

PhD Position in Structural Mechanics Group: “Development of fast time integration schemes for particle-based and finite element procedures in computational mechanics” (VAC-2021-20)

Title of the PhD project: Development of fast time integration schemes for particle-based and finite element procedures in computational mechanics

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 on Structural Mechanics.

The functions assigned to the candidate will be:

- Complete a PhD on Civil Engineering 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.

DESCRIPTION OF THE PHD PROJECT:

The project aims to develop new time integration schemes that allow the fast solution of complex transient problems in computational mechanics using particle-based methods (such as DEM and PFEM) and finite element methods. Both linear and nonlinear problems will be considered. We will investigate the potential of enhanced explicit dynamic schemes based on partitioned mass and damping procedures, mass tailoring methods, selective mass scaling techniques and finite increment calculus procedures, among others. The use of fast iterative solvers for implicit integration schemes and the combination of new explicit and implicit schemes will be also investigated.

The project will contribute to the research activities in the CP related to the fast computation of complex problems for predictive territory management, and other engineering problems where fast computing is needed.

References

Lars Olovsson, Kjell Simonsson and Mattias Unosson, Selective mass scaling for explicit finite element analyses, *Int. J. Numer. Meth. Engng* 63:1436–1445, 2005

JA González, KC Park, Large-step explicit time integration via mass matrix tailoring, *International Journal for Numerical Methods in Engineering* 121 (8), 1647-1664, 2020

REQUIREMENTS

1. MSc level in Engineering, Mathematics or Physics
2. A good command of English
3. Good programming skills
4. An enthusiastic attitude to conduct research, being hard-working and critic

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 (20%)
- Programming skills (10%)
- 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 23rd April, 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.