# Bounding Volume Hierarchies for Ray Tracing using Parallel Computation

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Photorealistic rendering of computer graphics is an important issue for long years. Today, we can see great results of researches in movies, video games, and etc. Rasterization is an effective algorithm for rendering in interactive frame rates. However, it is an approximate algorithm, so it has a lack of photorealism. On the other hand, rendering techniques based on ray tracing are slower than rasterization, however, the quality of rendering is highly improved.

It is said that ray tracing was relatively slower than other rendering techniques. However, recent progress of computer makes it possible to render computer graphics by means of ray tracing in interactive frame rates. A lot of techniques to accelerate ray tracing are existing. Among them, spatial and hierarchical scene subdivision to decrease computation cost of ray-object intersection is most effective. The improvements of hardware are also contributing to accelerate ray tracing. The use of SIMD that enables parallel computation of multiple data is necessary for maximizing potential of recent CPUs.

This thesis describes an acceleration technique of ray tracing by means of recent CPU architectures. Bounding volume hierarchies (BVH) that are used to accelerate ray tracing are improved to make them applicable to SIMD. We construct BVH as quad-tree that is easy to apply SIMD while others mostly used binary-tree. Our techniques achieved shallower tree construction and lesser use of memory than binary-tree. Furthermore,

traversal with parallel computation by means of SIMD enabled fast ray tracing.