PENG DAI

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EDUCATION

PhD of Electrical and Electronic Engineering, The University of Hong Kong 2020 - Present
Master of Electronic Engineering, University of Electronic Science and Technology of China 2017 - 2020
Bachelor of Electronic Engineering, University of Electronic Science and Technology of China 2013 - 2017

EXPERIENCE

SenseTime, Shenzhen
Research Intern Aug 2020 - Dec 2020

PUBLICATIONS

Hybrid Neural Rendering for Large-Scale Scenes with Motion Blur
Peng Dai*, Yinda Zhang*, Xin Yu, Xiaoyang Lyu, Xiaojuan Qi (CVPR 2023)
The hybrid neural rendering takes advantage of both image-based representations and neural 3D representations (e.g., point descriptors) to generate high-quality and temporally consistent novel view images. Considering that the quality of training images has an influence on the rendering results, we design efficient blur simulation and detection modules to handle blur artifacts in images captured in the wild.

Video Demoiréing with Relation-Based Temporal Consistency
Peng Dai, Xin Yu, Lan Ma, Baoheng Zhang, Jia Li, Wenbo Li, Jiajun Shen, Xiaojuan Qi (CVPR 2022)
We propose the first framework for restoring videos contaminated by moire artifacts when shooting screens with hand-held cameras. To improve the temporal consistency and preserve the natural changes in videos, we propose a novel relation-based consistency regularization to replace cumbersome and inaccurate optical flow estimation.

Neural Point Cloud Rendering via Multi-Plane Projection
Peng Dai*, Yinda Zhang*, Zhuwen Li*, Shuaicheng Liu, Bing Zeng (CVPR 2020)
Instead of using z-buffer-based rasterization, we voxelized the camera field of view to form multi-plane representations, and use 3D convolution to predict multi-plane RGBs and blending weights. Eventually, the synthesized novel-view images are robust to noisy points and are temporally consistent.

PBR-Net: Imitating Physically Based Rendering Using Deep Neural Network
Peng Dai, Zhuwen Li, Yinda Zhang, Shuaicheng Liu, Bing Zeng (TIP 2020)
We use deep neural networks to simulate the rendering process by providing pre-cached components (i.e., material, depth, surface normal, and panoramic light sources) as inputs. Inspired by intrinsic image decomposition, we propose to use shading images as intermediate supervision to facilitate the learning of illumination distribution.

ISS: Image as Stetting Stone for Text-Guided 3D Shape Generation
Zhengzhe Liu, **Peng Dai**, Ruihui Li, Xiaojuan Qi, Chi-Wing Fu (ICLR 2023, Spotlight.)
we propose a new approach for generating 3D shapes from texts without pairing text and shape data. Our key idea is to explicitly leverage the 2D image as a stepping stone to connect the text and shape modalities (CLIP + pre-trained single-view reconstruction + two mappers). Moreover, our approach can stylize the generated shapes with both realistic and fantasy structures/textures.

Towards Efficient and Scale-Robust Ultra-High-Definition Image Demoireing
Xin Yu, **Peng Dai**, Wenbo Li, Lan Ma, Jiajun Shen, Jia Li, Xiaojuan Qi (ECCV 2022)
We explore the practical application of ultra-high-definition (4K) image demoireing. Our method is lightweight and outperforms previous methods by a large margin.

Neural-Based Rendering and Application
Peng Dai (ACM MM 2021, Doctoral Symposium)

PREPRINTS

RenderAug: Data Augmentation with Render-based Image Relighting for Indoor Scene Parsing
Peng Dai, Mingqiao Ye, Zhe Wang, Xiaojuan Qi (In submission)
We explore the impact of lighting on indoor scene parsing and establish a pipeline to augment the training data by relighting each image. Eventually, we obtain more robust and accurate indoor scene segmentation results. Besides, we also annotate a dataset with images captured under different light conditions, propose a new metric measuring robustness, and study various training schemes.

Learning A Room with the Occ-SDF Hybrid: Signed Distance Function Mingled with Occupancy Aids Scene Representation
Xiaoyang Lyu, **Peng Dai**, Zizhang Li, Dongyu Yan, Yi Lin, Yifan Peng, Xiaojuan Qi (In submission)
We observed that learning SDF values, with rendered depth/surface normals as supervision, is detrimental to small objects and geometric details in large-scale scene reconstruction. Correspondingly, we propose to assist SDF with occupancy to avoid suppressing small structures when the sampled ray is close to the surface of small objects.

Taming Texture Generation on 3D Meshes with Point-UV Diffusion
Xin Yu, **Peng Dai**, Wenbo Li, Lan Ma, Zhengzhe Liu, Xiaojuan Qi (In submission)
In this work, we focus on synthesizing high-quality textures for 3D meshes. We present Point-UV diffusion, a two-stage coarse-to-fine diffusion pipeline that marries the powerful diffusion model with UV mapping to generate 3D consistent and high-quality texture images in UV space.

ISS++: Image as Stepping Stone for Text-Guided 3D Shape Generation
Zhengzhe Liu, **Peng Dai**, Ruihui Li, Xiaojuan Qi, Chi-Wing Fu (In submission)
An extension of our ICLR 2023 paper (ISS) that additionally adopts the Score Distillation Sampling (SDS) to generate high-quality and stylized 3D shapes.

SKILLS

Python, Pytorch, Latex, Mitsuba, Blender

REVIEWER

CVPR, ICCV, BMVC, IJCV, ISPRS