Liège, November 15, 2019

Job Announcement
Reference: ESR3-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 3)

on the Marie Curie ITN funded project
"Mesoscopic modelling and simulation of wiring harnesses"
(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 open-source 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 mesoscopic modelling of wire bundles 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 aim of this work is to develop a simulation code to study and understand the mechanical behavior of multi-filament cables and multi-wired harnesses on the mesoscopic level. The simulation should capture the frictional contact interactions between the filaments and wires so as to reproduce and predict experimental results. It should serve to identify constitutive laws for 1D macroscopic models.

The modelling of wire bundles will be based on non-smooth contact dynamics formulations. The simulation tool will combine an open-source advanced contact solver available at INRIA with an open-source rod formulation to be developed by the ESR. Its ability to solve complex contact problems involving many highly flexible rods will be assessed in terms of robustness and efficiency. The ESR will benefit from close interactions with ESR2 for the development of the modelling and simulation tool and with ESR11 for the experimental validation.

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 and validate the software implementation; a 3-months internship at INRIA Grenoble (France) supervised by Dr. Florence Bertails-Descoubes to couple rod formulation with non-smooth contact solvers; a 1-month internship at Central Supélec in Paris (France) supervised by Dr. Damien Durville for comparison with penalty methods; and a 2-months internship at the Fraunhofer Institute ITWM in Kaiserslautern (Germany) supervised by Dr. Joachim Linn for comparison between experimental tests and virtual experiments for equivalent constitutive laws.

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 Brüls, 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.