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Creating a Simple Open Source Matlab Program Used to Control Adaptive Optics

Evan Baker  
*Illinois Wesleyan University*

Carl Mueller  
*Illinois Wesleyan University*

Patrick Dahl  
*Illinois Wesleyan University*

Nathanial Wolanyk  
*Illinois Wesleyan University*

Gabriel Spalding, Faculty Advisor  
*Illinois Wesleyan University*

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CREATING A SIMPLE OPEN SOURCE MATLAB PROGRAM USED TO CONTROL ADAPTIVE OPTICS

Evan Baker, Carl Mueller, Patrick Dahl, Nathaniel Wolanyk and Gabriel Spalding*
Physics Department, Illinois Wesleyan University

Our goal is to contribute to the development of self-assembling structures that will allow for a whole new class of smart materials. To create sophisticated structures of this sort, the goal is to engineer each specific type of microparticle to be included in the mix, so as to constrain the ways in which it can bind to other micro/nano components in solution. Towards this end, we need to measure the interactions between particles at the individual component level. We are developing an optical trapping system that is optimized for this purpose. The use of acousto-optic deflectors (AODs) with digital frequency synthesizers allows, in theory, very precise position control over optical traps. However so as to generate these optical traps at the lowest laser power levels possible (to avoid unintended heating effects) we need to correct for significant optical aberrations introduced by the acoustic deflectors. My talk will explain our progress in correcting for these aberrations, related specifically to the MATLAB code I have developed. The larger goal of this work is to allow us to measure the forces and interactions of these microparticles to pico-Newton resolution (femto-Newton resolution may be possible).