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Ray Tracing Script Revision 1

I. Overview
   A. In computer graphics, ray tracing is a technique for calculating the color of a virtual pixel of an image by calculating the effects of light rays (coming from a virtual light source) on that particular pixel. A ray tracing algorithm involves tracing a path from some imaginary "eye" to each pixel of the image, and calculating the color of that pixel based on what object it represents, that object's properties, and its position relative to the eye and light source.
II. History
   A. Arthur Appel developed first "ray casting" algorithm in 1968
   B. Turner Whitted introduces reflection, refraction, and shadows into a ray tracing algorithm in 1979
   C. Since then:
      1. real-time ray tracing
      2. reflection, refraction, shadows improved
      3. improved time complexity
      4. increased realism
III. How It Works
   A. Examples of images made with ray tracing algorithms
   B. Diagrams
IV. Algorithm
   A. Comprised of basic knowledge of vectors, dot products, cross products
   B. Intersections with basic geometry
      1. Needs an intersection routine for every object, sphere, cube, etc.
      2. When a ray intersects object, the intersection routine returns distance of the intersection point from origin of the ray
   C. Intersections with more complex geometry
   D. Direction of rays
   E. Forward vs. backward ray tracing
      1. from eye to object or from object to eye
   F. Recursion
      1. Use recursion to follow the light path when it bounces around in the environment, can model the reflection and refraction
   G. Color and Shading
      1. Cosine shading: takes cosine of the angle between two vectors to determine the brightness at a point; also the dot product of the two unit vectors; values -1 to 1

        2. Texture mapping is another way to color objects

   H. Adaptive Depth Control

        1. Set a maximum depth or the program will continuously generate rays

   I. Advanced Techniques

        1. Distributed ray tracing

        2. Radiance

V. Conclusion

   A. Where to use ray tracing

   B. Remembering considerations

   C. Advantages and disadvantages of ray tracing