



KOLLOQUIUM

Institut für Elektrotechnik, Elektronik und Informationstechnik

Modern Optical-Digital Miniaturized Computational Imaging System Design for Superresolution and Large Field-of- View

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Cauerstraße 7, Raum N 5.17

Diskussionsleitung: Priv.-Doz. Dr. R. Rabenstein

Computational imaging systems use an optical-digital integrated approach toward the design of an overall system. The goals are, ideally, to realize high resolution (image sequence superresolution or SR), large field-of-view (FOV) and enhanced depth-of-field (DOF). Superresolution involves obtaining a single deblurred and noise free high-resolution image from multiple blurred and noisy low-resolution frames. Some of the existing techniques of superresolution include: Wavenumber domain methods (Tsai and Huang), (Kim, Bose and Valenzuela), Iterative Back-Project (Irani and Peleg), Surface approximation methods: Delaunay Triangulation (Bose, Lertrattanapanich), Wavelet based methods: First generation wavelets (Nguyen, Milanfar, Golub), Second generation wavelets (Bose, Chappalli). Depth of field enhancement include use of phase masks to convert spatially-variant blur to spatially invariant blur (Cathey-Dowski), plenoptic camera and the related more recent, lightfield camera, designed and built by a Stanford group of researchers. Design of large FOV computational imaging system has not been attempted so far.

The theoretical basis for superresolution provided by the multichannel generalized sampling theorem (GST) for multidimensional non-bandlimited signals has been developed recently (N. K. Bose and N. Ahuja, ICIIP 2006, to appear). A new SR technique based on Moving Least Squares (MLS) has also been developed (Bose and Ahuja IEEE Trans. IP, 2006, accepted) Steps have now been taken to design the optical system of lenslet array / photoreceptor array plexus to achieve large FOV. The talk will bring the audience up-to-date with the status of achieving the ultimate miniaturized computational imaging system that will be capable of realizing simultaneously SR, large FOV and extended DOF.