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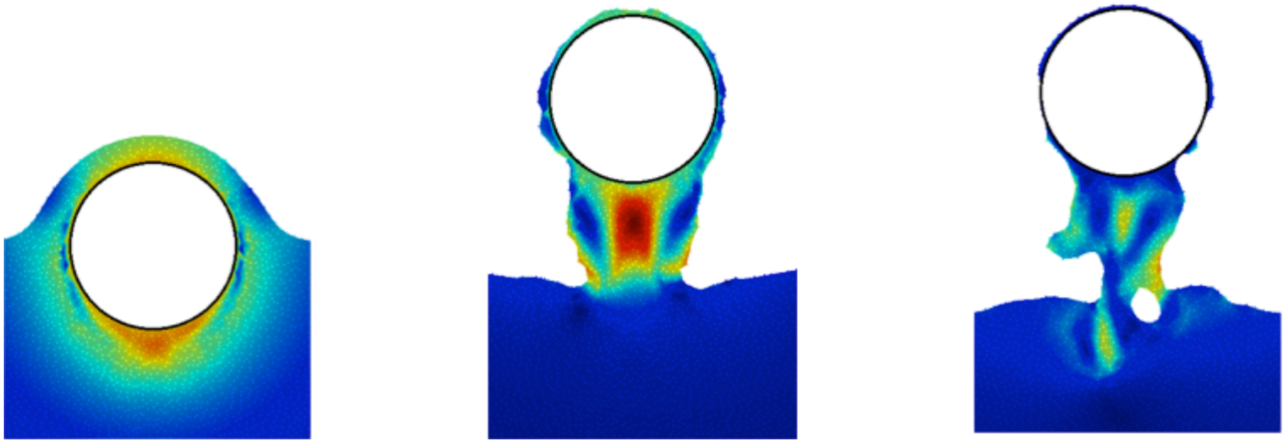
Post-Doctoral Fellow

Extension of the Particle – Finite Element Method (PFEM) for the simulation of liquid entrainment and coating process

The Aerospace & Mechanical Engineering (A&M) research unit at the **University of Liège** is seeking to recruit a postdoctoral fellow to join the teams of Profs. V. Terrapon and J.-P. Ponthot, for further developing an existing in-house solver based on the Particle-Finite Element Method (PFEM).

Context

The research will be carried out in the context of the project WOLFLOW (Wrapping Objects with Liquid Flows by Lifting them Out of their Wake) funded by the Belgian F.R.S.-FNRS (Fonds de la Recherche Scientifique). When an object is pulled out of a pool of fluid, it entrains a certain quantity of fluid that eventually drains down. The crossing of an object through a fluid-fluid interface is of particular importance, not only from a fundamental point of view, but also for many applications that imply coating processes. This project thus aims to build the bridge between the motion of the object in the fluid and the drainage mechanism when the object is out of the fluid. Its originality lies in the integrated analysis of the three steps of the process, i.e., the crossing of the interface, the liquid entrainment, and the film drainage along the object, which are all transient phenomena. Each of these steps is related to fundamental questions that must be addressed in order to unravel the whole process.



It is envisioned to analyze the dynamics of the flow and quantify liquid entrainment through simulations and compare the results with experimental measurements. Such simulations will be performed with an in-house solver based on the Particle-Finite Element Method (PFEM). The solver is currently limited to two-dimensional cases and its capabilities need thus to be extended to 3D.

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Main duties and responsibilities

The main task of the candidate will be to further develop the existing PFEM solver. This includes:

- extending the solver to treat three-dimensional cases,
- parallelizing the solver to efficiently run on distributed-memory computing architectures,
- developing an adaptive mesh refinement algorithm.

Additionally, physical models could be implemented, including turbulence models and modified boundary conditions for modeling the effect of surfactants.

The candidate will then use the solver to simulate different cases, compare the results with experimental data that will be obtained within the project, and analyze the physics of the process. Results will also be used as input for draining models that will be developed by another team within the project. The candidate will thus have to frequently interact and closely work with the two other collaborating teams (Benoît Scheid at the Université Libre de Bruxelles, and Stéphane Dorbolo at the University of Liège).

Appointment

Financial support is available for a post-doctoral position during **2 years**, starting immediately. The candidate must be in a situation of **international mobility**, i.e., may not have resided, studied or worked in Belgium during more than 24 months during the last 3 years preceding the initiation of the grant.

Profile

The candidate should have a PhD in Mechanical Engineering or equivalent and a strong background in C/C++ programming and in parallel computing. Additionally, she/he should be familiar with the Finite Element Method. Experience with PFEM and fluid mechanics would also be very beneficial. Finally, proficiency in written and spoken English is mandatory.

Application

Please send a motivation letter, your CV and 2 references to **vincent.terrapon@uliege.be**