Apr 9th, 2:35 PM - 3:35 PM

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Poster Presentation P52

PARTICLE TRACKING AND AOD CONTROL

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My project is two-fold: to implement LabVIEW–based software control the digital I/O cards controlling two Acousto-Optic Deflectors (AOD) and to implement computer vision software for automated tracking of two microparticles and their proximity to each other. The AODs role in this project is to quickly switch the laser between two points and thus trap two microparticles with just one laser beam. The particles have no reason to move quickly because the only outside force on them is Brownian motion, due to the random thermal movement of water molecules. The goal of my AOD-control program was to quickly (under 1ms) switch from one trap to another and back again, while also equilibrating the power delivered to each trap. The basic control task has now been accomplished, by using a while loop to reiterate quickly, allowing rapid switching between the two different inputs, by using data acquisition (DAQ) sub-virtual instruments (subVIs) built into LabVIEW. As for particle tracking, we have begun use of a program developed by one of our collaborators that is quite advanced: bit-map frames captured during video microscopy are analyzed as an image sequence to identify and locate the particles in each frame. As a prequel, we have used additional software to convert raw video from the microscope to avi video, and finally to a bitmap image sequence. Also, I modified the particle-tracking program to display displacement, rather than speed. At this point, I am able to optically two microparticles, at controlled separations, and then, as the traps "blink" off, track their displacements, so as to build up Boltzmann statistics relevant to the particle-particle interactions.