

Geometric and Arithmetic Culling Methods for Entire Ray Packets

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ABSTRACT

Recent interactive ray tracing performance has been mainly derived from the use of ray packets. Larger ray packets allow for significant amortization of both computations and memory accesses; however, the majority of primitives are still intersected by each ray in a packet. This paper discusses several methods to cull entire ray packets against common primitives (box, triangle, and sphere) that allows an arbitrary number of rays to be tested by a single test. This provides cheap “all miss” or “all hit” tests and may substantially improve the performance of an interactive ray tracer. The paper surveys current methods, provides details on three particular approaches using interval arithmetic, bounding planes, and corner rays, describes how the respective bounding primitives can be easily and efficiently constructed, and points out the relation among the different fundamental concepts.