

Meeting: 1003, Atlanta, Georgia, SS 9A, AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates, I

1003-68-1363 **Brian K. Tagiku*** (btagiku@hmc.edu), Department of Mathematics, Harvey Mudd College, 1250 N. Dartmouth Ave., Claremont, CA 91711, and **Michael R Raugh** (raugh@hmc.edu), Department of Mathematics, Harvey Mudd College, 1250 N. Dartmouth Ave., Claremont, CA 91711. *GUI Design for Self-Calibration Techniques on Interferometer Stages*. Preliminary report.

As nanotechnology becomes widely researched, the advancement of high-precision measurement becomes increasingly valuable to research. In particular, the development of self-calibration techniques can enhance the ability to construct lighter and stronger products. Professor Michael R. Raugh (Harvey Mudd College, Mathematics) has developed several algorithms for the self-calibration of two-dimensional stage interferometers, machines that have the ability to precisely measure (on the order of nanometers) the coordinates of points on a two-dimensional grid. Self-calibration is necessary in this context because no “gold-standard” two-dimensional grids exist to calibrate these machines. We have developed several graphical user interfaces (GUIs) in MATLAB that enable the testing and simulation of the proposed algorithms on data modeled to reflect errors in real world situations. The GUIs have the ability to simulate data from an uncalibrated interferometer, produce calibrated images of the grid that project the actual coordinates of each gridpoint, and compare and provide statistical information on the calibrated and uncalibrated results. This talk will discuss the motivation behind and the usage of the designed GUIs as well as the results obtained during testing. (Received October 05, 2004)