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**Shape Optimization for Drag Reduction in Linked Bodies using Evolution Strategies and the Hybrid Wavelet Collocation - Brinkman Penalization Method** OLEG V. VASILYEV, University of Colorado at Boulder, MATTIA GAZZOLA, PETROS KOUMOUTSAKOS, Swiss Federal Institute of Technology Zurich, Switzerland — In this talk we discuss preliminary results for the use of hybrid wavelet collocation - Brinkman penalization approach for shape optimization for drag reduction in flows past linked bodies. This optimization relies on Adaptive Wavelet Collocation Method along with the Brinkman penalization technique and the Covariance Matrix Adaptation Evolution Strategy (CMA-ES). Adaptive wavelet collocation method tackles the problem of efficiently resolving a fluid flow on a dynamically adaptive computational grid, while a level set approach is used to describe the body shape and the Brinkman volume penalization allows for an easy variation of flow geometry without requiring body-fitted meshes. We perform 2D simulations of linked bodies in order to investigate whether flat geometries are optimal for drag reduction. In order to accelerate the costly cost function evaluations we exploit the inherent parallelism of ES and we extend the CMA-ES implementation to a multi-host framework. This framework allows for an easy distribution of the cost function evaluations across several parallel architectures and it is not limited to only one computing facility. The resulting optimal shapes are geometrically consistent with the shapes that have been obtained in the pioneering wind tunnel experiments for drag reduction using Evolution Strategies by Ingo Rechenberg.

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