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Steerable filters as a tool to determine the orientation of fibers in flowing suspensions ALLAN CARLSSON, FREDRIK LUNDELL, KTH Mechanics, L. DANIEL SÖDERBERG, STFI-Packforsk AB — Fiber suspension flows are found in industrial applications such as paper manufacturing and polymer processing. In order to experimentally study fiber motions in such suspensions it is essential to be able to determine the position and orientation of fibers as a function of time. One method to extract this information from captured images is to use image filtering. The image filtering is based on computing convolutions of the images with a filter matrix that resembles a fiber. Steerable filters represent a class of filters where an arbitrary orientation of the filter can be obtained from a linear combination of a limited set of basis filters. Since the basis filters are not orientation dependent this makes it possible to eliminate the orientation dependency from the convolutions. Here a specific steerable filter is evaluated for functionality of finding the position and orientation of fibers in a flowing suspension. Through application of the filter on artificially generated test images with known fiber orientation it is possible to show that the error is less than 1 degree. A good agreement is also found when comparing the orientation distribution with a robust, but computationally more expensive, method on a real flow case where fibers are suspended in a shear flow.

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