2018-00244 - Discontinuous Galerkin Boundary Element Method for time-harmonic wave propagation

Contract type : Internship agreement  
Level of qualifications required : Graduate degree or equivalent  
Fonction : Internship Research  
Level of experience : Recently graduated

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.

About the research centre or Inria department
Located at the heart of the main national research and higher education cluster, member of the Université Paris Saclay, a major actor in the French Investments for the Future Programme (Idex, LabEx, IRT, Equipek) and partner of the main establishments present on the plateau, the centre is particularly active in three major areas: data and knowledge; safety, security and reliability; modelling, simulation and optimisation (with priority given to energy).

The 450 researchers and engineers from Inria and its partners who work in the research centre's 31 teams, the 100 research support staff members, the high-level equipment at their disposal (image walls, high-performance computing clusters, sensor networks), and the privileged relationships with prestigious industrial partners, all make Inria Saclay Île-de-France a key research centre in the local landscape and one that is oriented towards Europe and the world.

Assignment
Assignment : 
With the help of Stéphanie Chaillat and Axel Modave, the recruited person will be taken to develop an efficient approach to simulate wave propagation in complex media.

For a better knowledge of the proposed research subject :
A state of the art, bibliography and scientific references are available at the following URL, do not hesitate to log in: [https://uma.ensta-paristech.fr/umaZ/trainings/show.html?id=112](https://uma.ensta-paristech.fr/umaZ/trainings/show.html?id=112)

Collaboration : 
The recruited person will be in connection with the POEMS team.

Main activities
The proposed work is decomposed into the following steps:

- Review the existing DG-BEMs for the time-harmonic wave equation, and compare with classical BEM strategies.
- Implement and validate a DG-BEM from scratch in a Matlab code. Analyse and compare the accuracy by using others BEM codes developed in the POEMS team. High-order elements will be investigated.
- Depending on the interests of the candidate :
  - Extension to elastic waves;
  - Investigating the combination with modern algebraic techniques (such as H-matrices) and optimizing the procedure for parallel computing.

The new method could be implemented in a code developed in the team.
Skills
3rd-year engineer student in applied mathematics or mechanics. Solid backgrounds in applied mathematics and scientific programming skills are expected.

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