Assignment 2

Arian Etemadi

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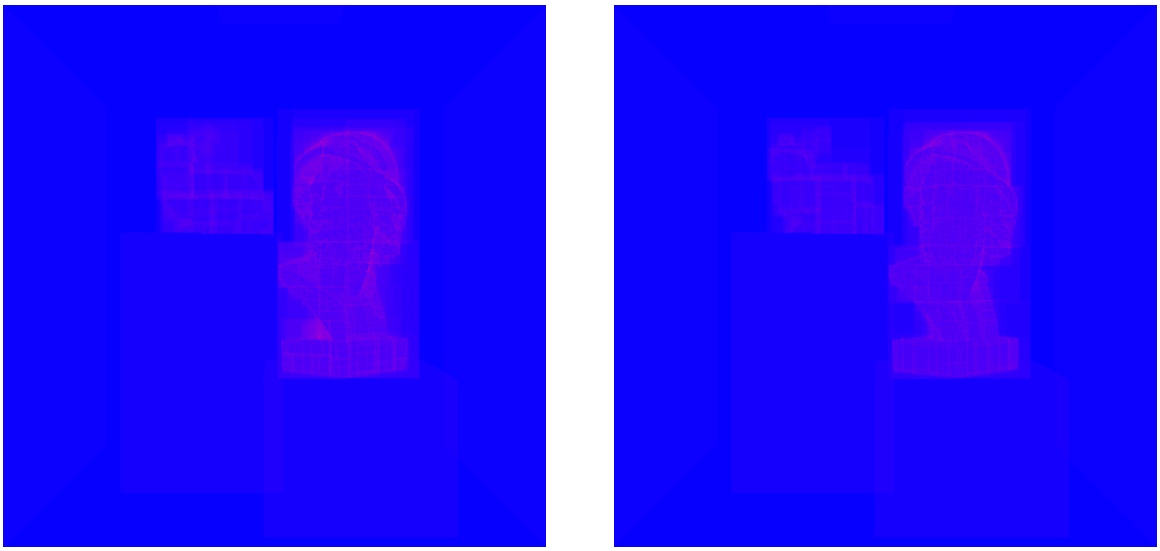
1 Tasks Implemented

I implemented the following (45 or 50 points in total, depending on the final benchmark):

- BVH Building + Traversal (40 or 45 points)
  - I implemented BVH with the Surface Area Heuristic on a triangle soup of all mesh triangles.
  - I made some small optimizations on the last day which I believe will get me to 45 points, but not sure. Otherwise, in the benchmarks so far, I am on 40 points.
- Ray-AABB intersection counting (5 points)

2 Bonus Tasks

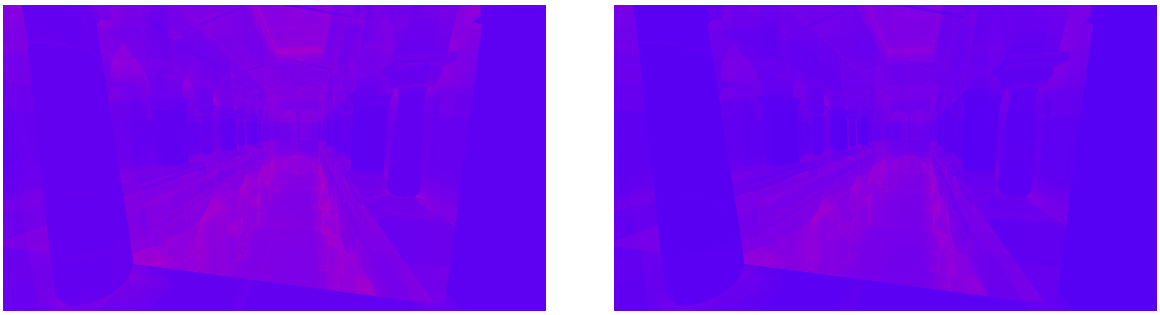
I implemented ray-AABB intersection counting. Since I implemented the BVH traversal in a for loop with a stack myself, the number of ray-AABB intersection checks for a given ray is equal to the number of elements that get inserted into this stack. Figures 1, 2, and 3 compare some results.



(a) Median Heuristic: 47421096

(b) SAH: 40791056

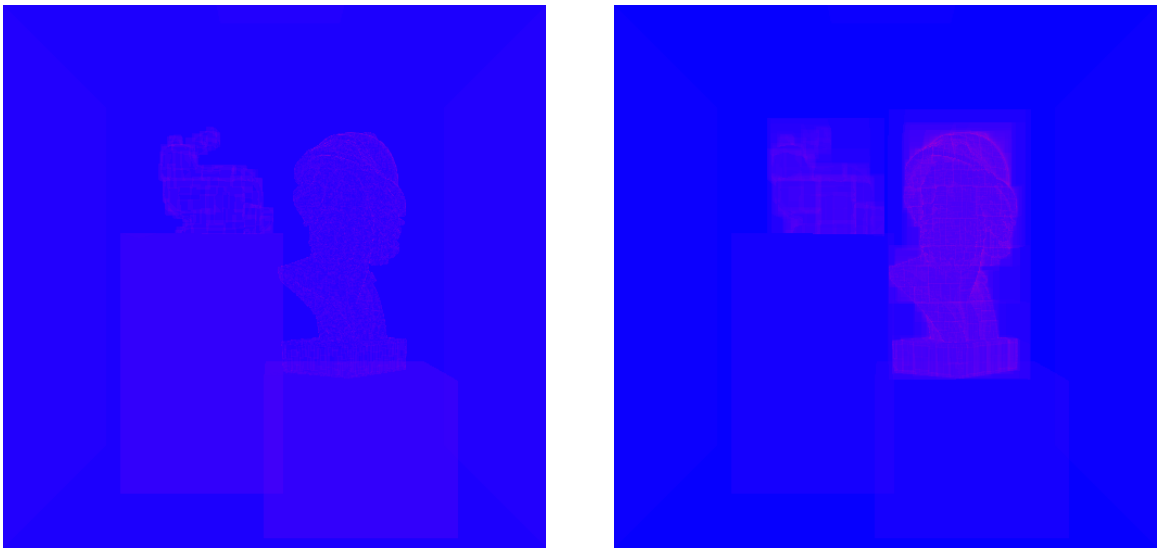
Figure 1: Number of ray-AABB intersections in total for the cbox ajax bunny scene. We compare Median and SAH Heuristic for the BVH. As expected, SAH is better.



(a) SAH, 10: 1224736128

(b) SAH, 50: 1118394112

Figure 2: Number of ray-AABB intersections in total for the sponza scene. We compare two variants of SAH: number of triangles in a leaf node less than 10 or less than 50. The latter has fewer intersections, but each leaf node is larger, so not necessarily faster.



(a) Triangle Intersections: 66745720

(b) Bounding Box Intersections: 40791056

Figure 3: Number of ray-triangle intersections vs. ray-AABB intersections in total for the cbox ajax bunny scene. Even though the number of bounding box intersections around complex objects is higher, the total number is higher for triangle intersections, since in the less busy but large areas of the scene we will probably only hit one triangle, but a few bounding boxes in any case.