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KOLLOQUIUM

PHAST: Hardware Accelerated Shortest Path Trees

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We present a novel algorithm to solve the nonnegative single-source shortest path problem on road networks and other graphs with low highway dimension. After a quick preprocessing phase, we can compute all distances from a given source in the graph with essentially a linear sweep over all vertices. Because this sweep is independent of the source, we are able to reorder vertices in advance to exploit locality. Moreover, our algorithm takes advantage of features of modern CPU architectures, such as SSE and multi-core. Compared to Dijkstra's algorithm, our method makes fewer operations, has better locality, and is better able to exploit parallelism at multi-core and instruction levels. We gain additional speedup when implementing our algorithm on a GPU, where our algorithm is up to three orders of magnitude faster than Dijkstra's algorithm on a high-end CPU. This makes applications based on all-pairs shortest-paths practical for continental-sized road networks. The applications include, for example, computing graph diameter, exact arc flags, and centrality measures such as exact reaches or betweenness.

Donnerstag, 28.10.10, 17:00 Uhr

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