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FSI simulation and analysis of flapping of flexible filaments in a flow

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This paper presents a fluid-structure interaction modelling, simulation and analysis of the flow-induced flapping of flexible filaments in a flow.

The simulation and analysis focus on the experiments performed by Zhang and co-workers [1], where dynamically stable states of flexible filaments in a flowing soap film is studied as a model for one-dimensional flags in a two-dimensional wind. In past presentations, we have shown the simulation of lowered Reynolds number flow than the Zhang's experiment. At this time, we will show that of actual Reynolds number. The order of the Reynolds number is 10^4-10^5.

The computational technique is based on an interface-capturing finite element method published in Ref.[2] and [3]. The fluid and structure domains are described in Eulerian and Lagrangian coordinates, respectively. They are coupled via the Lagrangian Lagrange-multiplier method at the FSI interface. Fluid elements across the interface are enriched by the extended finite element method so that they can reproduce the C1 discontinuity of velocity and the C0 discontinuity of pressure.

REFERENCES

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