced preservation of steady states, often referred to as well balanced. Other constraints as non-negativity or bounded variation within physically admissible values are also of great importance.

This work follows initial activities on the so called global flux quadrature (GFQ) approach, which has been shown to provide great enhancements in the approximation of stationary states, including multiD solenoidal constraints (see e.g. [\[GFQ-preprint\]](#) to appear on J.Comput.Phys., or [\[GFQ-talk\]](#) presented at the [Workshop on numerical approximation of hyperbolic PDEs in honor of Prof. Carlos Parés' 60th birthday](#))

The postdoc will contribute to the investigation of several possible extensions of the approach, going from its application to more complex PDE systems, to the methodological enhancements discussed below.

Principales activités

Specifically, we aim in the coming years to develop the following aspects

- applications of the GFQ approach to nonlinear complex multidimensional systems (Shallow Water equations, Euler equations with gravity, Maxwell equations, MHD, etc)
- development of subcell limiting strategies compatible with GFQ
- use of the GFQ strategy to enhance the solution of unsteady problems : space time formulations and ADER
- combination of GFQ with different numerical techniques: continuous and discontinuous finite elements, finite differences, finite volumes
- Entropy conservative/stable formulations

The relations with other techniques as e.g. dimension by dimension extensions of the correction method using local solutions of 1D Cauchy problem proposed in [\[CP20\]](#) will also be investigated, as well as their coupling with high order embedded boundary techniques, somewhat in the spirit of [\[C23,S18\]](#).

Compétences

Technical skills and level required :

The candidate must have a strong background in the development and implementation of high order methods for hyperbolic PDES (finite volume and/or difference and/or finite element and/or discontinuous Galerkin). High proficiency in programming (C, C++, Fortran or Python) is also a must.

Languages :

English at good working level.

Relational skills :

The candidate must be able to work in an international environment involving multiple collaborators, and be willing to travel.

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of partial teleworking and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Rémunération

gross monthly salary : 2788€ (before social security charges and income tax deduction)

Informations générales

- **Thème/Domaine** : Numerical schemes and simulations
Scientific computing (BAP E)
- **Ville** : Talence
- **Centre Inria** : [Centre Inria de l'université de Bordeaux](#)
- **Date de prise de fonction souhaitée** : 2024-07-01
- **Durée de contrat** : 12 months
- **Date limite pour postuler** : 2024-06-27

Contacts

- **Équipe Inria** : [CARDAMOM](#)
- **Recruteur** :
Ricchiuto Mario / Mario.Ricchiuto@inria.fr

A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

L'essentiel pour réussir

The person recruited must be a motivated young researcher, passionate for the development of advanced numerical techniques for hyperbolic PDES, and applications.

The candidate must be willing to look at both theoretical aspects related to the formulation and properties of the methods, as well as their implementation in high performance codes.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

Consignes pour postuler

Please send the following documents :

- CV
- Cover letter
- Support letters (mandatory)
- List of publication

Sécurité défense :

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST).

L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.