Architectural Support for 3D graphis in the Complex Streamed Instruction Set

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We extend the previously proposed Complex Streamed Instruction Set (CSI) architecture to provide for floating-point computations and conditional execution in order to efficiently support 3D graphics applications.

The CSI extension is evaluated using an industry standard 3D benchmark, and compared to the Intel's Streaming SIMD Extension (SSE).Compared to a 4-way issue superscalar processor extended with SSE and capable of processing 8 single-precision floating-point operations in parallel, the same processor extended with CSI attains the speedups of 2.8 and 2.13 on the transform and lighting kernels and the speedup of 1.61 on the geometry computations in whole. We also study how performance scales with the number of floating-point units and observe that CSI extension allows to utilize them more efficiently then SSE. Finally, the performance bottlenecks of the SSE-enhanced superscalar CPUs on the 3D graphics workload are identified.

Results show that performance of the 4-way issue machines is limited by the issue width and that of the 8-way machines is limited by the number of the cache ports.