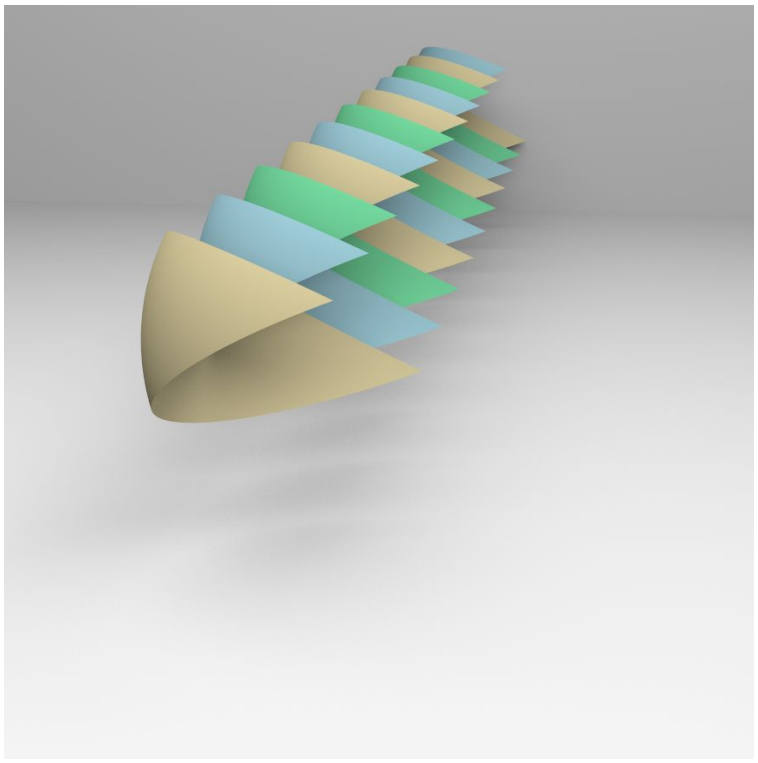
CGRA 408 Project 2

Core 1: Partial Sphere Bounding Box

For the partial sphere bounding box this is implemented in src/shapes/sphere.cpp in Sphere::ObjectBound(). For profiling this change the following scene was used:



The use of the correct bounding box decreases the render time of this image by 10 seconds.

Core 2: 3D Solid Texture

The solid texture for a tree trunk with age rings is implemented in src/textures/trunk.cpp and trunk.h. The texture allows for the number of rings, ring smoothness and detail to be modified. The spectrum for both the base wood and the rings is also configurable. The direction of the trunk can also be controlled, as is demonstrated in the teapot below. Note that the direction of the trunk is at an angle to the axis of the teapot. This basis can be controlled in the texture specifications. The full specification for this texture follows:

```
Texture "wood_texture" "color" "trunk"
        “float rind_smoothness” [8]
        "float ring_count" [24]
        "float ring_variation" [4]
        "float variation_resolution" [4]
        "spectrum trunk …”
        "spectrum rings…”
        "point trunk_center" [15 1.5 10]
        "vector trunk_up" [0 0.8 0.6]
```

Extension: New Accelerator

For the extension an octree acceleration structure has been implemented in src/accelerators/octree.cpp and octree.h. The octree can be enabled with:

```
Accelerator "octree" "integer leaf_size" [25]
```

The octree takes a property “leaf_size” which determines the max size for a leaf. The above wooden teapot is rendered using the octree.