

# Haolan Xu

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## EDUCATION

### University of Florida

Master of Science in Computer Science; GPA: 3.81/4.00

Gainesville, FL, USA

Sept. 2022 - May 2024

### Sichuan University

Bachelor of Engineering in Chemical Engineering and Technology; GPA: 3.74/4.00

Chengdu, SC, China

Sept. 2018 - Jun. 2022

## RESEARCH EXPERIENCE

### 3D object reconstruction using inverse rendering

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 evaluated by PSNR, SSIM, LPIPS

### Smooth contour rendering using point normal triangles

Jun. 2023 - Oct. 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

### Parametric modeling of smooth biological cells

Jan. 2023 - May 2023

- 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

## 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++, JavaScript

**Tools:** PyTorch(3D), NeRFStudio, Mitsuba, Optix7, Open(Web)GL, Blender, Cmake, L<sup>A</sup>T<sub>E</sub>X, 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