Haolan Xu

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EDUCATION

University of Florida — Gainesville, FL, USA
Master in Computer Science; GPA: 3.88/4.00 — Sept. 2022 - Present

Sichuan University — Chengdu, SC, China
Bachelor of Engineering in Chemical Engineering and Technology; GPA: 3.74/4.00 — Sept. 2018 - Jun. 2022

RESEARCH EXPERIENCE

Reconstruct shape and spatially-varying reflectance using StyleGAN and PBDR — Aug. 2023 - Present

Advisor: Prof. Jorg Peters, University of Florida and Dr. Kaleb Smith, Nvidia

- Generated SVBRDF maps using StyleGAN2-Ada, followed by integrating with the SOTA physics-based differentiable renderer, Mitsuba 3, to refine geometry, material, and illumination
- Finetuned the unified framework through the meticulous design of loss functions and regularization strategies, enabling the high-quality reconstruction of 3D objects

Rendering the smooth contours using point normal triangles — Jun. 2023 - Oct. 2023

Advisor: Prof. Jorg Peters, University of Florida

- Employed curved point normal patches for smooth approximation of surfaces to bypass more complex methods like Powell-Sabin construction
- Developed a contour detection algorithm by evaluating the orthogonality between shading normals and viewing directions, and implemented cubic Bernstein-Bézier interpolation for rendering smooth curves
- The method's computational efficiency and adaptability allow for seamless integration into any outline rendering pipeline

Parametric modeling of smooth biological cells — Jan. 2023 - May 2023

Advisor: Prof. Jorg Peters, University of Florida

- Modeled the parametric surface of axisymmetric spread cell using the cubic Bézier curve
- Simulated the flattening process by adjusting the control polygon of curves
- Devised heuristics based on constant mean curvature to extend the method to general cells

Predict performance of organic photovoltaic materials using deep learning — Oct. 2020 - Oct. 2021

Advisor: Prof. Li Zhou, Sichuan University

- Leveraged the innate strength of Bi-LSTM network models for sequential data to process language-like descriptor inputs
- Finetuned the model by introducing the attention mechanism which also weighs each segment of materials for elevating interpretability
- Used a volume rendering technique to visualize simulation-derived material data

PROJECT EXPERIENCE

Denoise in real-time ray tracing — Aug. 2023 - Sept. 2023

- Denoised per frame using the joint bilateral filter with A-Trous wavelet for acceleration
- Implemented temporal accumulation with motion vector projection for smoother transitions

Precompute radiance transfer with spherical harmonics rotation — Jul. 2023 - Aug. 2023

- Implement precomputed radiance transfer (PRT) using spherical harmonics (SH) in the Nori framework
- Achieved real-time rendering of the Stanford bunny across various scenes by PRT
- Further enabled dynamic light rotation leveraging the rotationally invariant properties of SH

Implement soft shadow using PCF & PCSS — Jun. 2023 - Jul. 2023

- Used the adaptive shadow bias algorithm to solve shadow acne to implement a robust hard shadow system
- Developed soft shadow using percentage closer filtering (PCF) and percentage closer soft shadows (PCSS)
- Adapted to more complex multiple dynamic light sources

A tiny software path tracer rendering cornell box — May 2023 - Jun. 2023

- Built a path tracer using Russian Roulette and light source sampling, optimized by multi-threaded acceleration
- Explored various microfacet materials with different bidirectional reflectance distribution functions such as perfect mirror reflection

SKILLS SUMMARY

Programming: Python, C/C++, JavaScript, Julia

Tools: PyTorch(3D), Mitsuba, Optix7, Open(Web)GL, Blender, Cmake, LaTeX, GIT

Language: English (fluent), Mandarin (native)

HONORS AND AWARDS

Achievement Award Scholarship in University of Florida (4500$) — 2022

Outstanding Graduate of Sichuan University (10%) — 2022

Annual Scholarship in Sichuan University (10%) — 2019 - 2021