LadHyX Seminar – September 29, 10:45, – LadHyX Library

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Coordinated motion of active filaments on spherical surfaces

Filaments (slender, microscopic elastic bodies) are prevalent in biological and industrial settings. In the biological case, filaments are often active, in that they are driven internally by motor proteins, with prime examples being cilia and flagella. For cilia in particular, which can appear in dense arrays, their resulting motions are coupled through the surrounding fluid, as well as through the surfaces to which they are attached. In this talk, I present numerical simulations exploring the coordinated motion of active filaments and how it depends on the driving force, density of filaments, as well as the attached surface. In particular, we find that the surface topology can introduce local defects in coordinated motion which can then feedback and alter the global state. This is particularly true when the surface is not held fixed and is free to move in the surrounding fluid. I will also provide an overview of the computational framework we use to simulate this system that combines unit quaternions, implicit geometric time integration, and quasi-Newton methods.