

Type of communication: Oral

Submitted by: FERNANDEZ, Enrique-Josua
University of Murcia
enriquej@um.es

Binocular vision tested with adaptive optics

Enrique Josua Fernández

Adaptive optics (AO) is a technique allowing the manipulation of wavefronts, including pure correction, so that generation of any aberration can be accomplished. AO have been initially developed in the field of Vision Sciences for monocular applications. Very recently, AO has been successfully implemented for binocular vision [1]. Displays capable for three-dimensional (3-D) vision are currently experiencing a renewed commercial interest. In this context many aspects remain poorly understood, especially those pertaining the impact of aberrations on 3-D vision. In particular, the possible degradation in presence of aberrations distinct of defocus of some visual functions associated to binocular vision, such as stereoacuity for instance, are for the first time to be studied [2]. The binocular adaptive optics visual simulator technology permits the study of vision, with simultaneous and independent full control of the aberrations of both eyes. Since vision can be tested through modified phase profiles, then there is an interesting way for studying the performance of any ophthalmic element under realistic conditions. Several examples of the method, together with some recent results obtained with the binocular AO visual simulator will be presented in this work, showing the potential of the technique. First experimental results show a complex relationship between the eye's aberrations and stereopsis. The technique may provide some light on the actual importance of aberrations on 3-D vision, which might have an impact in the design of systems and displays dedicated for stereo-perception of images. In addition, the apparatus can be operated as an adaptive optics binocular phoropter.

[1] Fernández, E. J., Prieto P. M., Artal P. (2009). Binocular adaptive optics visual simulator. *Optics Letters*, 34, 2628 –2630.

[2] Fernández, E. J., Prieto P. M., Artal P. (2010). Adaptive optics binocular visual simulator to study stereopsis in the presence of aberrations. *Journal of the Optical Society of America A*, 7(11), 48-55.