Zimu Guan

858-349-0734 | z6guan@ucsd.edu | Website | TaKeTube | Linkedin | San Diego, CA

Objective

First-year master of science student in UCSD CSE. Currently have hands-on experience in **computer graphics**, **software system design**, **high-performance computing**, **network programming** and **machine learning**. Have a strong background in **mathematics**. Seeking a 2023 Summer Intern.

Education

University of California San Diego · San Diego, CA — Sept. 2022 – Mar. 2024
Master of Science in Computer Science

University of Illinois at Urbana-Champaign · Urbana, IL — Aug. 2018 – May. 2022
Bachelor of Science in Computer Engineering · with High Honors · ***Minor in Mathematics*** — *GPA: 3.91/4.00*

Zhejiang University · Hangzhou, China — Aug. 2018 – Jun. 2022
Bachelor of Engineering in Electronics and Computer Engineering — *GPA: 3.93/4.00*

Work Experience

Xinhua Zhiyun · Software Engineer Intern – Audio/Video Processing Infrastructure — Jul. 2022 – Sept. 2022
C/C++, FFmpeg, OpenGL, skia, Audio/Video Processing — *Hangzhou, China*

- Maintained an audio/video synthesis & processing engine based primarily on FFmpeg, OpenGL, and skia, provided technical support for video production services with more than **10,000 requests per day**.
- Improved FFmpeg source code to adapt for video transcoding tasks in distributed systems, completely resolved the problems of increasing duration and audio glitches after video segmentation, transcoding, and concatenation. **Beat Alibaba's cloud transcoding service** which still generates tiny duration errors.

Research Experience

All-Hex Mesh Refinement with Density Control · Research Intern · [Link] — Apr. 2021 – Aug. 2021
C++, 3D graphics, Algorithm Design, Advisor: Jin Huang — ***State Key Lab of CAD & CG****, Zhejiang University*

- Built a conformal all-hexahedral mesh refinement pipeline as a prototype for the group's follow-up research, aiming to improve physically-based animation, especially the adaptive finite element method.
- Transferred the selective padding method for mesh optimization to mesh refinement to achieve flexible density control, reduced the error in the estimation of density by **%31.1 on average compared to the traditional method**.
- Developed several geometry processing tools as infrastructures for the group's research, including mesh evaluation, element-by-element refinement, and visualization. Integrated them into the refinement pipeline.

Selected Projects

TLEOS (Linux-like Operating System) · [Link] — Apr. 2021 - May. 2021
C, x86-asm, Qemu, Operating System Design

- Developed a Linux-like operating system kernel **from scratch** that supports almost all basic functionalities of a Linux kernel, including scheduling, interrupts, system calls, exceptions, virtual memory and a read-only file system.
- Supported a range of devices including keyboard, mouse, sound card, serial port, RTC, PIT, network card and VGA.
- Developed some basic graphics functionality including high-resolution image display.

FPGA-Based 3D Graphics Renderer · [Link] — Dec. 2020
SystemVerilog, Graphics Pipeline, Parallel Architecture, Hardware System Design

- Designed and implemented a basic real-time graphics pipeline on FPGA that renders 3D objects through Model View Projection transformation, viewport triangle clipping and rasterization.
- Achieved high-performance real-time rendering with smooth and **stable 60FPS** by efficiently utilizing numerous on-chip resources such as SRAM, DRAM, NIOS core, with the frame buffer and parallel hardware design.
- Developed smooth interactive interface with the position of the camera and the rotation of the object in control.

Monte Carlo Ray Tracing Renderer · [Link] — Dec. 2020
C++, Physically Based Rendering, Graphics, Parallel Computing

- Implemented a ray tracer capable of rendering high-quality realistic images, with support for microfacet materials.
- Used a series of methods such as BVH tree data structure, thread pool, etc. to optimize and accelerate the rendering, improving the rendering speed by nearly **%70** compared to the benchmark.

CUDA-Optimized Forward Propagation Convolutional Layer · [Link] — Dec. 2021
CUDA, C, GPU Architecture, Parallel Computing

- Designed and implemented the forward-pass of a convolutional layer using CUDA. Used a series of methods such as tiled shared memory, streaming, tuning, etc. to optimize and accelerate the forward propagation.

Skills

Programming Languages: C/C++, Python, x86-asm, SystemVerilog, Javascript/HTML/CSS, MATLAB, Shell
Tools: CUDA, OpenGL, FFmpeg, NumPy, CMake, Git, Docker, LaTeX