

Comparing Acceleration Data Structures for Real-time Ray Tracing on GPU

Feng Ge, B.Sc.(Hons)

University of Dublin, Trinity College, 2013

Supervisor: Michael Manzke

As one of the most significant techniques for the next generation video games, real-time ray tracing has become a hot research topic over the past few years. Ray tracing which represents the high realistic image producing algorithm has an expensive cost on both rendering time and memory consumption. However, the state of the art GPU is able to handle these issues due to the massively parallel processing power. On the other hand, more and more types of the acceleration data structure such as KD-Trees, Bounding Volume Hierarchies, Octrees... have been researched and proved can efficiently speed up the ray tracing process. The construction and traversal process for each these data structures exhibit different characteristics in terms of scalability, SIMD utilization, bandwidth usage, memory footprint, data structure quality, real time performance, memory layout concerns, cache performance etc. This project is proposed to implement, investigate and compare the characteristics of the construction process of some of these data structures on modern GPUs.