SurfaceNet: Adversarial SVBRDF Estimation from a Single Image

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SCAN ME

Motivation

SVBRDF estimation is crucial for correctly reproducing real-world materials in a virtual environment.

The problem can be posed as a domain translation task where a network learns to ma an input image to a set of SVBRDF.

Key ideas

- Encoder-decoder network with atrous convolutions to learn long-distance dependencies.
- L_1 + MS-SSIM loss to reconstruct low-frequency details.
- Patch discriminator to reconstruct high-frequency details.
- Unsupervised learning for un-annotated real-world samples.
- Domain shift reduction between synthetic and real data.

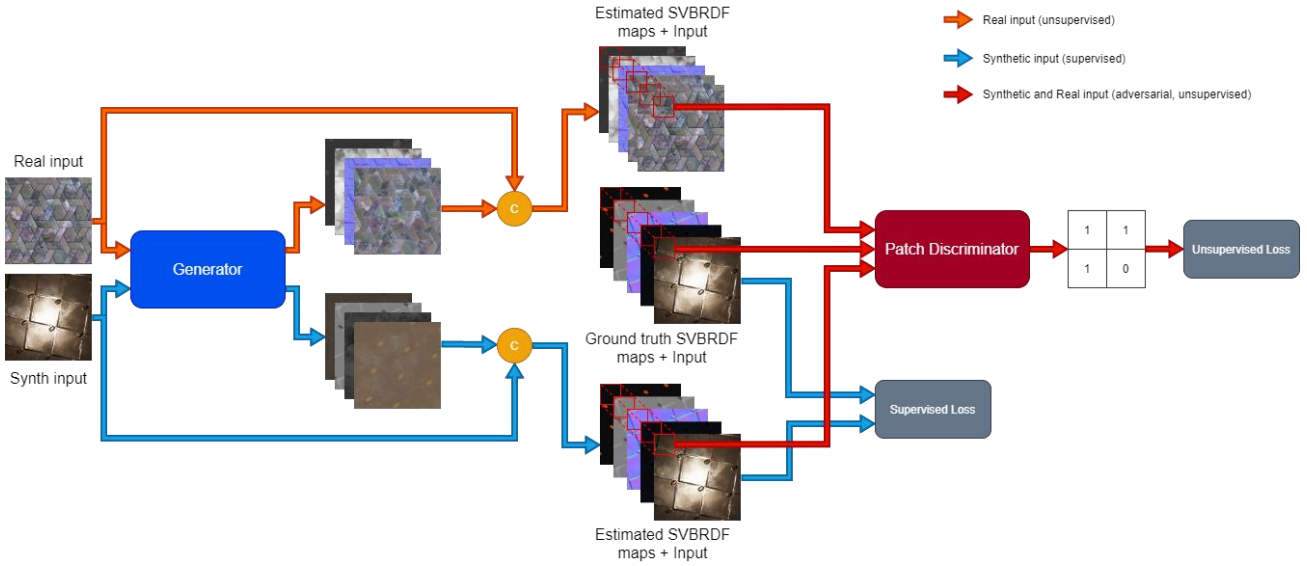
Some references

[1] Deschaintre et al., "Single-image svbrdf capture with a rendering-aware deep network", Siggraph 2018

[2] Gao et al., "Deep inverse rendering for high-resolution SVBRDF estimation from an arbitrary number of images", ACM TOG 2019

[3] Deschaintre et al., "Flexible SVBRDF Capture with a Multi-Image Deep Network", EGSR 2019

Method



Sup. Loss

Computed only for synthetic samples.

$\mathcal{L}_{\text{sup}} = L_1 + \text{MS-SSIM}$

Unsup. Loss

Computed only for both synthetic and real samples.

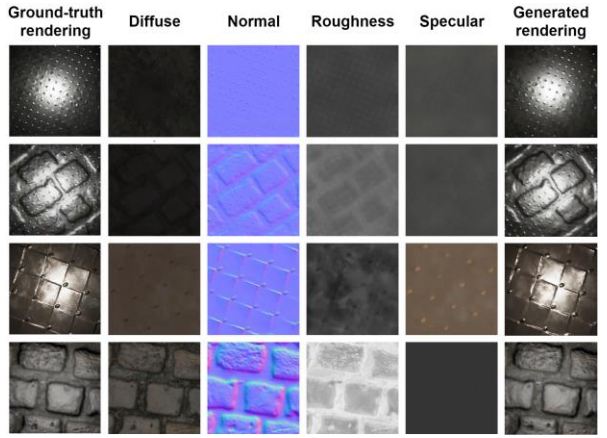
$\mathcal{L}_{\text{unsup}} = \mathcal{L}_{gen} + \mathcal{L}_{discr}$

Generation Quality

Method	Diff.	Nrm.	Rgh.	Spec.	Rend.
Real images, with natural illumination (RMSE)					
Deschaintre 2018	0.019	0.035	0.129	0.50	0.083
Deschaintre 2019	0.081	0.057	0.108	0.063	0.187
Gao 2019	0.050	0062	0.119	0.202	0.108
SurfaceNet	**0.017**	**0.030**	**0.029**	**0.014**	**0.058**

Results

Synthetic samples



Real samples