Comparing the Traversal of Acceleration Data Structures for Real-time Ray Tracing

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Abstract

Ray tracing offers an alternative approach to rasterisation used for the rendering of images. One issue with ray tracing is the performance cost, If we also consider the complexity of modern game engines which can contain millions of triangles in a single scene, this means that even in a scene with 1 million triangles we could have roughly 2 million x 1 million iterations for the ray tracer which is two trillion checks per update and is not feasible for real-time ray tracing. To get past this limitation we employ the use of acceleration data structures such as K-d trees and BVHs.

The goals for this project were to look at the traversal performance of two acceleration data structures, K-d trees and BVHs to see what characteristics they exhibit. The results look at the traversal times, cache performance, branching performance and instruction statistics of these acceleration data structures.