Papers & Misc Resource Notes

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Academic Papers

A bi-illuminant dichromatic reflection model for understanding images

B. A. Maxwell, R. M. Friedhoff and C. A. Smith, "A bi-illuminant dichromatic reflection model for understanding images," 2008 IEEE Conference on Computer Vision and Pattern Recognition, Anchorage, AK, USA, 2008, pp. 1-8, doi: 10.1109/CVPR.2008.4587491.

A new bi-illuminant dichromatic reflection model - models 2 illuminants orthogonally from the dichromatic reflection function of the surface; a bi-directional reflectance distribution function BRDF. BRDF allows division into body and surface reflection components, each having achromatic and chromatic part. BRDF describes amount of illumination reflected in a particular angle or emittance given illumination at angle of incidence.

Illumination Estimation Challenge: experience of past two years

Ershov, E., Savchik, A., Semenkov, I., Banic, N., Koscevic, K., Subašic, M., … Nikolaev, D. (2020). Illumination Estimation Challenge: experience of past two years. doi:10.48550/ARXIV.2012.15779

Illumination Estimation Challenge with Cube++
simple methods: max-RGB, gray-world - based on im stats
ML methods - Bayes, spectral learning, color moments, regr trees, cnn, GA, spatial localizations
problems: small datasets not covering all cases, no scene info provided (time of day), assuming single illum

IEC - Error on test set: reproduction angular error: arccos(one * (gt/est)/||(gt/est)||)
median, mean, trimean, but median is bad metric - 25% of worst estimations used
3 tracks - general, indoor, 2-illum
general: best Z. Li, CAUNet, mean reprod error of 25% of worst; 4.084077 degrees
indoor: mean repro error, Y. Quian using sde-awb: 2.541370
2-illum: metric min(R(gt1, est1)^2 + R(gt2, est2)^2, R(gt1, est2)^2 + R(gt2, est1)^2)
best sde-awb 31.026217

Winning alg can just predict color of white patch in scene, better to have stable alg - so look at mean of error over some percent worst responses.

Deep Neural Models for color discrimination and color constancy

Flachot, A., Akbarinia, A., Schütt, H. H., Fleming, R. W., Wichmann, F. A., & Gegenfurtner, K. R. (2020). Deep Neural Models for color discrimination and color constancy. doi:10.48550/ARXIV.2012.14402

Aims to estimate object color, not color correction
3 conv, 2 fc, clf - 16, 32, 64, 250, 250 kernels, size 5,3,3, 2x2 maxpool
Outputs Munsell chip label for each image
90 eps, Adam, lr 0.001 30-30-30 decrease 0.1, 0.4 dropout

Variations: 1. as is, 2. no color patches in bkrd, 3. background wrong illum, 4. no bkrd
Muns accuracy: predicted is 1 away from gt - discrete, convert to chromaticity and get euc dist E
D65 standard illum - fixed illum but can't generalize, CC illum varies
DeepCC 76% acc on CC validation, Deep65 86% on D65 val
better with blue-yellow
added linear readouts per layer - where does color constancy emerge
[try - aux output per layer]
learns similarity relationships betw colors resembling their true embeddings - compute Representational Dissimilarity Matrices betw Munsell classes per layer using correlation distance metric - RDM as input to Multi-Dim Scaling analysis MDS [try this]

FC4: Fully Convolutional Color Constancy with Confidence-weighted Pooling

Y. Hu, B. Wang and S. Lin, "FC^4: Fully Convolutional Color Constancy with Confidence-Weighted Pooling," 2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Honolulu, HI, USA, 2017, pp. 330-339, doi: 10.1109/CVPR.2017.43.

Focus on semantically informative regions, suppress uninformative
confidence layer
joint local patches considered
AlexNet + 6,6,64 and 1,1,4 layers (semi-dense feat maps - 1-3 are color, 4 is confidence) + weighted pooling layer to aggr from local to global to get color constancy est
L2 norm pixels
goal 1. semantic feats to discr ambiguous patches from good ones
2. not illum invariant but sensitive to diff lighting colors (violates image classification tasks that want to be invariant) ****
Squeeznet works good
pooling layer serves as a gradient dispatcher - grad to regions via conf wt
Adam, batch 16, 0.0001 alex/0.0003 squeeze, dropout 0.5, 0.00005 decay

Fast Fourier Color Constancy

Barron, J. T., & Tsai, Y.-T. (2016). Fast Fourier Color Constancy. doi:10.48550/ARXIV.1611.07596

When Color Constancy Goes Wrong: Correcting Improperly White-Balanced Images

M. Afifi, B. Price, S. Cohen and M. S. Brown, "When Color Constancy Goes Wrong: Correcting Improperly White-Balanced Images," 2019 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), Long Beach, CA, USA, 2019, pp. 1535-1544, doi: 10.1109/CVPR.2019.00163.

their solution: https://github.com/mahmoudnafifi/WB_sRGB

and by same:
Deep White Balance
https://github.com/mahmoudnafifi/Deep_White_Balance

Misc. Resources

Understanding Log and Color Space In Compositing

https://www.rocketstock.com/blog/tips-for-log-color-space-compositing/

No labels