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 numerous features from Vulkan-based Hazel to the OpenGL-based software.
- Implemented Planar Reflections, significantly improving reflection quality in rendered scenes.
- Integrated Linearly Transformed Cosines (LTC) area lights, improving lighting effects and visual appeal.
- Introduced Weighted Blended Order-Independent Transparency (WBOIT), enhancing transparency rendering.
- Utilized Atlas-Based Shadow Maps, improving shadow mapping efficiency.

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

- Developed a Forward+ Renderer to enhance lighting performance. (Watch: youtu.be/e0YTiO0Ur4o)
- Implemented Screen Space Reflections (SSR), utilizing cone tracing for rough reflections.
- Integrated Ground Truth Ambient Occlusion (GTAO), leading to more realistic ambient lighting.
- Introduced Horizon-Based Ambient Occlusion (HBAO) for improved visual depth.
- Implemented Percentage-Closer Soft Shadows (PCSS) tailored for point/spot lights.

PERSONAL PROJECT

Beyond Engine: A custom extension of Hazel Engine. **October 2023 - Present**

- Integrated NVIDIA DLSS, enabling higher performance and visual quality through AI upscaling techniques.
- Optimized CPU code using multiple techniques, including shader metadata caching and reading, reducing load times from 8s to 5s.
- Engineered a custom ray tracer using Vulkan's hardware-accelerated ray tracing pipeline.
- Integrated NVIDIA RTX Global Illumination (RTXGI) to enable real-time dynamic global illumination.
- Designed a physically-based path tracer to improve rendering quality for cinematic scenes.
- Optimized memory usage with Block Compression (BCn) formats and caching strategies using DDS to store all LODs.
- Optimized compilation times by reducing header parsing counts, cutting compilation time from 75s to 60s on an i5 13600KF.
- Enhanced rendering performance and flexibility using bindless descriptors.
- Optimized resource descriptor processing by implementing a bit-manipulated hashmap, reducing times from 1ms to 0.02ms.

SKILLS AND EXPERTISE

Programming & Rendering:

- Proficient in **C++, Intel x86 Assembly, GLSL, HLSL, Premake,** and **Cmake.**
- Extensively experienced in **Vulkan** and **OpenGL,** focusing on real-time rendering and **optimization.**
- Skilled in **shader programming, ray tracing,** and advanced **post-processing techniques**.
- Experienced in **multi-threading, SIMD,** and modern C++ features.

Tools & Engines:

- Experienced in game engines like: **Unreal Engine**, **Unity Engine**, and **Godot Engine**.
- Skilled in **performance analysis** and **graphics debugging** tools like: **VTune Profiler, NVIDIA Nsight, PIX, Razor,** and **RenderDoc**.
- Skilled in **Autodesk Maya** and **Blender** for **3D modeling**.

EDUCATION

Multimedia University in Malaysia **July 2018 - July 2021**
Bachelor's degree in Computer Science (Hons.) - Software Engineering Specialisation.
GPA: 3.11