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### Benchmarking the Performance of Graphics APIs

Vulkan aims to improve performance of the OpenGL computer graphics API, and compete with other modern APIs by providing a new low level interface to graphics hardware. By reducing overhead, Vulkan aims to allow for better generation of GPU work across multiple threads, ultimately improving the performance of intensive computer graphics applications (“Khronos”). By using multiple threads of execution, the workload can be split, and more of it can be completed in parallel. However, since its 1.0 release, there is still little evidence to back these performance claims (“Khronos”). As such, it is proposed that research be done into the performance benefits of Vulkan over various competing APIs by measuring the relative performance of these APIs when using common multi-threading techniques. In order to benchmark the various APIs, initial research will be done into the selected competitors, in order to make an accurate comparison with Vulkan. The most likely candidates for comparison are OpenGL, Direct3D 12, and Metal, each providing some different aspect for comparison. In addition to comparison with different APIs, a variety multi-threading techniques will also be researched and selected. Since performance is likely to vary between different techniques, rather than remaining in favor of a particular API, this will allow one to observe which software patterns are most effective in the different contexts explored by this research.

The direct benefit of this research is that it either confirms or refutes the claims about Vulkan's performance relative to other graphics APIs. It would also provide useful benchmarks relative to alternative APIs, which would make assessing an API for use in a particular graphics application much easier. Lastly, this research could potentially expose both flaws and strengths in the Vulkan API design, showing where its performance excels, and where it falls short. These outcomes all provide useful information for software developers, hardware manufacturers, and specification writers. By having concrete data on the performance of computer graphics applications, the target audience of this research will better understand the direction of modern computer graphics.

As for the broader community, this research would ideally provide useful insight with regards to the performance of computer graphics. If computer graphics applications are more easily able to take advantage of the performance benefits of Vulkan or other APIs, this will improve many different consumer product. Rendering applications for computer generated images in films could directly benefit from a greater understanding of performance gains. Similarly, video game applications can take advantage of increased performance to push technical limitations. Also, mobile devices taking advantage of a better understanding of computer graphics performance can potentially improve their user experience. The benefits of this research in the computing industry are wide reaching.

Works Cited

“Khronos Releases Vulkan 1.0 Specification.” *Khronos Group*. Khronos Group, 16 February 2016. Web. 24 February 2016.