

Interferometric Characterization of a Bimorph Deformable Mirror

Anglea Haff

Lawrence Livermore National Laboratories, University of California, Davis
Research Advisor: Jack Werner
Research Supervisor: Dave Horsley
Home Institution: Sacramento Community College

In the field of vision science attempts are being made to obtain images of the living human retina at the cellular scale. To obtain pictures with sufficient resolution to be useful, the wavefront aberrations must be corrected, and the new image sent to a camera. Microelectromechanical systems (MEMS) may be useful in vision science for their ability to correct wavefront aberrations in an adaptive optics system. The purpose of this research was to characterize a bimorph mirror for possible use in vision science using a Twyman-Green interferometer.

Before the bimorph mirror could be characterized, the fringe resolution of the interferometer must be determined so that we know the limits of the deformation of the mirror that can be measured. This is obtained by inducing a tilt on a test surface until the fringe pattern is no longer sinusoidal. A relationship between input optical intensity and laser power will be tested using a Gaussian model. The laser wavelength will be determined by measuring the step distance required to shift phase by 180 degrees.

A Zygo interferometer will be used for reference measurements, and then compared to measurements of MEMS taken by our interferometer. Interferograms will be taken and a program written by Dr. Dave Horsely will generate surface maps. By creating surface maps of test surfaces of known curvatures such as lenses it can be determined how efficiently the interferograms are being converted into surface maps. Ideally we would like to be able to recreate all of the Zernike modes of optical aberrations to predict corrections that would be possible in an adaptive optics system.

Angela Haff is a third year student at Sacramento Community College, majoring in Electrical Engineering. She has been accepted to UC Davis for the fall quarter 2004, and is very excited about attending. She started school at Woodland Community College in 2000, and has been working non-stop towards her goal ever since. This internship was a major stepping stone for Angela because she has been able to get some hands on experience with scientific work. In addition, she was able to become familiar with the UC Davis campus and staff before she begins classes in the fall.

