2019-01957 - "Numerical modeling of nanophotonic devices using high order finite element type solvers"

Contract type: Fixed-term contract
Renewable contract: Oui
Level of qualifications required: Graduate degree or equivalent
Other valued qualifications: Thèse
Fonction: Temporary scientific engineer
Level of experience: Recently graduated

About the research centre or Inria department

The Inria Sophia Antipolis - Méditerranée center counts 34 research teams as well as 8 support departments. The center's staff (about 500 people including 320 Inria employees) is made up of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrative staff. 1/3 of the staff are civil servants, the others are contractual agents. The majority of the center's research teams are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Four teams are based in Montpellier and two teams are hosted in Bologna in Italy and Athens. The Center is a founding member of Université Côte d'Azur and partner of the I-site MUSE supported by the University of Montpellier.

Context

Nachos is a joint project-team between Inria and the Jean-Alexandre Dieudonné Mathematics Laboratory at University Nice Sophia Antipolis. The team gathers applied mathematicians and computational scientists who are collaboratively undertaking research activities aiming at the design, analysis, development and application of innovative numerical methods for systems of partial differential equations (PDEs) modelling nanoscale light-matter interaction problems. In this context, the team is developing the DIOGENeS [https://diogenes.inria.fr/] software suite, which implements several Discontinuous Galerkin (DG) type methods tailored to the systems of time and frequency-domain Maxwell equations possibly coupled to differential equations modeling the behaviour of propagation media at optical frequencies. DIOGENeS is a unique numerical framework leveraging the capabilities of DG techniques for the simulation of multiscale problems relevant to nanophotonics and nanoelectronics.

Assignment

The main objective of this assignment is to further enhance the capabilities of the DG-type high order finite element solvers developed in the framework of the DIOGENeS software suite, and to demonstrate the benefits of these solvers through the study of realistic use cases pertaining to various applications of a team is now actively collaborating with potential end-users of the DIOGENeS software suite who are raising various modeling issues that need to be addressed prior to simulating such realistic use cases.

Main activities

More precisely, the successful candidate will be assigned two main tasks. On one hand, he/she will develop new methodological functionalities in the various components of the DIOGENeS software suite. These new features are either related to generic core properties of DG-type high order finite element methods for the system of time-domain and frequency-domain Maxwell equations coupled to appropriate differential models of the behaviour of nanoscale materials under optical illumination, or with modeling issues specific to concrete applications. Part of this work will be conducted in close collaboration with Ph.D. and postdoctoral fellows of the team who are currently investigating innovative finite element solvers for the solution of the PDE models relevant to nanophotonics and nanoelectronics. On the other hand, he/she will be in charge of several numerical studies conducted in collaboration with external (academic and industrial) partners of the team, leveraging the DG-type high order finite element solvers of the DIOGENeS software suite.

Skills

Candidates will hold a Master degree or a PhD degree in applied mathematics/scientific computing or computational wave physics or computational photonics.

Required skills:
- Sound knowledge of numerical analysis and development of finite element type methods for computational physics;
- A concrete experience in numerical modeling for computational electromagnetics will be an asset;
- Strong programming skills and exposure to object-oriented model;
- Knowledge and experience of Fortran 95/2000;
- Fluent spoken and written English.

Benefits package

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Remuneration

Gross salary: between 2632€ and 2936€ (depends on the experience)