KARIM MOHAMED

GRAPHICS / ENGINE PROGRAMMER

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EXPERIENCE

Graphics Programmer, The Forge Interactive Inc. (Remote) **April 2024 - July 2024**

- Maintained the cross-platform framework for PlayStation, Xbox, Switch and other gaming platforms.
- Upgraded software ray-traced shadows to hardware-accelerated ray-traced shadows.
- Worked with platform-specific graphics debuggers, learning troubleshooting and optimization techniques.
- Worked on the internal testing of the framework, improving testability and stability.

Graphics Programmer, Sensor Foundries Inc. (Remote) **May 2022 - April 2024**

- Transitioned rendering features from Vulkan-based Hazel to an OpenGL engine, maintaining performance and visual fidelity.
- Implemented Planar Reflections and LTC area lights, enhancing realism in reflections and lighting.
- Integrated WB-OIT transparency and Atlas-Based Shadow Maps, improving transparency rendering and shadow efficiency.
- Restructured core rendering and asset management systems improving performance and maintainability.

Rendering Engineer Contributor, Studio Cherno (Remote) **March 2021 - April 2022**

- Developed a tiled renderer to enhance lighting performance with a depth prepass to reduce overdraw (Showcased Here).
- Implemented advanced screen-space techniques including SSR with cone tracing, GTAO, and HBAO to enhance visual depth and realism in reflections and ambient occlusion.
- Integrated PCSS for point and spot lights, significantly improving shadow softness and overall shadow quality.

PERSONAL PROJECTS

Beyond Engine: A custom fork of Hazel Engine with a more advanced renderer. **Source code here**

- Integrated NVIDIA DLSS and RTXGI, enabling AI-driven upscaling and global illumination for better fidelity and performance.
- Engineered a physically-based RTX path tracer in Vulkan, allowing for cinematic rendering and real-time ray tracing capabilities.
- Optimized CPU performance via shader metadata caching, reducing load times by 40%; enhanced storage efficiency with BCn texture compression and DDS LOD caching, improving memory usage and scene loading times.
- Improved rendering efficiency with bindless descriptors and a bit-manipulated hashmap for resource processing, cutting descriptor handling from 1ms to 0.02ms.
- Optimized compilation times by reducing header parsing counts, cutting compilation time by 20%.

CUDA Ray Tracing in One Weekend: High-performance GPU path tracer. **Source code here**

- Built a CUDA-based path tracer achieving real-time performance with sub-9 ms frame times (30 samples per pixel) on an RTX 3080 and ~350 ms on an Intel i5-13600KF CPU, leveraging SAH-based BVH acceleration and memory-efficient traversal.
- Eliminated DRAM utilization by fitting working sets entirely into L1 cache using SoA data layouts and allowing for better coalesced memory access; yielding ~99% L1 hit rates and near-zero L2/DRAM traffic.
- Removed all virtual function calls and class inheritance by using data-oriented design to support fully branchless evaluation and warp-coherent traversal logic; achieved 92% branch efficiency with minimal scoreboard stalls.
- Tuned SM occupancy and register pressure to maintain high SM throughput, achieving optimal performance without reliance on RT cores.

SKILLS AND EXPERTISE

- Programming Languages: C++, CUDA, Intel x86 Assembly, GLSL, HLSL.
- Tools & Frameworks: Vulkan, OpenGL, The Forge, Premake, CMake, Git, Jenkins.
- Engines & Libraries: Unreal Engine, Unity, Godot, Hazel, RTXGI, DLSS EnTT.
- Debugging & Profiling: RenderDoc, Nsight Graphics, Nsight Compute, PIX, Intel VTune, Razor.
- 3D Tools: Blender, Autodesk Maya (for asset setup and debugging purposes).
- Specialties: Real-time rendering, shader development, ray tracing, GPU optimization, multi-threading, SIMD.

EDUCATION

Multimedia University in Malaysia **July 2018 - July 2021**

Bachelor's degree in Computer Science (Hons.) - Software Engineering Specialisation.

GPA: 3.11