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Orthogonal Tracking Microscopy for Nanofabrication Research MATTHEW MCMAHON, ANDREW BERGLUND, PETER CARMICHAEL, JABEZ MCCLELLAND, J. ALEXANDER LIDDLE, National Institute of Standards and Technology — Constructing 2D lateral particle trajectories from digital video sequences of nanoparticle motion in a liquid is straightforward and fairly common, requiring only the use of centroid-finding algorithms. On the other hand, extracting particle trajectories in the third (out-of-plane) dimension has been more difficult, requiring detailed calibration of the radius of the defocused diffracted rings which result from vertical fluctuations of particle position. We introduce a new technique, termed orthogonal tracking microscopy or orthogonal projection microscopy, in which integrated micromirrors produce one or more reflected images of a particle within the same field of view as the direct image. The reflected images project vertical motion into lateral motion. Thus, we are able to construct a fully 3D particle trajectory from 2D digital video using only centroid-finding algorithms. We use this technique to study particle-surface interactions relevant to directed assembly of nanoparticles.

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