Deep Outdoor Illumination Estimation
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Motivation
Goal: Estimate high dynamic range lighting conditions and camera parameters from a single outdoor low dynamic range image.

Problems and solution
Lighting comes from everywhere, so we need panoramas to explain it. Also, HDR is mandatory for lighting. But there exist no readily available HDR panorama dataset.

Solution: use the Hošek-Wilkie parametric sky model on the SUN360 panorama dataset.

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Impact of the turbidity (t) on sky appearance and renders

Dataset preparation

CNN architecture and training

Training using stochastic gradient descent with Adam with an initial learning rate of 0.01.

7 crops were taken for each of the 38,814 panoramas of SUN360 and then split into (261,288 / 1,751 / 8,659) subsets for (train / validation / test). Extra care was taken to ensure no panorama overlap between those subsets.

Results

Quantitative performance

Comparison with the method of Lalonde et al. showing the cumulative sun azimuth estimation errors on a 176-image subset from the SUN360 test set, and (b) their original dataset.

Virtual object insertion

Relighting on SUN360

Quantitative relighting comparison with the ground truth lighting parameters on the SUN360 dataset on bottom left/RGB, top right: Scale-invariant RMSE and bottom right: per-channel scale invariant.

For more

https://projects.jflalonde.ca/deepOutdoorLight/