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Abstract

Master in Computer Science

Approximate Agglomerative Clustering in the Intel Embree Ray Tracing Kernels

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Ray tracing algorithms have long since been known as techniques capable of producing very high degrees of realism in graphics, but at significant computational cost. As a result, there has been a high degree of research spent on the acceleration of these algorithms. One such area of research has been in the construction of Bounding Volume Hierarchies (BVHs). These data structures are used in conjuction with ray tracing and collision detection algorithms to drastically increase performance. They accomplish this by helping to eliminate potential intersection candidates within a scene by omitting geometric objects located in bounding volumes which are not intersected by the current ray.

The fast and efficient construction of BVHs has been the subject of extensive research as a result of their effectiveness. One relatively unstudied construction technique is Agglomerative Clustering and in particular Approximate Agglomerative Clustering (AAC). This research presents an implementation of the algorithm in the Intel Embree Ray Tracing Kernels, which utilise the power of modern multicore CPUs and SPMD techniques. Recent research advocates the exploration and comparison of new construction techniques and this implementation shows AAC to be a viable option which demonstrates many advantages over other solutions.