PhD Position in Kratos Multiphysics Group (VAC-2021-34)

Title of the PhD project: Reduced Order Modelling techniques for compressible flow Finite Element models

INTRODUCTION:

The International Centre for Numerical Methods in Engineering (CIMNE, www.cimne.com) is a research centre, created in 1987 by consortium between the Catalan Government and the Universitat Politècnica de Catalunya (UPC-BarcelonaTech), devoted to the development and application of numerical methods to a wide range of areas in engineering. CIMNE has been selected as a Severo Ochoa Centre of Excellence for the period 2019-2023, the highest level of recognition of excellence and leadership awarded to a research centre in Spain.

POSITION DETAILS

Number of vacancies: 1
Category: PhD (PHD2)
Location: Barcelona
Yearly salary (gross): 17.563,14 EUR
Working hours: Full time
Duration: 3 years
Starting date: No later than Sept 2021

FUNCTIONS TO BE DEVELOPED BY THE APPLICANT

CIMNE is looking for a **PhD Researcher** to be part of the Research and Technical Development (RTD) Group Kratos Multiphysics.

The functions assigned to the candidate will be:

- Complete a PhD on “Análisis Estructural” at Universitat Politècnica de Catalunya – Barcelona Tech. The candidate is expected to complete the PhD thesis in a maximum of three years.
- Collaborate with various research groups within CIMNE and worldwide.
- To publish a minimum of two papers in JCR journals during the PhD period, author and co-author articles in high-impact international journals.
- Carry out quality research, training and management.
- Participate on the dissemination and outreach activities associated with the project.
- Participate in international conferences presenting her/his work.

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DESCRIPTION OF THE PHD PROJECT:

While a large body of applications can be tackled by the use of incompressible CFD, a large number of situations requires the adoption of compressible approaches.

The proposed research will explore the application of FEM for the simulation of compressible flows with the specific goal of targeting optimization-type applications.

To this end the research will focus on the development of a range of models with different level of fidelity, ranging from resolved models such as full Navier Stokes, Euler or full-potential models to arrive to the development of fast surrogates to be developed by the use of Projection-Based Reduced Order Models.

The newly developed capabilities will be applied both in the context of aerospace, where the candidate will tackle the benchmark test cases to be proposed in the NextSim project to applications in manufacturing.

A specific requirement of the developments will be also to guarantee the integration with Machine Learning models (for example TensorFlow) so that the models can be eventually coupled with Artificial Intelligence frameworks, for example in the context of the eFlows4HPC project.

References

Davari, M., Rossi, R., Dadvand, P. et al. A cut finite element method for the solution of the full-potential equation with an embedded wake. Comput. Mech. 63, 821–833 (2019). https://doi.org/10.1007/s00466-018-1624-3

K. Kamran, R. Rossi, E. Oñate, S.R. Idelsohn, A compressible Lagrangian framework for the simulation of the underwater implosion of large air bubbles, Comput. Methods Appl. Mech. Engrg., Volume 255, 2013, Pages 210-225,ISSN 0045-7825, https://doi.org/10.1016/j.cma.2012.11.018.

Bayona Roa, C.A., Baiges, J. and Codina, R. (2016), Variational multi-scale finite element approximation of the compressible Navier-Stokes equations, International Journal of Numerical Methods for Heat & Fluid Flow, Vol. 26 No. 3/4, pp. 1240-1271, https://doi.org/10.1108/HFF-11-2015-0483.

REQUIREMENTS

1. Aerospace engineering/mechanical with solid background in numerical methods
2. Previous expertise in CFD
3. Knowledge of Python/C++ programming
4. Previous experience with Kratos
5. Fluent writing/speaking in English and Spanish languages

EVALUATION OF CANDIDATES

The requirements and merits will be evaluated with a maximum mark of 100 points. Such maximum mark will be obtained by adding up the points obtained in the following items:

- Academic record (60%)
- Previous research and academic experience in the field of the position (10%)
- Programming skills (20%)
- Language skills (10%)

HOW TO APPLY

Candidates must complete the "Application Form" form on our website, indicating the reference of the vacancy and attaching the following documents **in English**:

- Curriculum vitae
- A motivation letter
- Academic transcripts from all Undergraduate and MSc degrees
- Name and institutional contact information of two possible referees

The deadline for registration to the offer ends on 31st May, 2021 at 12 noon.

The shortlisted candidates may be called for an interview. They may also be required to provide further supporting documentation.

CIMNE is an equal opportunity employer committed to diversity and inclusion. We are pleased to consider all qualified applicants for employment without regard to race, colour, religion, sex, sexual orientation, gender identity, national origin, age, disability or any other basis protected by applicable state or local law. CIMNE has been awarded the HRS4R label.

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