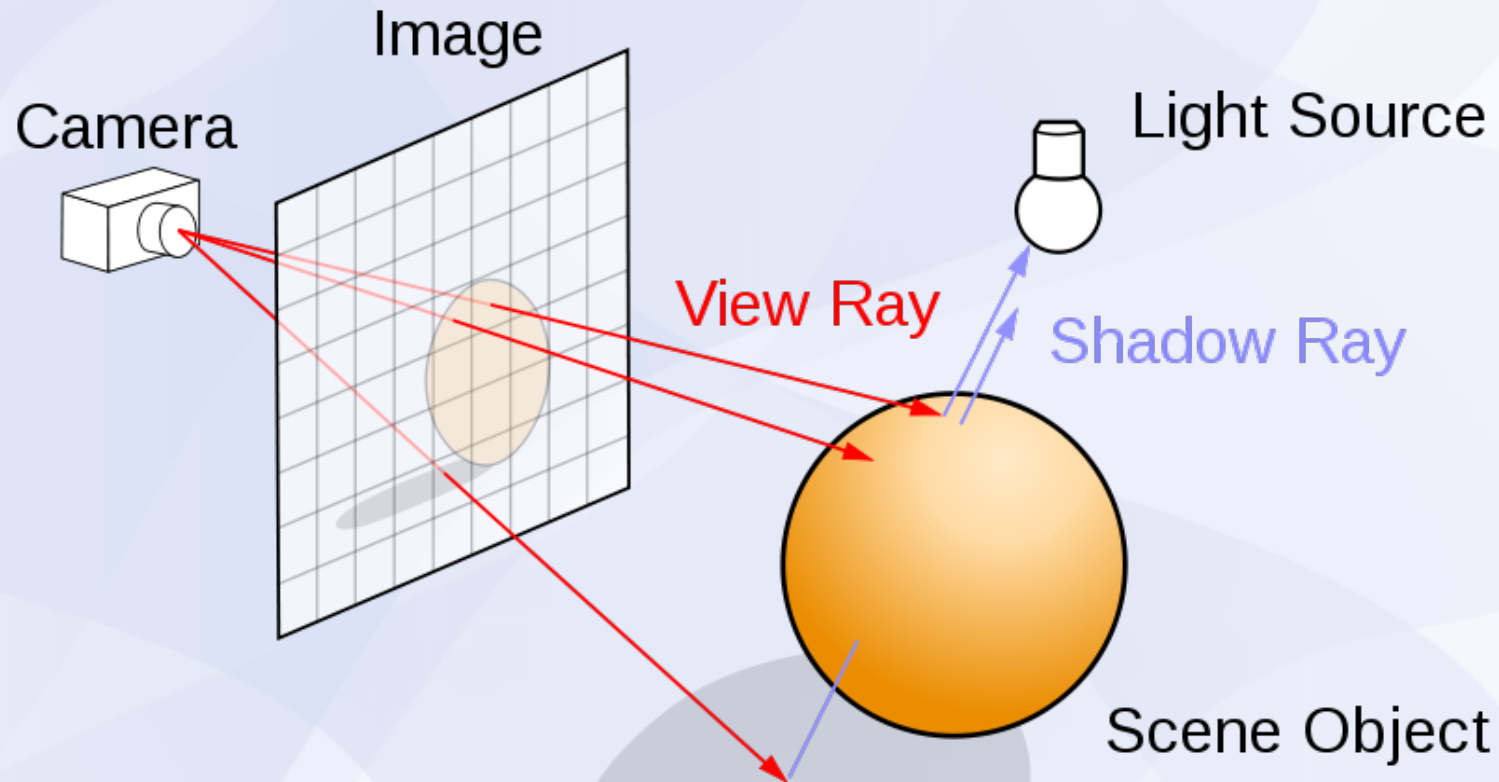


CS420 Assignment 3 Hints

Ray Tracing



Step 1: send rays



- Send out rays from camera position $(0,0,0)$ pointing to $-z$
- Image size 640x480
 - For debugging, use smaller size

- Send out rays from camera position $(0,0,0)$ pointing to $-z$
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Step 2: Intersect with scene

- Sphere & triangle
- Analytical solution

Debugging

- Do step by step
 - Intersect with sphere, test code
 - Intersect with triangle, test code
 - Compute sphere color, test code
 - Compute triangle color, test code

Tips

- Ensure $B \neq 0$ when dividing A / B
- Before calling $\text{sqrt}(x)$, make sure $x \geq 0$
- Remember to normalize the direction vector
- Remember to check $\text{len}(\text{dir}) \neq 0$ before dividing by the length

Tips

- Distinguish between normals:
 - normal of a triangle
 - vertex normal
 - normal interpolated from vertex normals

Tips

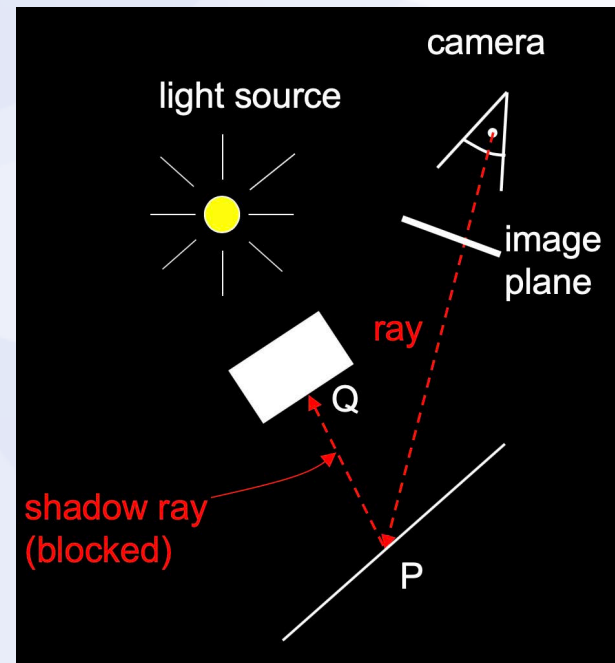
- Floating-point operations are not accurate:

A shadow ray is "blocked" only if

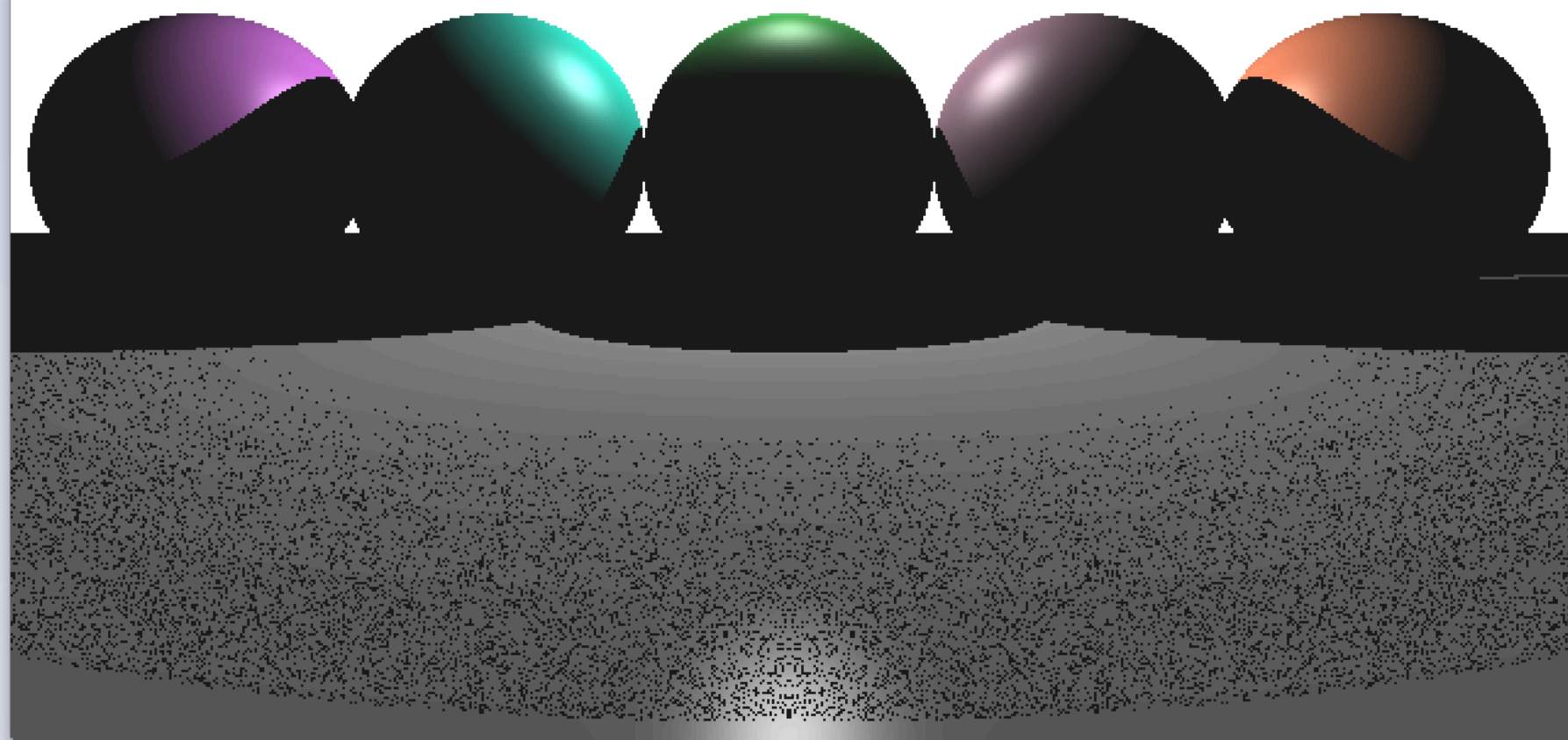
$\text{dist}(P, Q) > \text{smallValue}$

(as opposed to:
 $\text{dist}(P, Q) > 0$)

- Otherwise, artifacts appear... (see next image)



Ray Tracer



Extra Credits

- **Super-sampling**
 - anti-aliasing
 - can do adaptively: if some region is smooth, no need to super sampling
- **Ray tracing**

$(1-ks) * \text{localPhongColor} + ks * \text{colorOfReflectedRay}$
- You can also add refraction

Extra Credit (Cont'd)

- Animation
- Soft shadows
- Parallel computing for faster rendering
 - OpenMP: utilize multi-core CPUs
 - Cuda: use GPU to do parallel computing