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3D Particle Tracking in Turbulent Flows using Real-time Image Compression DANIEL BLUM, KING-YEUNG CHAN, EMMALEE RIEGLER, RACHEL BROWN, GREG A. VOTH, Wesleyan University — We measure 3D trajectories of particles advected in a turbulent flow between two oscillating grids in order to extract multi-particle Lagrangian trajectories. Images of the particles are captured using high speed cameras (1024 x 1280 pixels at 500Hz and faster at lower spatial resolution) arranged stereoscopically. The video stream is then processed by novel real-time compression hardware. The filtering circuit in the compression hardware outputs the position and brightness data of pixels above a brightness threshold. The compression factor dynamically varies from 100 to 1000 depending on the number of bright pixels. The resulting data rate is low enough that it can be recorded directly to hard drive, which allows data acquisition times that were previously limited to 10 seconds to be extended to several days. We report preliminary measurements characterizing the nearly homogeneous turbulence in a 1m x 1m x 1.5m flow between oscillating grids.

Daniel Blum
Wesleyan University

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