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A position is offered at University of Rijeka, Faculty of Civil Engineering, starting from 1 April 2020 and limited for 36 months for

Early stage researcher (THREAD ESR 9)

on the Marie Curie ITN funded project
"Stable long-term numerical integration of the Cosserat rod problem in large overall motion"
(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 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 non-linear numerical modelling of motion of 3D beams will be supervised by Prof. Gordan Jelenić (University of Rijeka) in the course of the doctoral study programme at the Faculty of Civil Engineering. The ESR will develop numerically stable and efficient procedures for static and dynamic analysis of 3D beams in large overall motion with possible presence of unilateral constraints. The workplace will be in the Chair of Engineering Mechanics at the Faculty of Civil Engineering, with a research portfolio including theoretical, numerical and experimental analysis of Cosserat continua, plates and shells, layered structures and damage, and non-smooth contact dynamics. The ESR will be a member of the team working on non-linear finite-element 3D beam development.

Requirements:

- Master Degree in Engineering, Mathematics, Physics or related fields.
- Minimum average grade on the previous study level of 3.0 on the national scale between 1 (lowest) and 5 (highest), equivalent to 67.5% (transcript of records required).
- Experience in finite-element design and analysis is highly desirable.
- Experience in numerical simulation in dynamics and software development 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 four 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 Republic of Croatia 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:

The ESR will work on mechanical analysis of satellite aerials during the rocket-launch phase, when they are exposed to extreme inertial loading and high-frequency vibration and impacts in a compact confinement within a rocket. The design requirement is that the satellite should occupy as little space within the rocket as possible, yet still be able to allow the aerials to deploy without permanent deformation or damage upon satellite ejection from the rocket into the orbit. Various finite-element interpolation options for 3D beams will be investigated for accuracy and robustness. A number of time-stepping schemes will be devised, which shall respect geometry of the problem configuration space and preserve mechanical constants of motion and allow for generalisation in the presence of unilateral constraints. The project is expected to result in higher-order spatial interpolation of displacements and rotations parametrised to provide objective solutions on the non-linear problem manifold.

The ESR will join THREAD's comprehensive secondment programme including a three-month internship to Prof. Tomaž Rodič at the Slovenian Centre of Excellence in Space Technologies *Space SI* (Ljubljana,

Slovenia) to understand the challenges in designing satellite appendages and two one-month secondments, one to Prof. Johannes Gerstmayr at University of Innsbruck (Austria) to learn more about modelling flexible beams in the presence of unilateral constraints and the other to Prof. Olivier Brüls at the University of Liège (Belgium) to learn more about deployable structures.

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 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. Gordan Jelenić on e-mail gordan.jelenic@uniri.hr. 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.