External Job Announcement, Reference Nr. 5-15018/19-D

The Martin Luther University Halle-Wittenberg offers the following position, starting from 1 April 2020 and limited for 36 months:

Early stage researcher (THREAD ESR 1) (m-f-d) on the Marie Curie ITN funded project

"A robust and efficient Lie group solver for Cosserat rod models with internal and external constraints" (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 solvers for Cosserat rod models will be supervised by Prof. Martin Arnold (Martin Luther University Halle-Wittenberg). The ESR will develop numerically stable and structure preserving coarse-grid discretisations in space and time for Cosserat rod models. The workplace will be in the Numerical mathematics group at the Institute of Mathematics that is specialised on the numerical solution of time-dependent coupled and constrained systems of differential equations, on model-based simulation and on numerical methods and scientific software for industrial computer aided engineering processes (https://sim.mathematik.uni-halle.de/arnold/index_english.html).

Requirements:
- MSc in Mathematics, Computer Science, Computational physics, Computational engineering or related fields is preferred (all backgrounds are welcome to apply).
- Experience in numerical software development is highly desirable.
- Experience in mathematical modelling with differential equations is desirable.
- High standard of spoken and written English.

- Qualification as an „Early Stage Researcher", i.e. at the time of appointment no doctoral degree and less than 4 years of research experience (full-time equivalent) after obtaining a degree that formally allows you to embark for a doctorate.
- Mobility requirement: at the time of appointment an "Early Stage Researcher" must not have resided or carried out their main activity in Germany for more than 12 months in the 3 years immediately prior to their appointment.
- For more details please see here: https://thread-etn.eu/apply/

Tasks:
Novel time integration methods for Cosserat rod models are developed and analysed theoretically following the variational integration framework. The methods are implemented practically in an open-source, error-controlled variable step size Lie group integrator for flexible mechanical systems. This solver shall allow to combine advanced modelling features like nonlinearities, complex constitutive laws or contact conditions with a reliable, robust and efficient system simulation.
The ESR will join THREAD's comprehensive secondment programme including a three-month internship at the industrial partner fleXstructures GmbH, Kaiserslautern, Germany and one-month secondments to Dr. Joachim Linn at Fraunhofer ITWM (Kaiserslautern, Germany) to learn more about highly flexible slender structures in system simulation, to Prof. Olivier Brüls at the University of Liège (Belgium) to get knowledge on non-smooth dynamics and to Prof. Johannes Gerstmayr at the University of Innsbruck (Austria) for developing open-source software for time integration.
Severely disabled persons are encouraged to apply and will be given preference in the case of equal suitability. Women are strongly urged to apply. 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/apply/. Applications must include a motivation letter tailored to the research project, the curriculum vitae (Europass format preferred), the digital copy of the highest academic degree (e.g. master) and the contact data of up to three scientific references. For queries about the research project please contact Prof. Martin Arnold, Email: martin.arnold@mathematik.uni-halle.de. 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.