Computer Graphics

Raytracing

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Rendering

Generating an image for a given representation
(3D models in our case)

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The result is called a render

The 3D models, particles, etc. are stored in a scene file

Scene file

The scene file describes the virtual scene and contains:

- Geometry
- Viewpoint
- Texture and colors
- Lighting
- Materials
- Shading
- . . .

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These are defined in a specific language which is read by a rendering program to output a digital image

The challenge

Rendering programs solve rendering equations for each point in the scene

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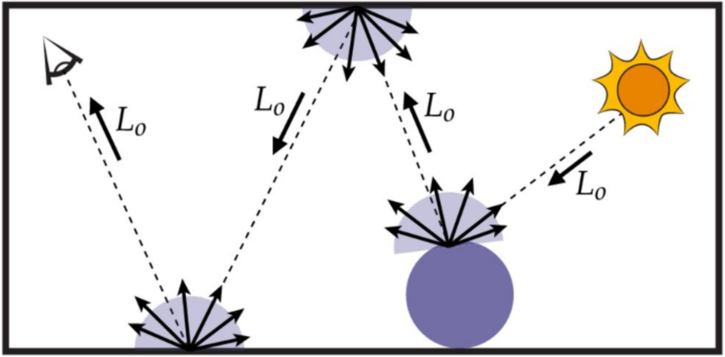

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Photorealism is not always a requirement

In general we just want our images to look nice, and quickly!

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Rendering involves several disciplines:

- Light physics
- Visual perception
- Aesthetics
- Mathematics
- Software engineering
- Algorithmics
- . . .

Rendering techniques: rasterization

Find the image pixels affected by each primitive, and modify them

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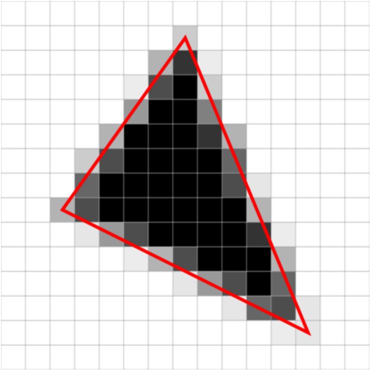

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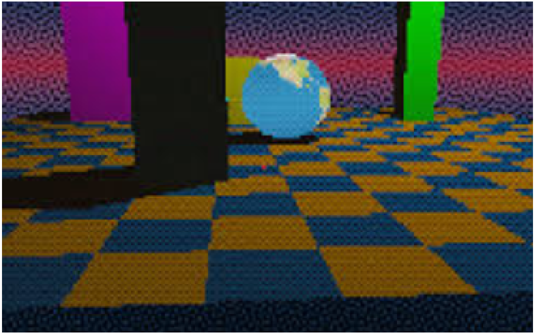
For 3D models, it's just the mapping from scene geometry to pixels, does not prescribe a particular way to compute the colors



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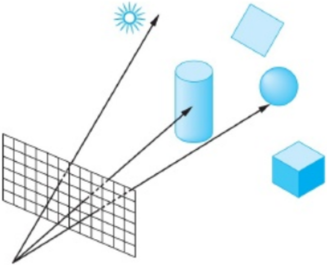
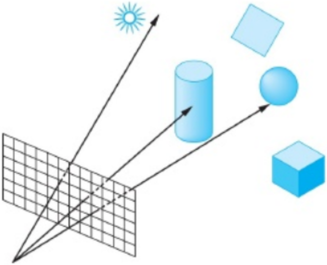
Rendering techniques: ray casting

- Cast straight rays from the point of view



Rendering techniques: ray casting

- Cast straight rays from the point of view
- If something is intersected, compute color



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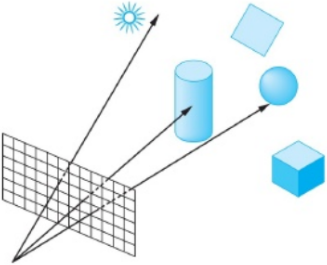
- Rays do not bounce off surfaces
  So no reflection, no refraction, no decaying shadows, etc.



Rendering techniques: ray casting

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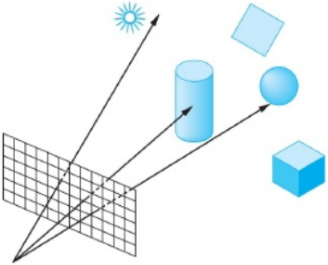
- If something is intersected, compute color
- Rays do not bounce off surfaces
  So no reflection, no refraction, no decaying shadows, etc.
- Color depends on distance, angle of incidence, etc.



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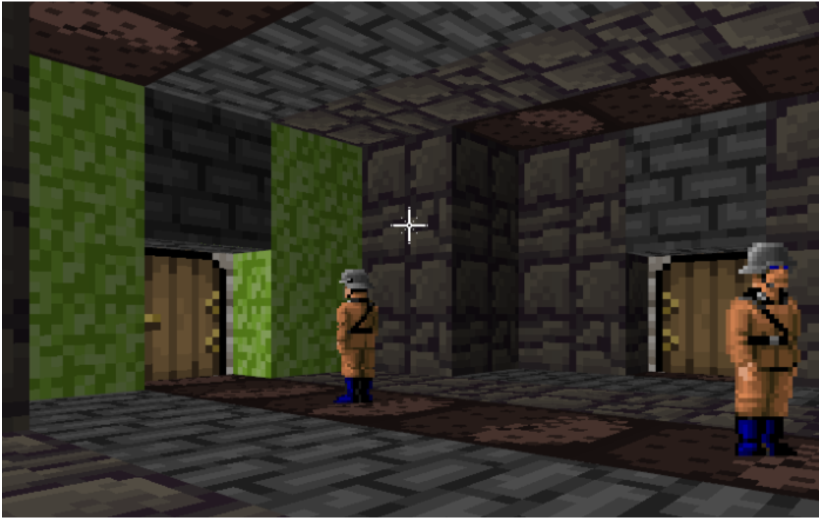
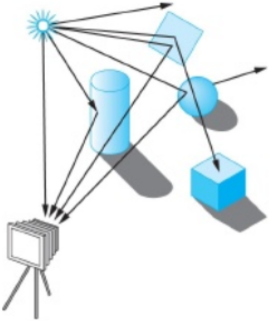


Rendering techniques: ray tracing

- Follow ("trace") rays of light from light source to viewer



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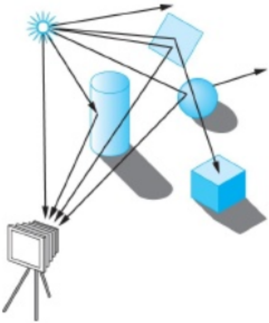
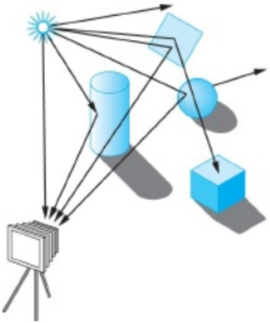
  Can account for reflection, dispersion, aberration, etc.



Rendering techniques: ray tracing

- Follow ("trace") rays of light from light source to viewer
- If something is hit, simulate physical behavior (including bounces)
  Can account for reflection, dispersion, aberration, etc.
- Better visual realism, higher computational cost



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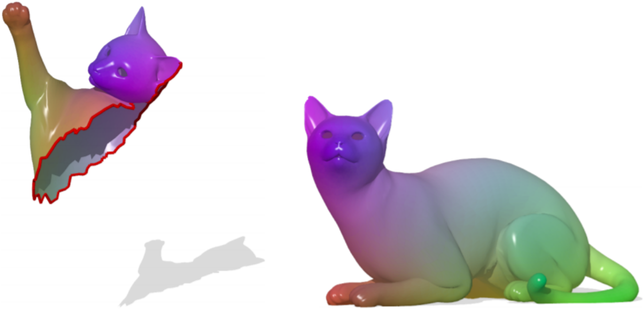
Pov-RAY

Exercise: Raytrace previous examples

Pick an example or exercise from the previous lectures, and reproduce it in POV-Ray.

Use materials and lights as you like.

Do a nice rendering!



Send me the .png image + the POV-Ray code