This thesis presents Ray Collection BVH, an improvement over a current day Ray Tracing acceleration structure to both
build and perform the steps necessary to efficiently render dynamic scenes. Bounding Volume Hierarchy (BVH) is a
commonly used acceleration structure, which aides in rendering complex scenes in 3D space using Ray Tracing by
breaking the scene of triangles into a simple hierarchical structure. The algorithm this thesis explores was developed in
an attempt at accelerating the process of both constructing this structure, and also using it to render these complex
scenes more efficiently.

The idea of using “ray collection” as a data structure was accidentally stumbled upon by the author in testing a theory he
had for a class project. The overall scheme of the algorithm essentially collects a set of localized rays together and
intersects them with subsequent levels of the BVH at each build step. In addition, only part of the acceleration structure
is built on a per-Ray need basis. During this partial build, the Rays responsible for creating the scene are partially
processed, also saving time on the overall procedure.

Ray tracing is a widely used technique for simple rendering of realistic images to making movies. Particularly in the
movie industry the level of realism brought in to the animated movies through ray tracing is incredible. So any
improvement brought to these algorithms to improve the speed of rendering would be considered useful and welcome.
This thesis makes contributions towards improving the overall speed of scene rendering, and hence may be considered
as an important and useful contribution.

Major: Computer Science

Educational Career:
Bachelor’s of Computer Engineering, BS, 2007, University of Central Florida

Committee in Charge:
Sumanta Pattanaik, Chair, EECS
Charles Hughes, EECS
Mark Heinrich, EECS

Approved for distribution by Sumanta Pattanaik, Committee Chair, on October 17, 2011.

The public is welcome to attend.