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MSC:

- 94A08** Image processing (compression, reconstruction, etc.) in information and communication theory Cited in 2 Documents
- 35A15** Variational methods applied to PDEs
- 62H35** Image analysis in multivariate analysis
- 65K10** Numerical optimization and variational techniques

Keywords:

image dehazing; perceptual color correction; contrast enhancement; variational image processing; visibility enhancement

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References:

- [1] C.O. Ancuti and C. Ancuti, \textit{Single image dehazing by multi-scale fusion}, IEEE Trans. Image Process., 22 (2013), pp. 3271–3282.
- [2] M. Bertalmío, V. Caselles, and E. Provenzi, \textit{Issues about Retinex theory and contrast enhancement}, Int. J. Comput. Vis., 83 (2009), pp. 101–119.
- [3] M. Bertalmío, V. Caselles, E. Provenzi, and A. Rizzi, \textit{Perceptual color correction through variational techniques}, IEEE Trans. Image Process., 16 (2007), pp. 1058–1072.
- [4] P. Carr and R. Hartley, \textit{Improved single image dehazing using geometry}, in Proceedings of Digital Image Computing: Techniques and Applications (DICTA '09), IEEE Press, Piscataway, NJ, 2009, pp. 103–110.
- [5] A. Chambolle and T. Pock, \textit{A first-order primal-dual algorithm for convex problems with applications to imaging}, J. Math. Imaging Vis., 40 (2011), pp. 120–145. · [Zbl 1255.68217](#)
- [6] J.Y. Chiang and Y. Chen, \textit{Underwater image enhancement by wavelength compensation and dehazing}, IEEE Trans. Image Process., 21 (2012), pp. 1756–1769. · [Zbl 1373.94091](#)
- [7] F. Fang, F. Li, and T. Zeng, \textit{Single image dehazing and denoising: A fast variational approach}, SIAM J. Imaging Sci., 7 (2014), pp. 969–996. · [Zbl 1299.68200](#)
- [8] R. Fattal, \textit{Single image dehazing}, in Proceedings of SIGGRAPH '08, ACM, New York, 2008, pp. 72:1–72:9.
- [9] R. Fattal, \textit{Dehazing using color-lines}, ACM Trans. Graphics, 34 (2014), 13.
- [10] S. Ferradans, M. Bertalmío, E. Provenzi, and V. Caselles, \textit{An analysis of visual adaptation and contrast perception for tone mapping}, IEEE Trans. Pattern Anal. Mach. Intell., 33 (2011), pp. 2002–2012.
- [11] A. Galdran, D. Pardo, A. Picón, and A. Alvarez-Gila, \textit{Automatic red-channel underwater image restoration}, J. Visual Comm. Image Rep., 26 (2015), pp. 132–145.
- [12] A. Galdran, J. Vazquez-Corral, D. Pardo, and M. Bertalmío, \textit{A variational framework for single image dehazing}, in Computer Vision - ECCV 2014 Workshops (Zurich), Lecture Notes in Comput. Sci. 8927, Springer International Publishing, Switzerland, 2014, pp. 259–270.
- [13] P. Getreuer, \textit{Automatic color enhancement (ACE) and its fast implementation}, Image Process. On Line, 2 (2012), pp. 266–277.
- [14] K.B. Gibson and T.Q. Nguyen, \textit{Fast single image fog removal using the adaptive Wiener filter}, in Proceedings of the 20th IEEE International Conference on Image Processing (ICIP), 2013, pp. 714–718.
- [15] N. Hautière, J.P. Tarel, and D. Aubert, \textit{Towards fog-free in-vehicle vision systems through contrast restoration}, in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, 2007, pp. 1–8.
- [16] K. He, J. Sun, and X. Tang, \textit{Single image haze removal using dark channel prior}, in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, 2009, pp. 1956–1963.
- [17] K. He, J. Sun, and X. Tang, \textit{Single image haze removal using dark channel prior}, IEEE Trans. Pattern Anal. Mach. Intell., 33 (2011), pp. 2341–2353.
- [18] R. Kaftory, Y.Y. Schechner, and Y.Y. Zeevi, \textit{Variational distance-dependent image restoration}, in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, 2007, pp. 1–8.

- [19] J. Kopf, B. Neubert, B. Chen, M. Cohen, D. Cohen-Or, O. Deussen, M. Uyttendaele, and D. Lischinski, \textit{Deep photo: Model-based photograph enhancement and viewing}, in Proceedings of SIGGRAPH '08, ACM, New York, 2008, pp. 116:1–116:10.
- [20] H. Koschmieder, \textit{Theorie der horizontalen Sichtweite: Kontrast und Sichtweite}, Keim & Nemnich, Frankfurt, 1925.
- [21] Y. Lai, Y. Chen, C. Chiou, and C. Hsu, \textit{Single-image dehazing via optimal transmission map under scene priors}, IEEE Trans. Circuits Systems Video Tech., 25 (2015), pp. 1–14.
- [22] J. Long, Z. Shi, W. Tang, and C. Zhang, \textit{Single remote sensing image dehazing}, IEEE Geosci. Remote Sensing Lett., 11 (2014), pp. 59–63.
- [23] A. Makarau, R. Richter, R. Muller, and P. Reinartz, \textit{Haze detection and removal in remotely sensed multispectral imagery}, IEEE Trans. Geosci. Remote Sensing, 52 (2014), pp. 5895–5905.
- [24] J.J. McCann and A. Rizzi, \textit{Veiling glare: The dynamic range limit of HDR images}, Proc. SPIE, 6492 (2007), 649213.
- [25] E.J. McCartney, \textit{Optics of the Atmosphere: Scattering by Molecules and Particles}, Wiley, New York, 1976.
- [26] G. Meng, Y. Wang, J. Duan, S. Xiang, and C. Pan, \textit{Efficient image dehazing with boundary constraint and contextual regularization}, in Proceedings of the IEEE International Conference on Computer Vision, 2013, pp. 617–624.
- [27] W.E.K. Middleton, \textit{Vision Through the Atmosphere}, University of Toronto Press, Toronto, 1952. · [Zbl 0049.42503](#)
- [28] J. Morović, \textit{Color Gamut Mapping}, Wiley, Chichester, UK, 2008.
- [29] S.G. Narasimhan and S.K. Nayar, \textit{Chromatic framework for vision in bad weather}, in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, vol. 1, 2000, pp. 598–605.
- [30] S.G. Narasimhan and S.K. Nayar, \textit{Vision and the atmosphere}, Int. J. Comput. Vis., 48 (2002), pp. 233–254. · [Zbl 1012.68760](#)
- [31] S.G. Narasimhan and S.K. Nayar, \textit{Contrast restoration of weather degraded images}, IEEE Trans. Pattern Anal. Mach. Intell., 25 (2003), pp. 713–724.
- [32] S.G. Narasimhan and S.K. Nayar, \textit{Interactive (de) weathering of an image using physical models}, IEEE Workshop on Color and Photometric Methods in Computer Vision, 2003, pp. 1–8.
- [33] S.K. Nayar and S.G. Narasimhan, \textit{Vision in bad weather}, in Proceedings of the Seventh IEEE International Conference on Computer Vision, vol. 2, 1999, pp. 820–827.
- [34] K. Nishino, L. Kratz, and S. Lombardi, \textit{Bayesian Defogging}, Int. J. Comput. Vis., 98 (2012), pp. 263–278.
- [35] R. Palma-Amestoy, E. Provenzi, M. Bertalmio, and V. Caselles, \textit{A perceptually inspired variational framework for color enhancement}, IEEE Trans. Pattern Anal. Mach. Intell., 31 (2009), pp. 458–474.
- [36] A. Rizzi, C. Gatta, and D. Marini, \textit{A new algorithm for unsupervised global and local color correction}, Pattern Recognition Lett., 24 (2003), pp. 1663–1677.
- [37] G. Sapiro and V. Caselles, \textit{Histogram modification via differential equations}, J. Differential Equations, 135 (1997), pp. 238–268. · [Zbl 0913.35141](#)
- [38] L. Schaul, C. Fredembach, and S. Susstrunk, \textit{Color image dehazing using the near-infrared}, in Proceedings of the 16th IEEE International Conference on Image Processing (ICIP), 2009, pp. 1629–1632.
- [39] Y.Y. Schechner, S.G. Narasimhan, and S.K. Nayar, \textit{Instant dehazing of images using polarization}, in Proceedings of the 2001 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, vol. 1, 2001, pp. I-325–I-332.
- [40] Y. Shiau, H. Yang, P. Chen, and Y. Chuang, \textit{Hardware implementation of a fast and efficient haze removal method}, IEEE Trans. Circuits Systems Video Tech., 23 (2013), pp. 1369–1374.
- [41] C. Su, L.K. Cormack, and A.C. Bovik, \textit{Color and depth priors in natural images}, IEEE Trans. Image Process., 22 (2013), pp. 2259–2274. · [Zbl 1373.94385](#)
- [42] R.T. Tan, \textit{Visibility in bad weather from a single image}, in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, 2008, pp. 1–8.
- [43] J.P. Tarel and N. Hautière, \textit{Fast visibility restoration from a single color or gray level image}, in Proceedings of the IEEE 12th International Conference on Computer Vision, 2009, pp. 2201–2208.
- [44] J.-P. Tarel, N. Hautière, L. Caraffa, A. Cord, H. Halmaoui, and D. Gruyer, \textit{Vision enhancement in homogeneous and heterogeneous fog}, IEEE Intell. Transportation Syst. Mag., 4 (2012), pp. 6–20.
- [45] J.-P. Tarel, N. Hautière, A. Cord, D. Gruyer, and H. Halmaoui, \textit{Improved visibility of road scene images under heterogeneous fog}, in Proceedings of the IEEE Intelligent Vehicles Symposium (IV), 2010, pp. 478–485.
- [46] J. Vazquez-Corral and M. Bertalmío, \textit{Color stabilization along time and across shots of the same scene, for one or several cameras of unknown specifications}, IEEE Trans. Image Process., 23 (2014), pp. 4564–4575. · [Zbl 1374.94378](#)
- [47] J. Vazquez-Corral and M. Bertalmío, \textit{Simultaneous blind gamma estimation}, IEEE Signal Process. Lett., 22 (2015), pp. 1316–1320.
- [48] Y. Wang and C. Fan, \textit{Single image defogging by multiscale depth fusion}, IEEE Trans. Image Process., 23 (2014), pp. 4826–4837. · [Zbl 1374.94403](#)
- [49] I. Yoon, S. Kim, D. Kim, M.H. Hayes, and J. Paik, \textit{Adaptive defogging with color correction in the HSV color space for consumer surveillance system}, IEEE Trans. Consumer Electronics, 58 (2012), pp. 111–116.
- [50] S.W. Zamir, J. Vazquez-Corral, and M. Bertalmío, \textit{Gamut mapping in cinematography through perceptually-based contrast modification}, IEEE J. Selected Topics Signal Process., 8 (2014), pp. 490–503.

- [51] Y. Zhang and B. Guindon, \textit{Quantitative assessment of a haze suppression methodology for satellite imagery: Effect on land cover classification performance}, IEEE Trans. Geosci. Remote Sensing, 41 (2003), pp. 1082–1089.
- [52] S. Zhuo and T. Sim, \textit{Defocus map estimation from a single image}, Pattern Recognition, 44 (2011), pp. 1852–1858.

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