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Measurement of the Persistence Length of Cytoskeletal Filaments using Curvature Distributions PATTIPONG WISANPITAYAKORN, Department of Physics, Worcester Polytechnic Institute, Worcester, MA, KEITH J. MICKOLAJCZYK, WILLIAM O. HANCOCK, Department of Biomedical Engineering, Pennsylvania State University, University Park, PA, LUIS VIDALI, Department of Biology and Biotechnology, Worcester Polytechnic Institute, Worcester, MA, ERKAN TUZEL, Department of Physics, Worcester Polytechnic Institute, Worcester, MA — Cytoskeletal filaments such as microtubules and actin filaments play important roles in mechanical signal transduction allowing cells to respond to their environment. Measuring the mechanical properties of cytoskeletal structures is crucial for gaining insight into intracellular mechanical stresses and cellular processes. One of the ways to characterize such bio-filaments is by measuring their persistence length. Here, we show how curvature distributions can be used as a tool to quantify bio-filament deformations, and investigate how the apparent stiffness of filaments depends on the resolution and noise of the imaging system. We present analytical calculations of the scaling curvature distributions as a function of filament discretization, and test our predictions by comparing Monte Carlo simulations to results from Fourier and tangent correlation analysis. We also apply our approach to microtubules and actin filaments obtained from *in vitro* gliding assay experiments with high densities of non-functional motors. Finally, we provide an ImageJ Plugin for users to measure the persistence length of bio-filaments from *in vivo* or *in vitro* fluorescence microscopy images.

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