

Liège, November 15, 2019

Job Announcement

Reference: ESR2-THREAD-ULiege

The University of Liège offers the following PhD position, starting from 1 March 2020 and limited for 36 months:

Early stage researcher (THREAD ESR 2)

on the Marie Curie ITN funded project

“Local frame methods for the simulation of textile manufacturing processes”
(full-time employment).

The position is offered within the EU Marie-Skłodowska-Curie Innovative Training Networks in the project *“Joint Training on Numerical Modelling of Highly Flexible Structures for Industrial Applications [THREAD]”*. The salary of the Marie-Skłodowska-Curie Innovative Training Networks Fellowship (MSCA-ITN) follows the regulations set by the European Commission. The salary will include social security and will be composed of living, mobility and family allowances, where applicable, as outlined in the Grant Agreement and Horizon 2020 Marie-Skłodowska-Curie Actions Work Programme, please see here:

http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-msca_en.pdf

Background

THREAD addresses the mechanical modelling, mathematical formulations and numerical methods for highly flexible slender structures like yarns, cables, hoses or ropes that are essential parts of high-performance engineering systems. The complex response of such structures in real operational conditions is far beyond the capabilities of current virtual prototyping tools. With 14 new PhD positions at 12 universities and research institutions in Austria, Belgium, Croatia, France, Germany, Norway, Slovenia and Spain, the project brings mechanical engineers and mathematicians together around major challenges in industrial applications and simulation software development. It establishes an innovative modelling chain starting from detailed 3D modelling and experimental work to build validated 1D nonlinear rod models, which are then brought to a system-level simulation thanks to the outstanding numerical properties of the developed algorithms. This holistic approach combines advanced concepts in experimental and theoretical structural mechanics, non-smooth dynamics, computational geometry, discretisation methods and geometric numerical integration and will enable the next generation of virtual prototyping.

The current Early Stage Researcher PhD project (ESR) on numerical methods for the simulation of textile manufacturing processes will be supervised by Prof. Olivier Brüls (University of Liège, Belgium). The workplace will be the Multibody and Mechatronic Systems Laboratory within the Department of Aerospace and Mechanical Engineering of the University of Liège (www.ltas-mms.ulg.ac.be), which is specialized in flexible multibody dynamics, mechatronics, numerical simulation, control and optimisation methods.

Requirements

- MSc in Mechanical Engineering, Aerospace Engineering, Computational Engineering, Computational Physics or related fields is preferred (all backgrounds are welcome to apply).

- Experience in numerical software development is highly desirable.
- Experience in modelling methods in mechanics and dynamics is desirable.
- High standard of spoken and written English.
- Qualification as an “Early Stage Researcher”, i.e. at the time of appointment no PhD and less than 4 years of research experience (full-time equivalent) after obtaining a degree that formally allows you to embark for a PhD.
- Mobility requirement: at the time of appointment an “Early Stage Researcher” must not have resided or carried out their main activity in Belgium for more than 12 months in the 3 years immediately prior to their appointment.
- For more details please see here: <https://thread-etn.eu>

Tasks

The ESR will develop and analyze local frame methods for the simulation of textile manufacturing processes. He/she will establish a finite element formulation for cables and rods with contact based on the local frame approach. The work will include the modelling of continuous 1D yarn and cable structures with geometric nonlinearities, the representation of contact conditions based on the non-smooth contact dynamics approach, numerical discretisation methods in space and time using Lie group interpolation and efficient solution algorithms for non-smooth flexible multibody systems on Lie groups.

Besides theoretical investigations, the method will be implemented in the finite element simulation code Oofelie and will be applied to model the textile braiding process. The simulation should allow to predict the influence of some key parameters of the braiding machine on the final product layout. This ESR will also benefit from close interactions with ESR3 for the development of the modelling and simulation tool.

The ESR will join THREAD’s comprehensive secondment programme including a 3-months internship at the industrial partner GDTEch in Liège (Belgium) supervised by Dr. Michael Bruyneel in order to receive training on simulation techniques in the industry, develop numerical methods in Oofelie, and validate the software implementation; a 3-months internship at the research center Centexbel in Liège (Belgium) for the study of the braiding process and the definition of the numerical test case; a 1-month internship to Prof. Sigrid Leyendecker at the Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany) to learn about the discrete mechanics of beams; and a 2-months internship to Prof. Martin Arnold at the Martin-Luther-University Halle-Wittenberg (Germany) to study mathematical and numerical methods in non-smooth contact dynamics.

The recruitment procedure will guarantee a fair and equal treatment of all applications. Mobility requirements as outlined above are mandatory. All requirements will be evaluated prior to appointment.

Please submit your full application dossier only in English until **15 January 2020**. Applications must be submitted on the website <https://thread-etn.eu>. Applications must include a motivation letter tailored to the research project, the curriculum vitae (in Europass format), the digital copy of the highest academic degree (e.g. master) and the recommendation letters from two scientific references. For queries about the research project please contact Prof. Olivier Brûls, Email: o.bruls@uliege.be. For queries about the European Training Network THREAD, please contact the project coordinator at coordination@thread-etn.eu.

The position is offered with reservation of possible budgetary restrictions. Application portfolios will not be returned, application costs will not be reimbursed.