Haolan Xu

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EDUCATION

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 rigging for 4D generation — Sep. 2024 - Present
- Developing a physics-based rigging framework using Material Point Method simulations to learn cuboid velocity and material properties (e.g., Young's modulus, Poisson's ratio) from videos, enabling physically accurate motion of 3D objects
- Building a 4D non-parametric animatable model that bypasses the limitations of traditional skinning weights, supporting the creation of diverse, physically accurate 4D virtual assets

Inverse rendering meets GANs for 3D object reconstruction — Aug. 2023 - Jan. 2024
- Generated SVBRDF maps (Albedo, Roughness, Normal) and Depth map using StyleGAN2-Ada from RGB images captured in real scenes, then introduced a physics-based differentiable renderer named Mitsuba 3 as the rendering layer to recover geometry, material, and illumination of objects
- Finetuned the unified framework through designing loss functions based on the rendering loss, resulting in the high-quality reconstruction of 3D objects

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

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

⍾ A 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, Blender, LaTeX, GIT

Language: English (fluent), Mandarin (native)

HONORS AND AWARDS

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

Outstanding Graduate of Sichuan University — 2022

Annual Scholarship in Sichuan University — 2019, 2020, 2021