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 — *Sept.2018 - June.2022*

Skills Summary

Languages: Python, C/C++, JavaScript, Julia
Frameworks: OpenGL, WebGL, Pytorch(3D)
Tools: Blender, Mitsuba, Cmake, LaTeX, GIT
Platforms: Windows, Ubuntu

Research

Rendering the smooth contours using Point Normal triangles — June. 2023 - Present

- Implemented **Point Normal (PN) triangles**, leveraging principles of **Gouraud shading**
- Identified contours using **orthogonality checks** between normal vectors and the view direction
- Employed **Berstein-Bézier form** and **barycentric coordinates** to render accurate contours efficiently

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 a 2D model of axisymmetric spread cells 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 application to general 3D cell formations

Predicting Performance of Organic Photovoltaic Materials Using Deep Learning — Oct. 2020 - Oct. 2021

- Creatively propose **a language-like molecular descriptor(SMILES string)** as inputs
- Predict the potential photoelectric conversion efficiency(PCE) of OPVs through **deep learning(Bi-LSTM network model)**
- Introduce **the attention mechanism** to identify the segments that are important to PCE, which can provide guidance for the design experiments of OPVs

Projects

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
Outstanding Student of the Year in Sichuan University	2019, 2020
The First Prize Scholarship in Sichuan University	2019, 2020