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
B.E. in Chemical Engineering and Technology; GPA: 3.75/4.00 (WES Evaluation: 3.81) — *Sept.2018 - June.2022*

Skills Summary

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

Tools: Blender, Pytorch(3D), Mitsuba, Optix7, NeRFstudio, Open(Web)GL, Cmake, LaTeX, git

Platforms: Windows, Ubuntu, MacOS

Research

Rendering the smooth contours using point normal triangles — June. 2023 - Present

- Implemented **Point Normal (PN) triangles** with the **Gouraud shading**
- Identified contours using **orthogonality checks** between shading normal and the view direction
- Employed curved PN patches for the smooth approximation of surfaces, mapping smooth contours from flat triangles
- Constructed the entire contour using piecewise Bézier Curves derived from individual triangles

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

- Developed a deep understanding of the **Berstein-Bézier form** through practical implementation in Python
- Constructed axisymmetric spread cell models in 2D using the **cubic piecewise Bézier curve**
- Extended the 2D model into 3D by implementing **a rotation algorithm** around the central axis
- Adapted the 3D model based on constant mean curvature, enhancing the model's predictability and generalization

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

- Proposed **a language-like molecular descriptor(SMILES string)** as inputs
- Created **Bi-LSTM network model** for prediction
- Introduced **the attention mechanism** to identify the segments that are important to PCE

Projects

Denoise in real-time ray tracing — Aug. 2023

- Denoised for per frame using the **Joint Lateral Filter**
- Implemented **Temporal Accumulation** with **Motion Vector** projection
- Accelerated the denoise with **A-Trous Wavelet**

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

- Implemented **Precomputed Radiance Transfer (PRT)** in the **Nori** framework
- Achieved **real-time** rendering of the Stanford bunny across various scenes utilizing spherical harmonics coefficients
- Enabled **dynamic light rotation** leveraging the **rotationally invariant** properties of spherical harmonics

Implement soft shadow using PCF & PCSS — June. 2023 - July. 2023

- Implemented a robust hard shadow system using the two-passes approach
- Introduced **adaptive shadow bias algorithm** to solve shadow Acne
- Developed soft shadow using **Percentage Closer Filtering (PCF)**
- Further refined the visual fidelity of shadows by implementing **Percentage Closer Soft Shadows (PCSS)**
- Enabled the support of **multiple dynamic light sources**

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

- Implemented a **path tracer** with **Russian roulette** and **Sampling light source**
- Rendered the Cornell Box with different samples per pixel (SPP)
- Optimized the path tracer by **Multi-threaded acceleration**, **Microfacet materials**, and **Perfect mirror reflection**

Honors and Awards

University of Florida Achievement Award Scholarship — 2022

Outstanding Graduates of Sichuan University — 2022

The General Scholarship in Sichuan University — 2019, 2020, 2021