Haolan Xu

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EDUCATION

University of Illinois Urbana-Champaign — Urbana, IL, USA
Visiting Student in Electrical and Computer Engineering — Sept. 2024 - Present

University of Florida — Gainesville, FL, USA
Master of Science in Computer Science; GPA: 3.83/4.00 — Sept. 2022 - May 2024

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

RESEARCH EXPERIENCE

Physics-based 4D generation — Sept. 2024 - Present

- Proposed **PhysRig**, a differentiable physics-based rigging framework that can drive a volumetric soft-body structure with an animated skeleton using the physics simulator, enabling more realistic animations for articulated objects
- Developed **PhysInteract**, a differentiable physics-driven framework that can simultaneously infer material properties, interaction modalities, and fine-grained contact details from real world videos

Inverse rendering meets GANs for 3D object editing — Aug. 2023 - Jan. 2024

- Adopted a physics-based inverse rendering framework based on Mitsuba 3 and pretrained StyleGAN2-Ada
- Finetuned the unified framework based on the rendering loss, resulting in the high-quality reconstruction and relighting

Smooth contour rendering using point normal triangles — May. 2023 - Aug. 2023

- Proposed a smooth surface approximation framework using curved point-normal patches (via cubic Bernstein–Bézier interpolation) for smooth contour rendering, bypassing complex Powell–Sabin constructions
- The method's computational efficiency and adaptability allow for seamless integration into any outline rendering pipeline

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) by calculating 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)
- Extended to the multiple dynamic light sources scene

Tiny software path tracer — 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 like mirror reflection

SKILLS SUMMARY

Programming: Python, C/C++

Tools: PyTorch(3D), NeRFStudio, Mitsuba, Warp, Blender, LaTeX, GIT

Language: English (fluent), Mandarin (native)

HONORS AND AWARDS

Achievement Award Scholarship in University of Florida — 2022

Outstanding Graduate of Sichuan University — 2022

Annual Scholarship in Sichuan University — 2019, 2020, 2021