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Feedback-enhanced Microrheology HEEV AYADE, MARCEL BREMERICH, HIROSHI ARIMATSU, DAISUKE MIZUNO, Kyushu University — An essential feature of the cytoskeleton is their ability to perform variety of mechanical functions in cells. The active force generation by molecular motors keeps the living cytoskeletons far from equilibrium that makes the understanding of cell mechanics and behaviors particularly challenging. Here, we have investigated the non-equilibrium mechanical properties of cells using optical trapping based microrheology, which tracks the motion of phagocytosed probe particles with high spatial and temporal resolution than video tracking microrheology. In order to perform high resolution measurement in cells or active soft materials, the active fluctuations of the beads have to be compensated for in order to keep the bead stably in a highly focused beam spot. We achieve this by implementing a PID-controlled feedback mechanism to reposition the sample chamber with a 3D-piezo stage, for large-scale but slow motions of the probes. The stage motion is recorded as piezo-control, and the motion of the probe from the laser focus is provided as the quadrant photodiode output. Sum of those signals reconstitutes the complete bead trajectory. The method reported here is robust in accessing thermal and athermal fluctuations in active systems.

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