COL781
Assignment 1 Part 2
REPORT

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1. Introduction:

a. The objects implemented are – plane, sphere, polygon, parallelopiped, quadric, mesh. One can specify the scenery using a JSON file, the view window height and width as well as the resolution.

b. The code is optimized with multithreading exploiting the embarassingly parallel nature of the raytracing problem.

c. Objects are augmented using affine transformation and translation. This transformation can be universally applied to any object, and can be used to warp, rotate, shear and translate.

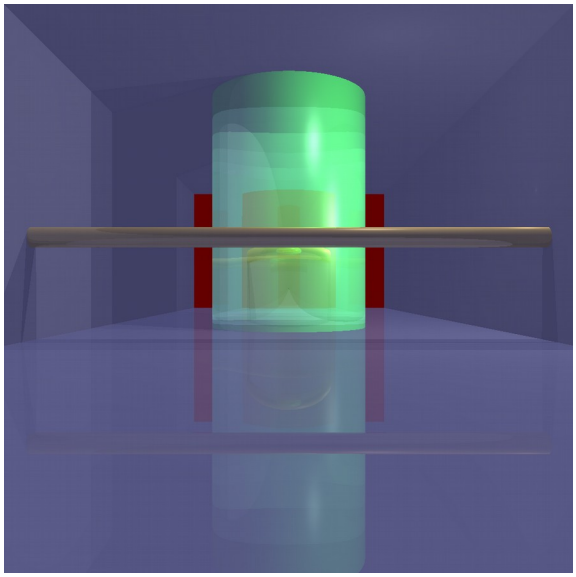
d. Texture mapping is implemented for box, mesh, sphere, cylinder.

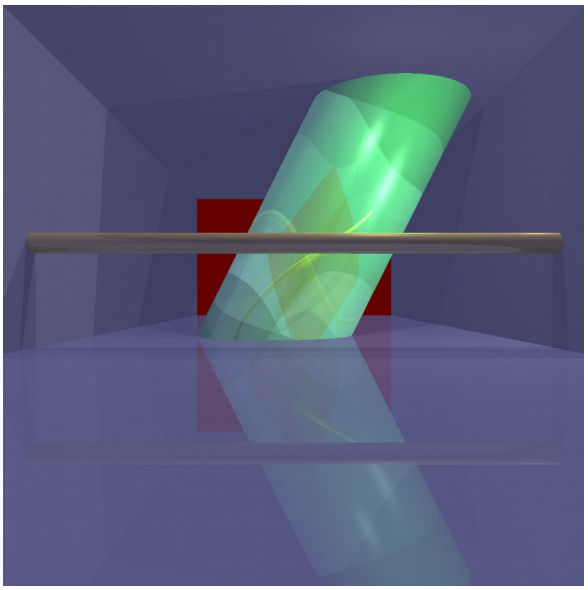
e. OpenGL simulation is done, in which we can see the objects, image plane, camera, light sources and queried rays.

Some examples:

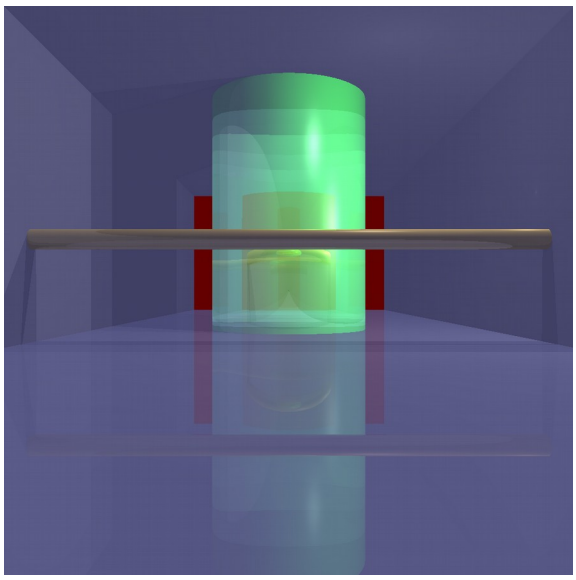
Transformation:

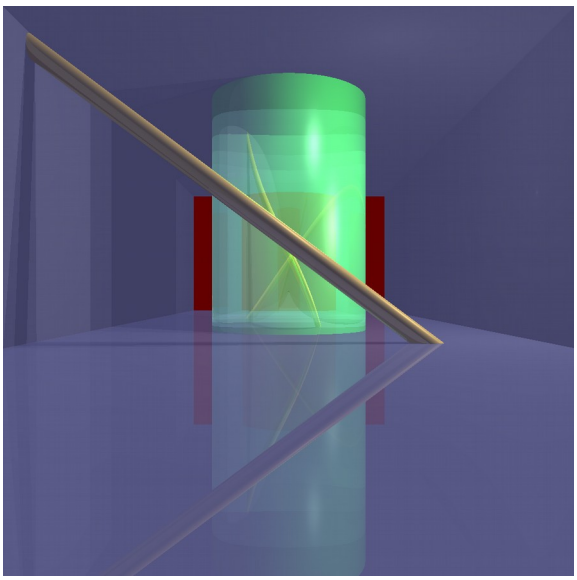
Shearing of cylinder



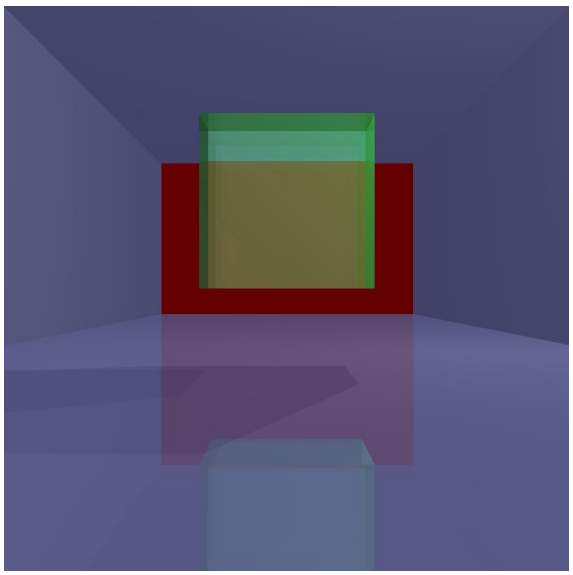


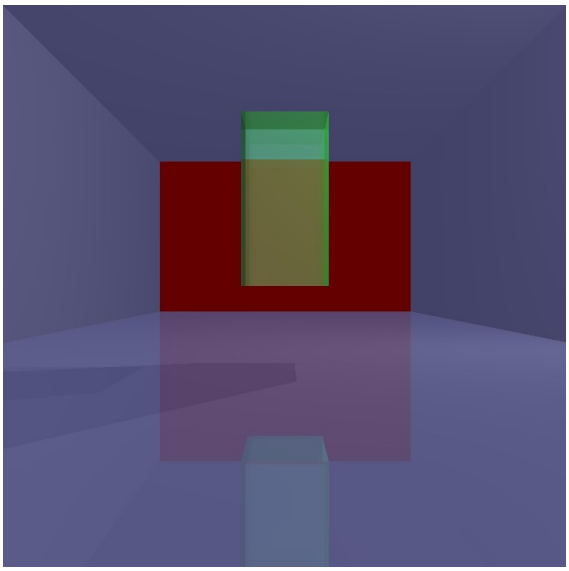
Rotation of cylinder



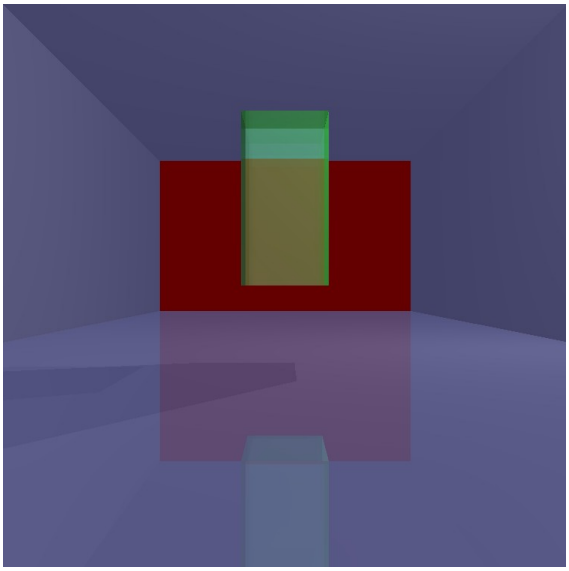


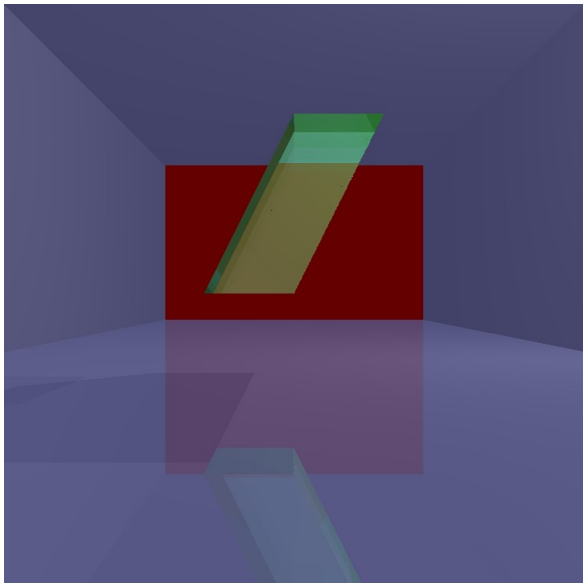
Shrinking box by factor of 2 along Y axis



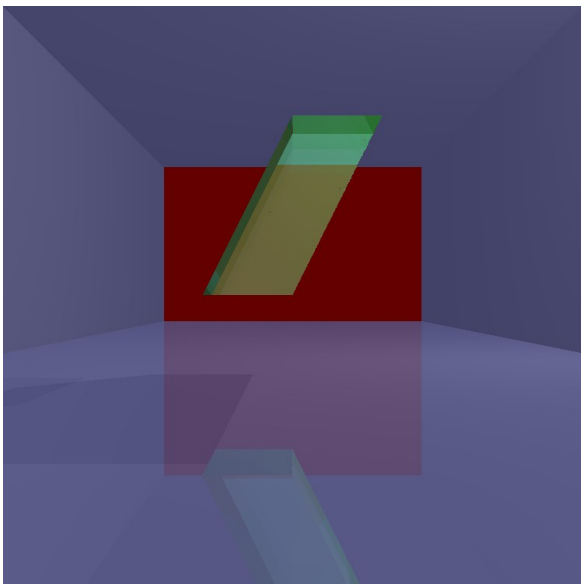


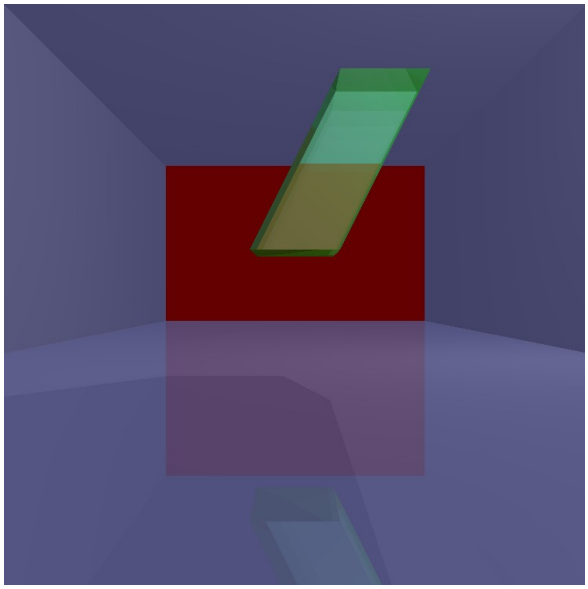
Shearing of box



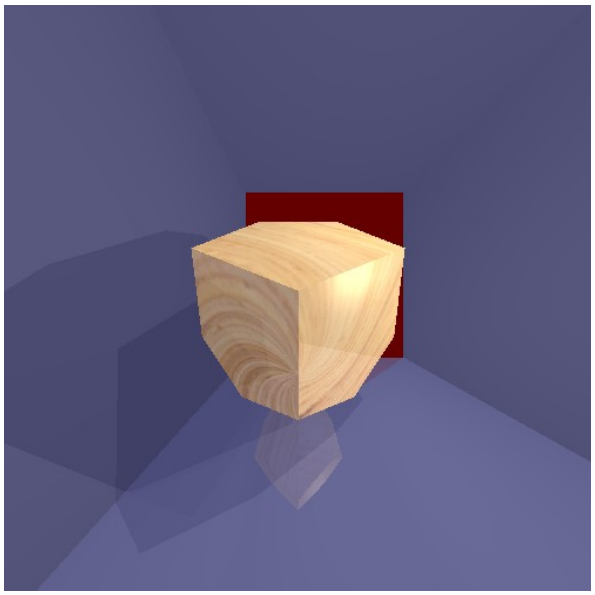


Translation of sheared box aloing X and Y axes

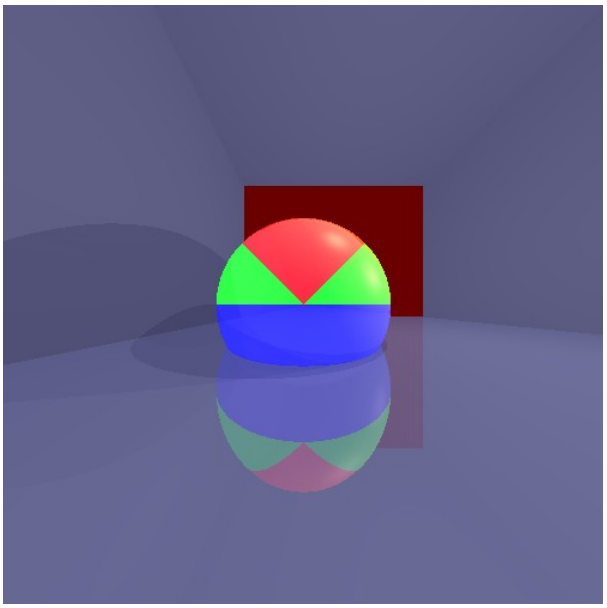




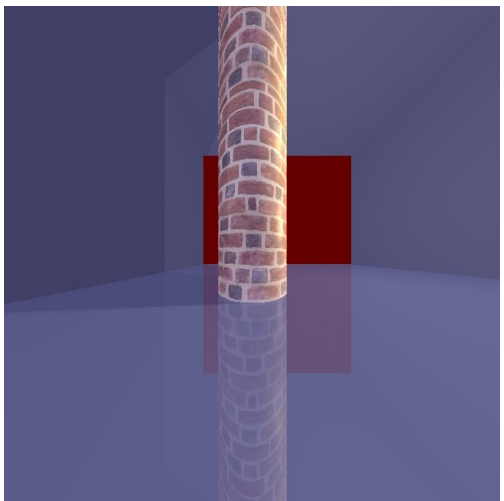
Dodecahedron mesh with texture mapping



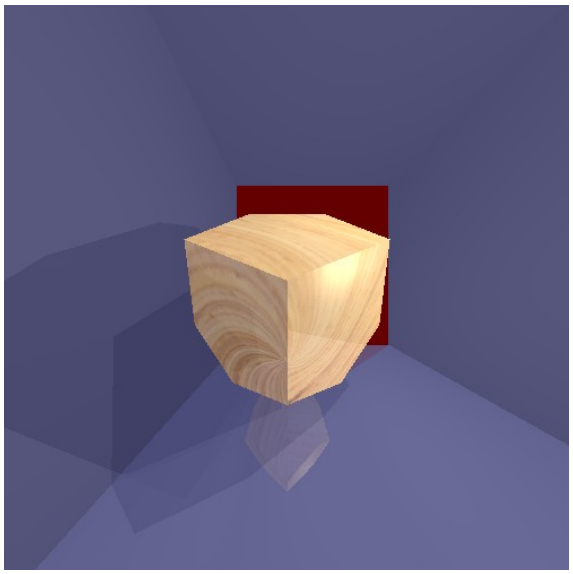
Sphere with texture mapping

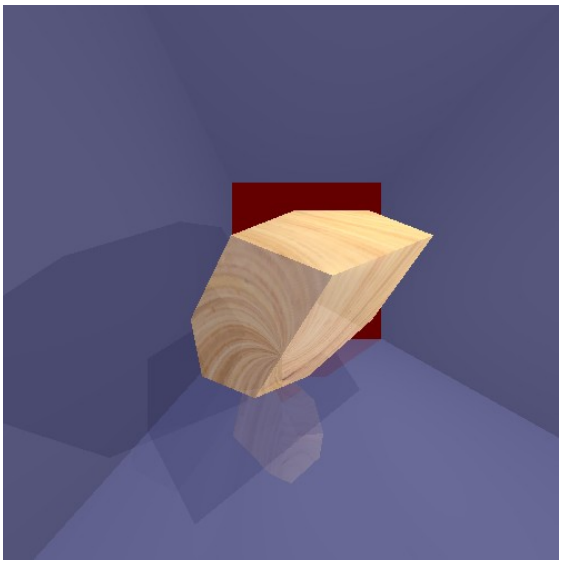


Cylinder with texture mapping

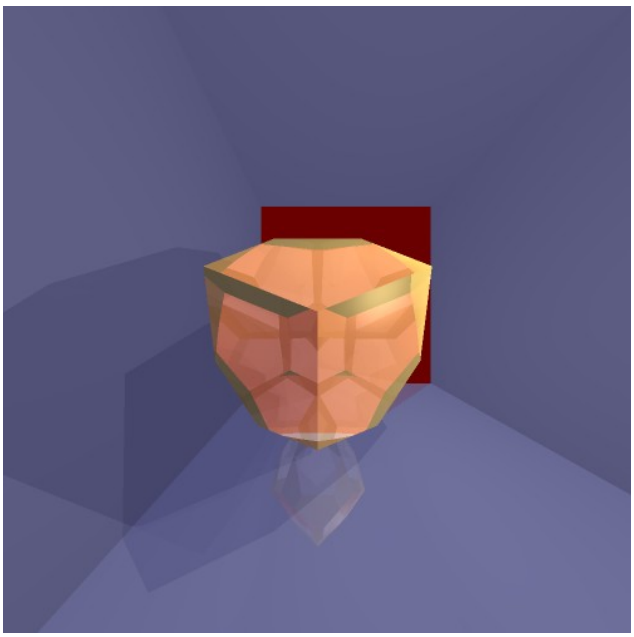


Affine transformed dodecahedron mesh with texture mapping

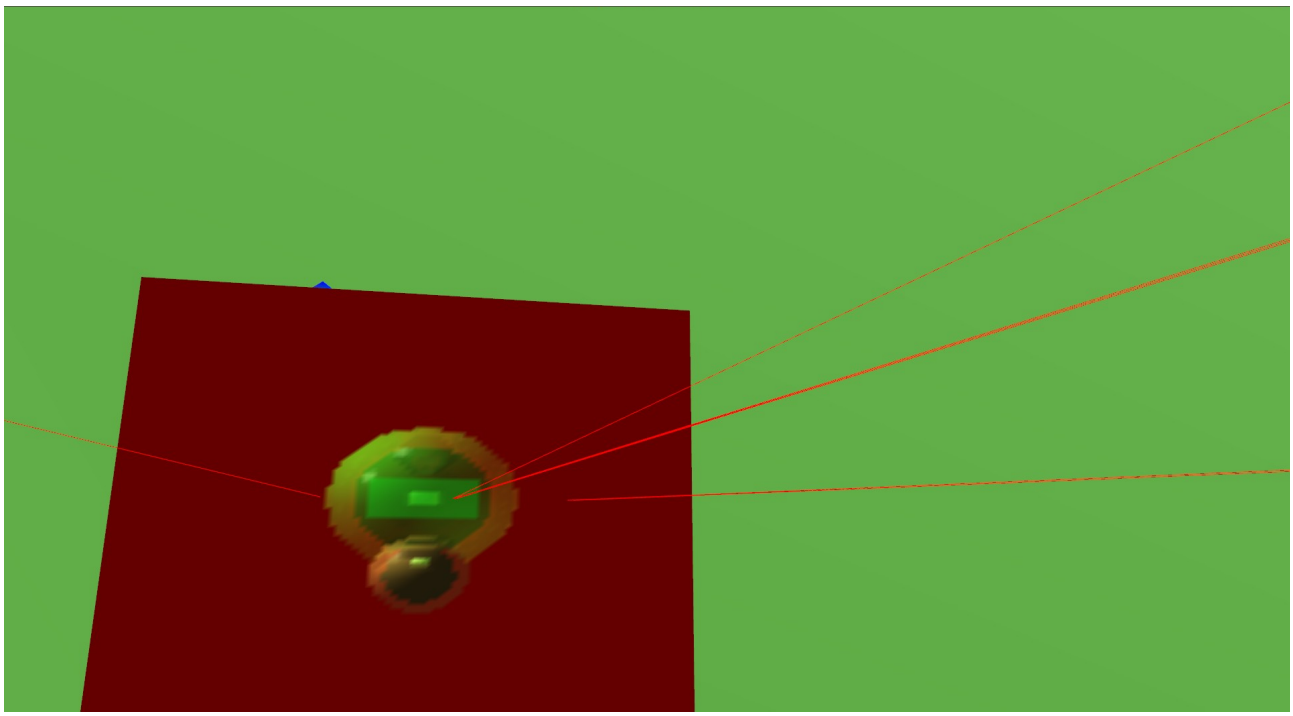




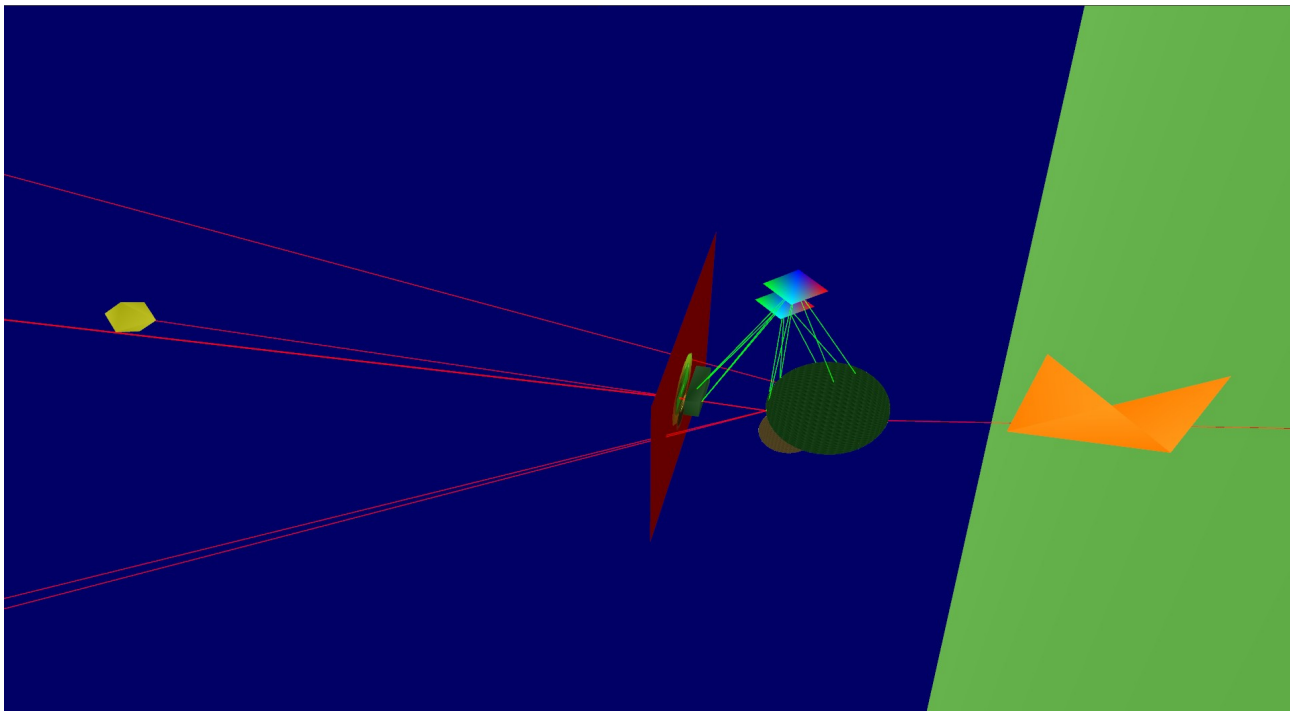
Dodecahedron mesh with refraction and reflection



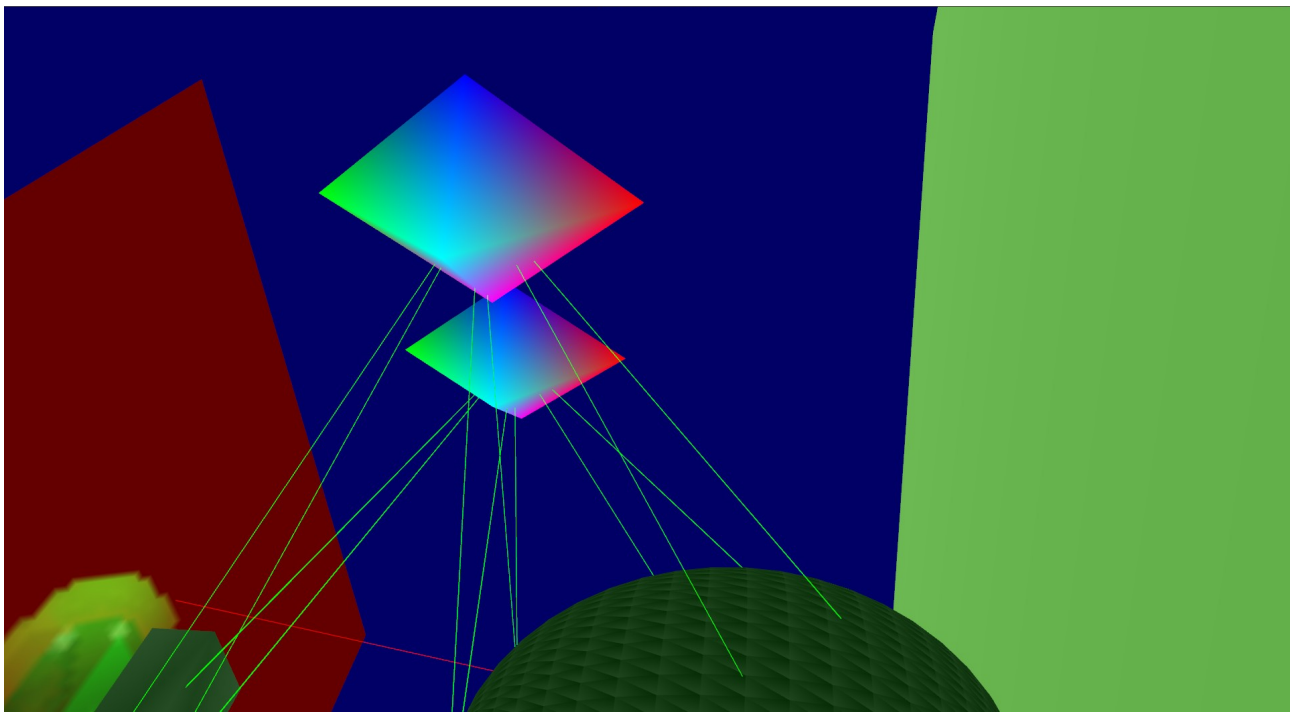
Some snapshots of interactive simulation in OpenGL:



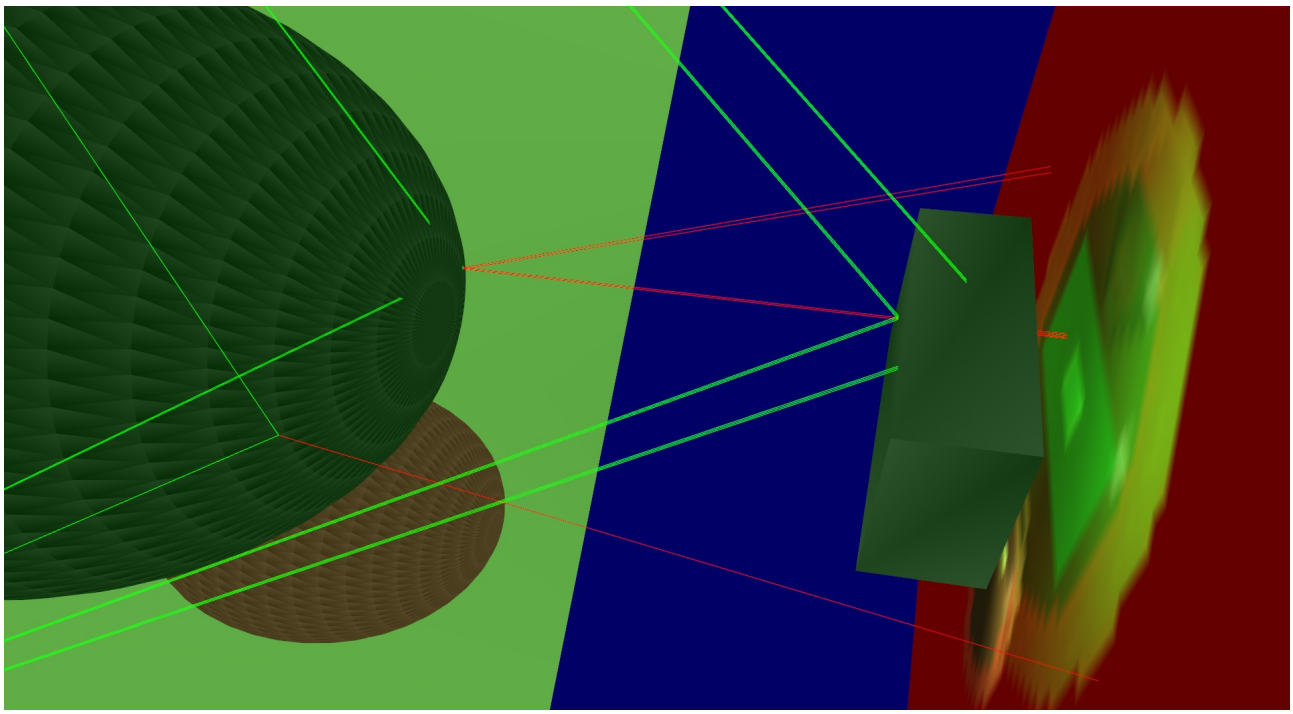
Facing the view plane

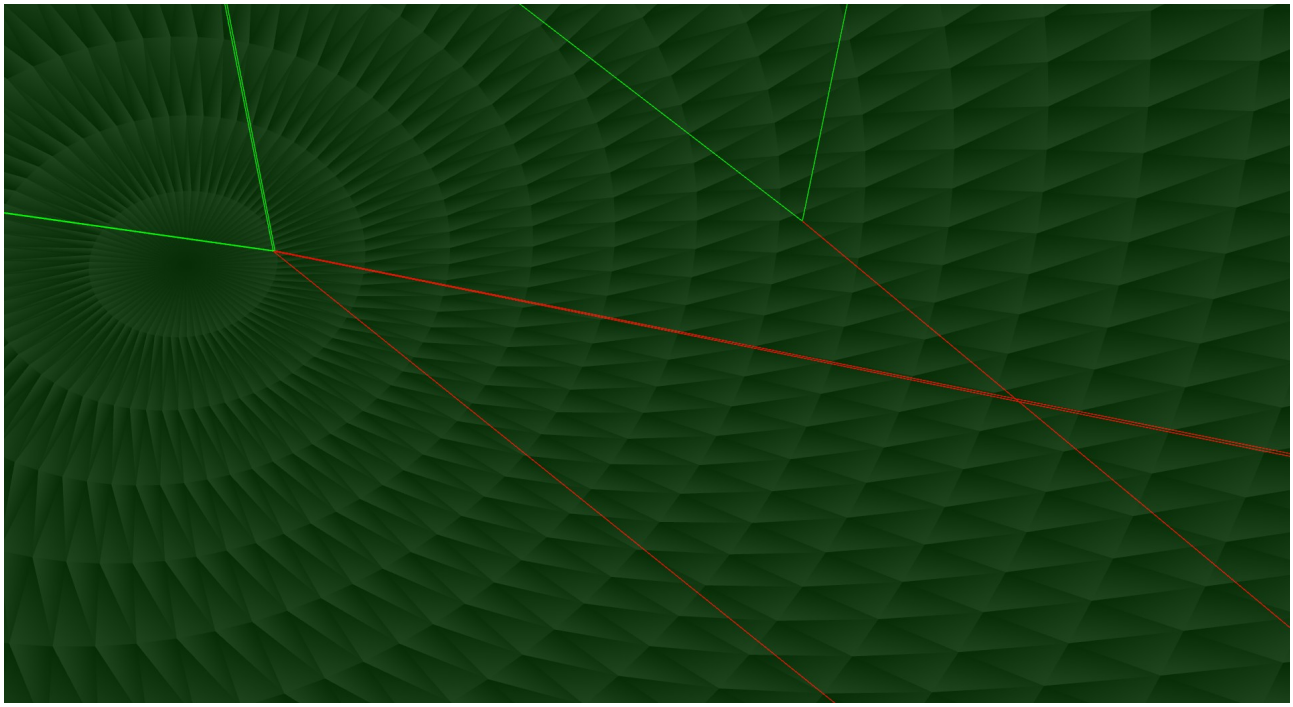


Overall scene:
1. Yellow object is camera.
2. Multicolored objects are light sources.
3. A cuboid, two spheres and a polygon are pictured.



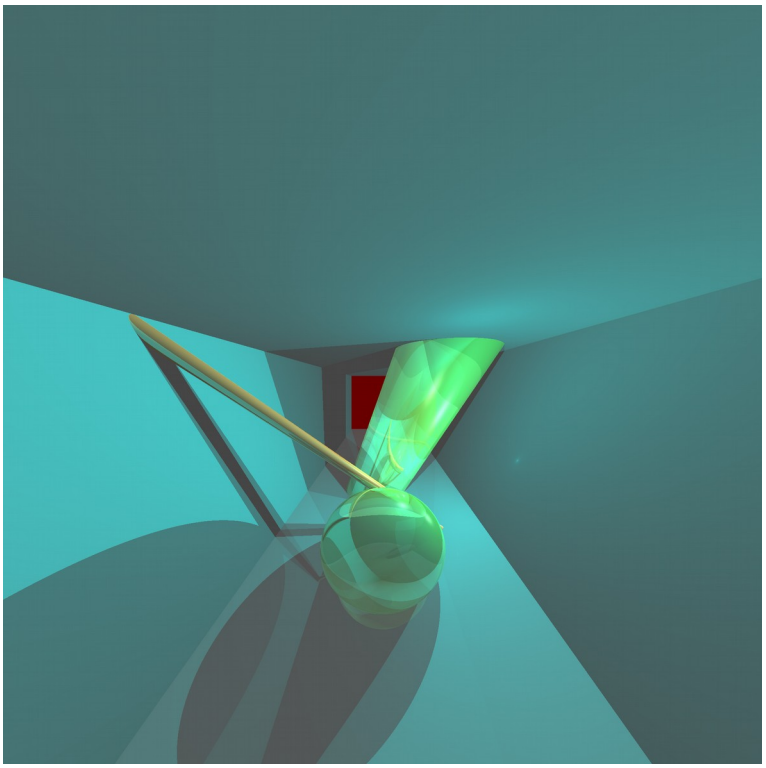
Close up of shadow rays (green).

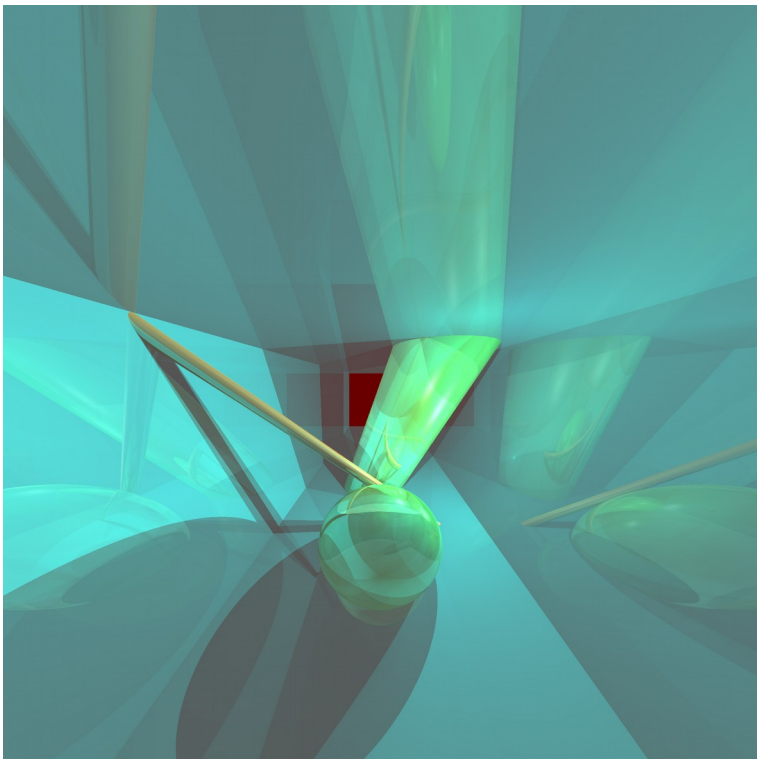




Inside the green sphere.

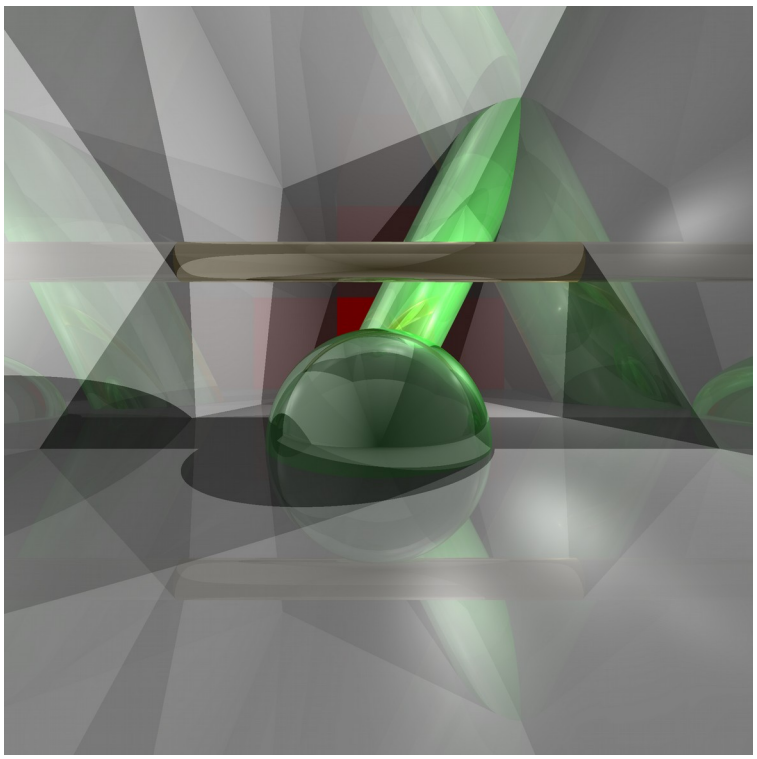
Miscellaneous examples:

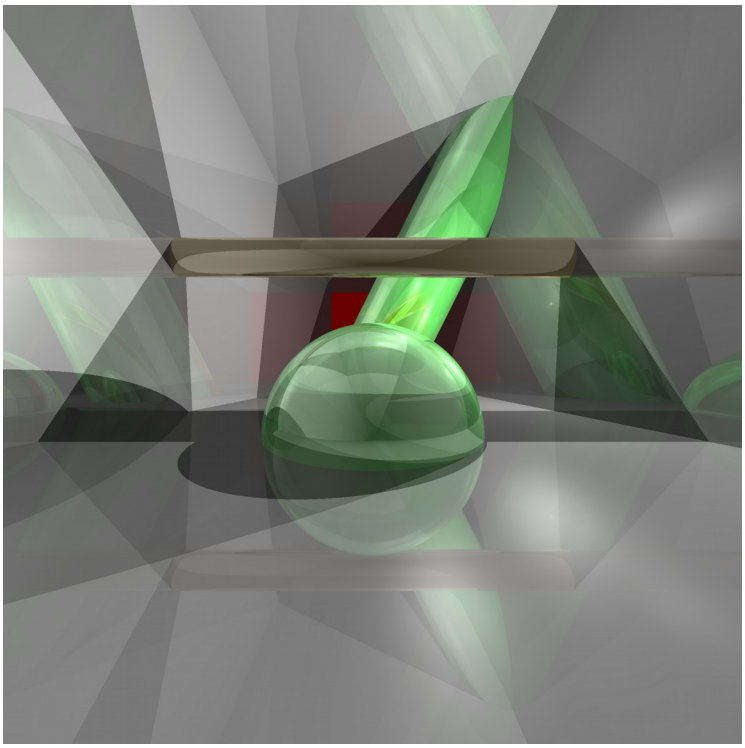




Walls with and without reflection

Sphere with and without transparency





Affine warp of sphere