Lecture 8: Ray tracing

(1) Note that from Equation

$$\mathrm{dir}_{\mathrm{rc}} = -Nn + W\left(\frac{2c}{nCols} - 1\right)u + H\left(\frac{2r}{nRows} - 1\right)v$$

that along a scan line, the direction of one ray can be found incrementally from that of the previous one by means of a single vector addition: Express $\mathrm{dir}_{r,c+1}$ by $\mathrm{dir}_{r,c}$.

(2) When and where does the ray (20-t, 8-2t, 3+t) hit the plane created in SDL by: translate 4 5 6 rotate 90 1 0 0 plane?

(3) Write the routine xfrmRay() that hit() uses to transform a ray into the generic coordinates of a sphere. Given careful attention to the difference between transforming a point and a vector.

(4) Implementation of hit() for the tapered cylinder.

(5) Implementing the generic box extent test. Adjust the Cube :: hit() method to develop the routine bool rayHitsBoxExtent(ray& ray, Cuboid& cub) that tests whether the given ray intersects the extent described in cub. This entails simplifying hit() without altering its logic. Show how the numer and denom values needed for each plane of the box depend on the data in cub. As each plane of the box is intersected by the ray, the candidate interval (t_{in}, t_{out}) is updated, and if the interval vanishes, an early out occurs and the test returns true.