GPU Accelerated Acceleration Structure Library in CUDA

We propose a CUDA library for acceleration structure(s). Many different types of projects could benefit from a robust and easy to use acceleration structure. We propose the following functionality:

- KD Tree
  - GPU construction
    - Real-Time KD-Tree Construction on Graphics Hardware
  - GPU traversal
    - KD-Tree Acceleration Structures for a GPU Raytracer
  - Ray-prim Intersection
- Uniform grid
  - Fast Fixed-Radius Nearest Neighbors: Interactive Million-Particle Fluids
  - Photon Mapping on the GPU

We would like the library to be as general as possible to allow for easy integration into other projects. Once the library is completed, we will incorporate it into some of our existing projects to test for performance gains.

The following spatial data structures were discussed in Dr. Badlers CIS 560 course. If we complete implementation of the two structures outlined above, then we will consider implementing one or more of the following. (Note: The resources linked to have not been studied thoroughly, and may not be relevant to the project at hand.)

- Quad trees
  - Quadtree Construction on the GPU: A Hybrid CPU-GPU Approach
- Bounding volume hierarchy
  - Fast BVH Construction on GPUs
  - Thinking Parallel, Part II: Tree Traversal on the GPU
  - GPU Ray Tracing Based on Reduced Bounding Volume Hierarchies
- Binary Space Partitioning trees
  - Implicit and Dynamic Trees for High Performance Rendering
  - Ray Tracing with the BSP Tree