BIO ENGINEERING SEMINAR

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MMCR, Mechanical Engineering

Neural control of the human eye's auto-focusing response

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Abstract: The auto-focus response of the human eye, technically referred to as ocular accommodation, enables us to achieve and maintain a clear image of the visual environment at several different viewing distances. While our understanding of the biomechanics of accommodation has improved over the past few decades, the neural control of accommodation remains incompletely understood. Through behavioral studies, computational modeling and comparison with existing neurophysiological observations, we have established that accommodative step responses are driven using a combination of pulse and step innervations. The ballistic pulse innervation overcomes the initial visco-elasticity of the accommodative plant and determines the dynamics of step response while the feedback-controlled step innervation maintains the response in its steady-state. Behavioral observations also suggest that the characteristics of pulse and step innervations might change with the onset of presbyopia or with practice, suggesting that the neural control of accommodation does not operate with machine-like properties but they adopt strategies to optimize the characteristics of the step response.

About the speaker:

Dr. Shrikant Bharadwaj completed his undergraduate degree in Optometry from the Elite School of Birla Institute of Technology and Science, Chennai and a PhD in Vision Science from the University of California Berkeley School of Optometry, USA. After completing his post-doctoral training in Vision Science at the Indiana University School of Optometry, USA, Dr. Bharadwaj returned to the L V Prasad Eye Institute (LVPEI) in Hyderabad a DBT Ramalingaswami Fellow in 2009. Dr. Bharadwaj has since then established the Visual Optics research laboratory at LVPEI with the overall agenda of understanding how the optics of the eye influences spatial vision and depth vision. Dr. Bharadwaj uses a combination of experimental, behavioral and computational techniques to address this research agenda. His laboratory actively publishes research work in international peer reviewed vision science journals and the research work is generously supported by extramural grants from the Department of Science and Technology and Department of Bio-Technology and from the optical industry (Abbott Medical Optics, Groningen, The Netherlands).

In addition to his research work, Dr. Bharadwaj also serves as the Associate Director of Optometry at LVPEI and actively teaches undergraduate and post-graduate students at LVPEI's Bausch & Lomb School of Optometry.