Tongwei D.

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Portfolio: https://dw218192.github.io/portfolio/

EDUCATION

University of Pennsylvania (GPA: 4.0/4.0)   **PA, USA**
MSE in Computer Graphics and Game Technology   Aug.2022 - Dec.2023(expected)
Core courses**:** *Physically based Rendering, GPU Programming, Procedural Generation, Computer Animation*

University of Southern California (GPA: 3.8/4.0)   **CA, USA**
BS in Computer Science   Aug.2017 - Jun.2021

SKILLS

- **Programming:** C, C++, C#, Python, GLSL, HLSL, Maya MEL, Houdini VEX
- **Software:** Visual Studio, Unity, Unreal Engine 4&5, Git, Maya, Houdini
- **Framework:** CUDA, Vulkan, OpenGL, WebAssembly, LLVM

WORK EXPERIENCE

Research Assistant, Software Developer Intern | Penn Computational Intelligence Lab   *May.2023 – Sep.2023*
- Incorporated Microsoft's **mimalloc** allocator into **WASI-SDK**'s C standard library.
- Implemented a multi-way segment tree to achieve O(log(n)) address-tag pair look-up for a custom kernel, achieving a **5x** speed boost with only **1.3x** worst-case memory overhead.
- Built a specialized memory allocator based on mimalloc for **disaggregated computing** applications.
- Delivered biweekly presentations to report my findings and progress.

Software Engineer Intern | Yisen Tech   *May.2022 – Aug.2022*
- Implemented a flexible 3D scene inspector that seamlessly switches between multiple backend Graphics APIs, including **OpenGL** and **Vulkan**, during runtime.
- Added shader editing and hot reloading support to enable quick prototyping of different shading models.
- Enhanced code robustness and error handling by integrating third-party **C++23** features, such as std::expected and std::span.
- Incorporated **ImGUI** to facilitate user-friendly editing and view **GPU** data in real time.
- Employed **Vulkan Ray Tracing extensions** to develop a renderer module for the editor, enabling real-time rendering of photorealistic path-traced images.

Unity Engine Tool Programmer | NetEase Games   *May.2018 – Aug.2020*
- Used **Unity Editor API** to develop pipeline automation and scene object placement tools using **C#**, greatly improving the working efficiency of level designers.
- Refactored existing animation debugging tools, achieving approx. 50% performance gain and 100% less memory usage.
- Leveraged **compute shaders** to optimize terrain brush tools by transferring some workloads to GPU.
- Held regular meetings with the art team to gauge tool usage and collect performance data.

PROJECT EXPERIENCE

Maya Plugin for Procedural Flower Modeling   *Feb. 2023 – Apr.2023*
- Implemented a Maya Plugin using C++ and **MEL** to procedurally generate tree-like structures and flowers based on extended **L-System** production rules and grammar with positional information.
- Created a user-friendly GUI using the **Qt** framework, enabling convenient configuration and visualization of the parameters.

GPU Sound Propagation Simulator   *Nov. 2022 – Dec.2022*
- Developed an efficient 3D sound propagation system by segmenting space into discrete planes and simulating 2D wave propagation on each slice as an approximation.
- Ported the C++ library to Unity to allow for easy access by game developers.

CUDA Path Tracer and Denoiser   *Sep. 2022 – Nov.2022*
- Implemented a Monte-Carlo Path Tracer using **CUDA C++** with .obj Mesh loading and texture mapping.
- Implemented an edge avoiding denoiser for high-quality, low-SPP denoising using G-Buffer data.
- Achieved a 10x speed-up for triangle intersection tests in complex scenes using GPU-based octree and stream compaction.
- Utilizing **NVIDIA Nsight** kernel profiler, conducted a thorough performance analysis to catch significant factors that impact the running time of the path tracer.

2D Puzzle Game   *Mar. 2021 – May.2021*
- Designed and developed a 2D puzzle game in Unity, featuring recursive puzzles and brain teasers for players to solve.
- Utilized various decoupling patterns (e.g., observer pattern, game logic as data) to ensure code extensibility and maintainability.
- Implemented a simple boolean expression parser that enables level designers to set conditions for triggers and manage the dependencies between scene objects.