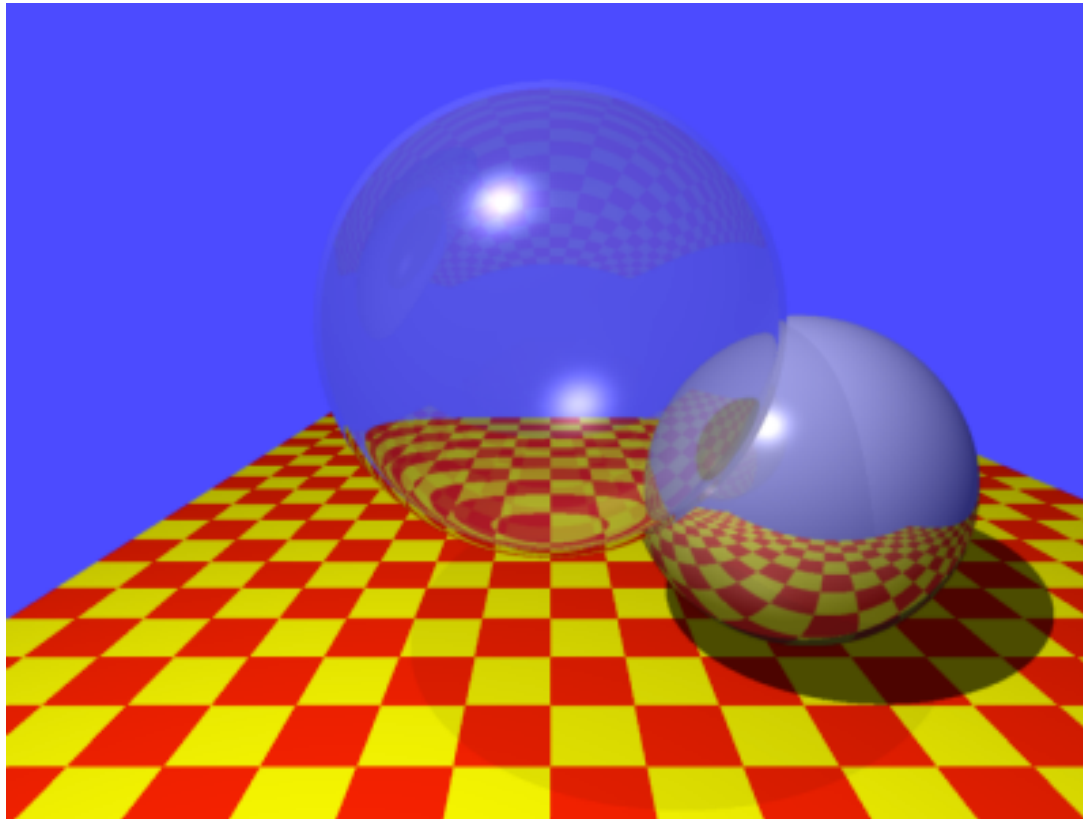


11 - raytracing

3 approaches to graphics

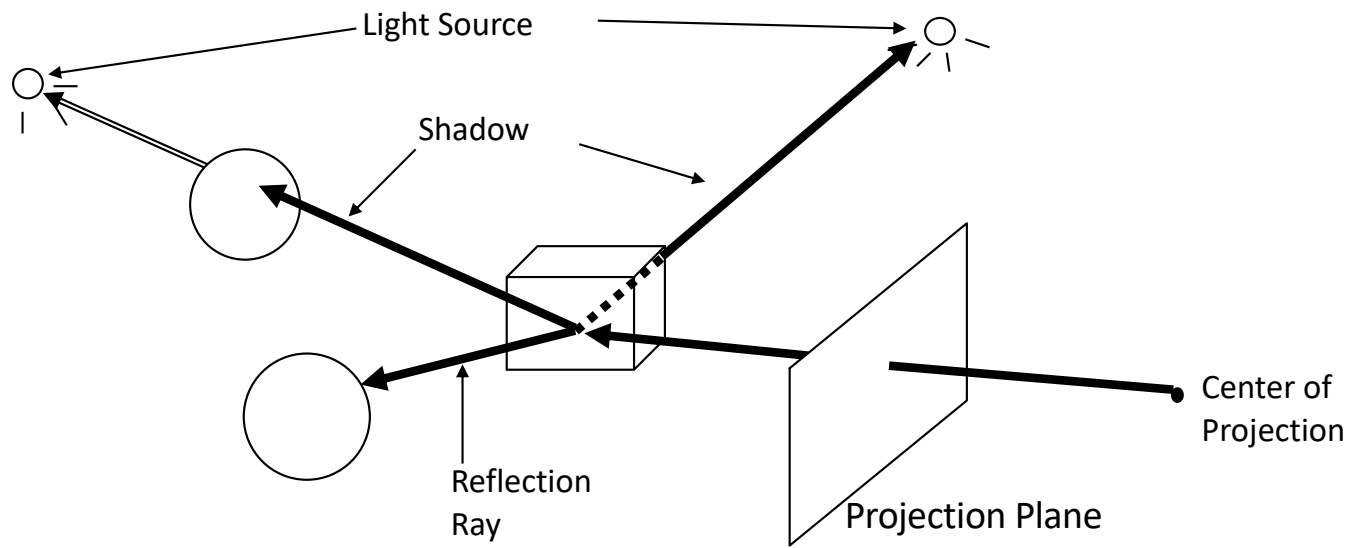
- On-line / “real-time”
 - Immediate mode
 - Retained mode
- Off-line / batch / “slow”

Ray Tracing



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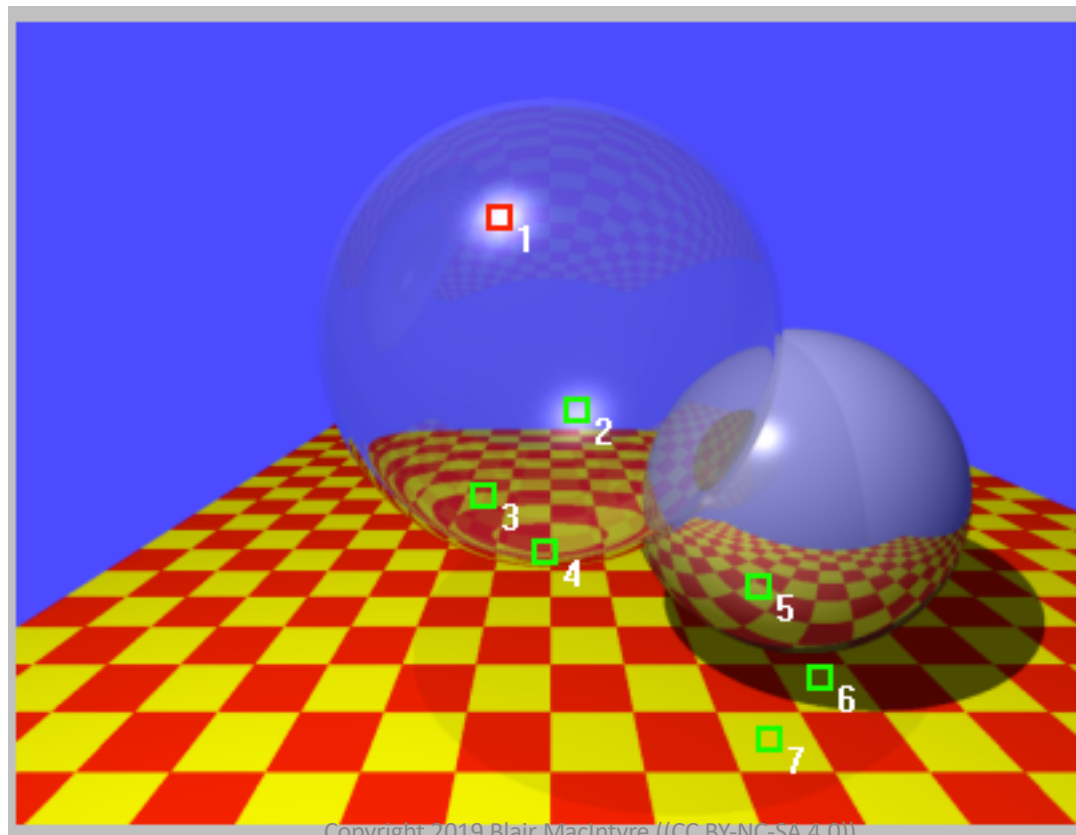
Basic Idea



Basic Algorithm

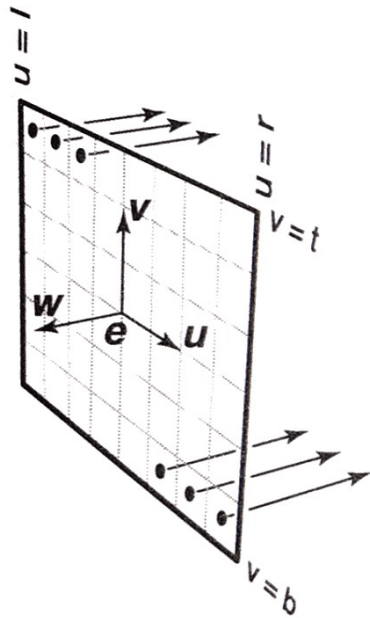
from Alan Watt, *3D Computer Graphics, 3rd Edition, 1999*

The Adventures of 7 Rays

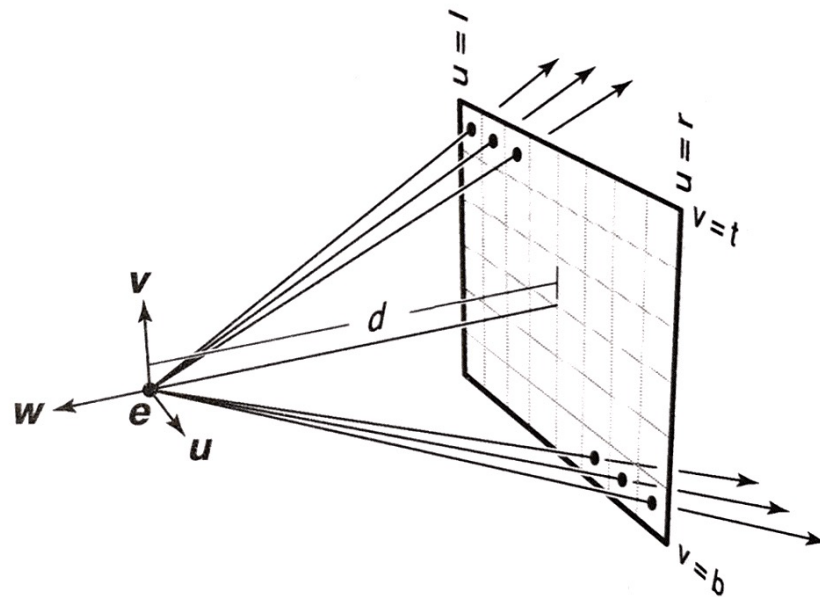


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Projection (Orthographic, Perspective, Oblique)

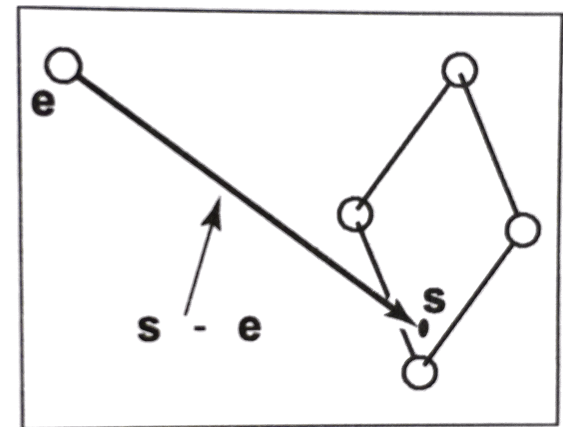
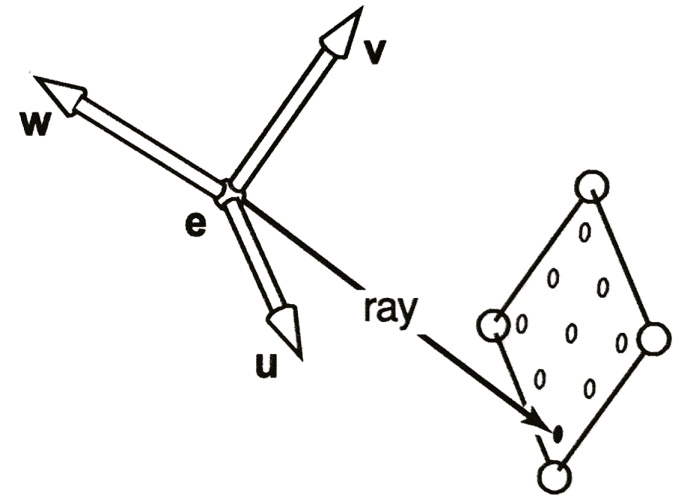
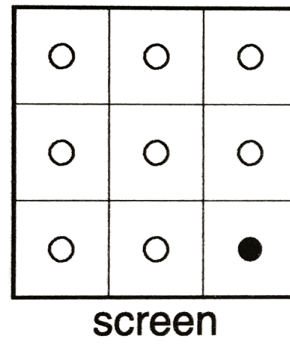


Parallel projection
same direction, different origins



Perspective projection
same origin, different directions

$$p(t) = e + t(s - e)$$



Illumination of a point

$$L = k_a I_a + k_s I_r + k_t I_t \sum_{1 \leq i \leq N} k_d I_i (N \cdot L_i) + k_s I_i (N \cdot H_i)^{p_i}$$

Computing Intersections

Sphere/Ray Intersections

Ray/Plane Intersection