INVITED TALK Monday, November 6, 2005 2PM-3PM

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Image Enhancement for People with Visual Impairment

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Abstract

There are more than 3 millions people with partial sight (low vision) in the USA. Their number is expected to double by the year 2020 and they like to watch television. This talk summarizes over 20 years of experience in developing and evaluating image enhancement approaches for this population. Understanding of normal and impaired visual function should guide the development of such devices and techniques. Each new method requires rigorous evaluation to demonstrate its value. I will argue that devising evaluation procedures is as challenging as devising new vision-enhancing devices or techniques. This is particularly difficult with motion video and for the evaluation of performance rather than preference. Approaches for enhancement developed and tested include contrast enhancement (including adaptive thresholding to create binary high contrast images); bandpass filtering (to enhance a range of spatial frequencies critical for individual patient); wideband enhancement (which consists of superposition of bipolar, visually relevant, edges over the original image); and enhancement within the compression domain of the JPEG/MPEG coding schemes. Applications were developed and tested for television viewing and for enhancement of real-world views using head-mounted displays and cameras.



Speaker Bio-Sketch: Eli Peli is the Moakley Scholar in Aging Eye Research at The Schepens Eye Research Institute, and Professor of Ophthalmology at Harvard Medical School. He is also the director of the Vision Rehabilitation Service at the New England Medical Center Hospitals in Boston. Eli's principal research interests are image processing in relation to visual function and clinical psychophysics in low vision rehabilitation, image understanding and evaluation of display-vision interaction. He is a consultant to many companies in the ophthalmic instrumentation area, manufacturers of head-mounted displays, and to government agencies including the NIH and NASA. Eli is a Fellow of the American Academy of Optometry, the Optical Society of America, and the SID. He has received numerous awards including the Glenn A. Fry Award, the Alfred W. Bressler Prize in Vision Science, a Honorary Master in Medicine Degree from Harvard, and an Honorary Doctor of Science Degree from SUNY. Eli has published

more than 120 refereed journal papers and has been awarded 6 US Patents. He edited a book entitled Visual Models for Target Detection and coauthored a book on driving with low vision.