Journal Club topics

April 17, 2008

1 Computational photography/imaging/optics

- **Overviews** Mait et al. [56],Raskar

- **Optics basics?** Geometric optics, matrix optics, camera/lens modelling

- **Light field photography** Plenoptic function: Adelson and Wang [1]; plenoptic camera: Ng et al. [66]; compound eye system superresolution (SR): Barnard et al. [6], Chan et al. [29]

- **Wavefront coding** Cathey and Dowski [22]

- **Coded aperture imaging** Multi-aperture: Green et al. [42]; Depth estimation for guided deconvolution: Levin et al. [52], Liang et al. [53], Veeraraghavan et al. [86]

- **Coded exposure imaging** Motion blur removal: Agrawal and Raskar [2], Raskar et al. [73]

- **Hybrid cameras** Motion-based deblurring: Ben-Ezra and Nayar [8]

- **Compressive imaging** "Single pixel" camera: Wakin et al. [88]

- **high dynamic range (HDR) imaging? video matte extraction?** [58]

2 Inverse problems

- **Classical methods** Wiener filter, Constrained Least Squares, Tikhonov Regularisation, iterative methods, early termination, projection onto convex sets (POCS) *Books:* Bertero and Boccacci [9], Kaipio and Somersalo [45], Pratt [72]; *Journals:* Banham and Katsaggelos [5], Biemond et al. [12], Marroquin et al. [57]; Choice of regularisation parameters: Galatsanos and Katsaggelos [37], Hansen [43], Reeves and Mersereau [74]

- **Denoising?** (new methods/models not yet applied to other problems), non-white/non-gaussian noise

- **blind deconvolution (BD)** *Books:* Campisi and Egiazarian [19]; *Journals:* alternating minimization (AM) approaches: Chen and Yap [30], You and Kaveh [90]; variational Bayesian (VB) approaches:Babacan et al. [3], Fergus et al. [36], Likas and Galatsanos [54], Molina et al. [60], You and Kaveh [91]; total variation (TV) approaches: Babacan et al. [3], Chan and Wong [27], Šroubek and Flusser [84]; maximum likelihood (ML),expectation maximization (EM),autoregressive moving average (ARMA) models: Katsaggelos and Lay [46], Lagendijk et al. [51]; Other methods — Overview:Kundur and Hatzinakos [49, 50]; Cepstral Cannon [21]; higher order statistics (HOS) [69]; generalised cross-validation (GCV): Reeves and Mersereau [75]; vector quantizer (VQ) and principal component analysis (PCA) Nakagaki and Katsaggelos [63].

- **SR** *Books:* Katsaggelos et al. [47] *Journals:* Space-time SR [79], multi-frame SR for video [15], SR for compression Barreto et al. [7], "limits": Baker and Kanade [4], Lin and Shum [55], Robinson and Milanfar [76], Wang and Qi [89]

- **Multichannel BD/SR** Multichannel Subspace/direct approaches:Pai and Bovik [68], Šroubek and Flusser [83] blind superresolution (BSR): Šroubek et al. [82]; Multichannel motion-deblurring Sorel and Flusser [81]

- **Segmentation** Besag [11], Bouman and Shapiro [18], Derin and Elliott [32]

- **Single image SR, interpolation** Roth and Black [77]

- **Inpainting, missing data, boundary conditions** Kokaram [48]

- **Tomography etc.**

- **Registration & motion estimation** [92]

- **spatially varying (SV) restoration** Nagy and O'Leary [62], Sorel and Flusser [81], You and Kaveh [90]

- **Depth estmation/depth from defocus (DFD)**

3 Image models

- **Markov random field (MRF) priors** *Overview:* Bouman [16]; *Books:* Won04Stochastic; *Journals:* Classic references: Besag [10], Derin and Elliott [32], Geman and Geman [41]

- **Multiscale, multilevel, nonstationary MRF priors** generalised Gaussian MRF (GGMRF): Bouman and Sauer [17]; compound GMRF (CGMRF): Molina et al. [59]; Multiscale MRFs: Bouman and Shapiro [18]

- **Non-quadratic cost functionals** Half-quadratic methods: Geman and Reynolds [39], Geman and Yang [40]

- **TV models** *Books:* Chan and Shen [26]; *Journals:* Bioucas-Dias et al. [13], Chambolle and Lions [23], Chan et al. [28], Rudin et al. [78], Vogel and Oman [87]

- **Wavelet & filterbank models** Gaussian scale mixture (GSM) models Portilla et al. [71]

- **Sampled & dictionary based priors** fields of experts (FoE) models Roth and Black [77]; recogstruction: Baker and Kanade [4]; learned dictionaries: Elad and Aharon [34]; example-based databases Elad and Datsenko [35]

- **point-spread function (PSF) modelling?**

4 Optimisation & Simulation methods

- **MAP estimation, gradient descent, AM**

- **Conjugate gradients, preconditioning** Preconditioners Chan et al. [24], Chan and Ng [25]

- **EM algorithm** [31, 65]

- **VB methods** Smídl and Quinn [80]

- **Bayesian marginalisation methods** Applied to reg. param estimation, BD, and SR: Bishop and Hopgood [14], Molina et al. [61], Pickup et al. [70], Tipping and Bishop [85]

- **Markov chain Monte Carlo (MCMC) methods, MMSE estimates** *Overview:* Neal [64]; *Books:* Gelman et al. [38], Ó Ruanaidh and Fitzgerald [67]; *Journals:* Geman and Geman [41]

- **Simulated annealing, genetic algorithms** Geman and Geman [41], Jeng and Woods [44]

- **iterated conditional modes (ICM)** Besag [11]

- **Bounding functional, quadratic approximation methods** [13]

- **Sparse approximation methods**

- **Dictionary learning** Elad and Aharon [34]

- **k-Nearest neighbour searches**

- **PDEs**

- **Graph cuts**

- **Belief propogation**

- **Compressed sensing** Candes et al. [20], Donoho [33]

- **Neural networks, support vector machines (SVMs), classification?**

- **Parallel processing?**

5 3D Reconstruction & Computer vision

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