Complex Fluid Flows in Engineering: Modeling, Simulation and Optimization

Fabian Key*, Marek Behr† and Stefanie Elgeti*,†

* Institute of Lightweight Design and Structural Biomechanics (ILSB)
TU Wien
1040 Vienna, Austria
e-mail: {key,elgeti}@ilsb.tuwien.ac.at, web page: https://www.ilsb.tuwien.ac.at/

† Chair for Computational Analysis of Technical Systems (CATS)
Center for Simulation and Data Science (JARA-CSD)
RWTH Aachen University
52056 Aachen, Germany
e-mail: {behr,elgeti}@cats.rwth-aachen.de web page: https://www.cats.rwth-aachen.de/

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ABSTRACT

The design process in engineering applications is currently experiencing a change in paradigm away from experience-based design to numerical design. In many such engineering applications, flows of complex fluids are encountered; posing the challenge of understanding, describing, computing, and controlling these flows. In this spirit, this minisymposium aims at providing a forum for questions concerning both numerical and optimization methods specific to fluid flow. On the modelling-side it covers the issues related to complex, non-Newtonian flow phenomena, such as choice of model or appropriate stabilization. Furthermore, in the area of simulation, novel numerical methods, ranging from discretization methods to both free-boundary problems and deforming domain problems, are considered. In all cases, the flow solution may serve as the forward solution of a shape optimization problem. To this end, this minisymposium will cover novel techniques for the shape representation as well as new methods for an efficient evaluation of the design.

Topics of this minisymposium include, but are not limited to:

- Non-Newtonian fluid models describing shear-thinning or viscoelastic properties.
- Simulation methods including stabilization schemes, interface capturing, and interface tracking.
- Methods related to shape optimization in fluid flow, in particular geometry representation, reduced order models, and development of objective functions.
- Methods particular to specific applications.