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CS-Colloquium

The SURE-LET Methodology for Image Denoising

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Wo? Seminarraum 11
Währinger Straße 29
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Abstract

The goal of this presentation is to promote a new approach for dealing with noisy data -- typically, images or videos here. Image denoising consists in approximating the noiseless image by performing some (usually non-linear) processing of the noisy image. Most standard techniques involve prior assumptions on the result of this processing (sparsity, low high-frequency contents, etc.); i.e., on the denoised image. Contrasting with these approaches, the SURE-LET methodology does not require any prior knowledge, apart from the noise statistics (Gaussian). It consists in approximating the processing itself (seen as a function) over a linear combination of elementary non-linear processings (LET: Linear Expansion of Thresholds), and to optimize the coefficients of this combination by minimizing a statistically unbiased estimate of the Mean Square Error (SURE: Stein's Unbiased Risk Estimate, in the case of additive Gaussian noise). We will introduce the technique and outline its advantages (fast, noise-robust, flexible, image adaptive). A comprehensive set of results will be shown and compared with the state-of-the-art.

Bio

Thierry Blu was born in Orléans, France, in 1964. He received the "Diplôme d'ingénieur" from École Polytechnique, France, in 1986 and from Télécom Paris (ENST), France, in 1988. In 1996, he obtained a Ph.D in electrical engineering from ENST for a study on iterated rational filterbanks, applied to wideband audio coding. Between 1998 and 2007, he was with the Biomedical Imaging Group at the Swiss Federal Institute of Technology (EPFL) in Lausanne, Switzerland. He is now a Professor in the Department of Electronic Engineering, The Chinese University of Hong Kong.



Dr. Blu was the recipient of two best paper awards from the IEEE Signal Processing Society (2003 and 2006). He is also coauthor of a paper that received a Young Author best paper award (2009) from the same society. He has been an Associate Editor for the IEEE Transactions on Image Processing (2002-2006), the IEEE Transactions on Signal Processing (2006-2010), Elsevier Signal Processing (2008-2011). He was a member of the IEEE Signal Processing Theory and Methods Technical Committee (2008-2013). He is currently on the board of Eurasip J. on Image and Video Processing (since 2010). He was elected Fellow of the IEEE in 2012 for "fundamental contributions to approximation theory in signal and image processing".

Research interests: (multi)wavelets, multiresolution analysis, multirate filterbanks, interpolation, approximation and sampling theory, sparse sampling, image denoising, psychoacoustics, biomedical imaging, optics, wave propagation, etc.