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 \(-z\)
• Image size 640x480
  • For debugging, use smaller size
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 $\sqrt{x}$, 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 not accurate:
  - When computing shadow rays, use:
    \[ \text{distanceFromLightToFirstObject} < \text{distanceFromLightToTargetSurface} - \text{smallValue} \]
  - Otherwise, artifacts appear… (see next image)
Extra Credits

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

• **Ray tracing**
  \[(1-ks)\times \text{localPhongColor} + ks\times \text{colorOfReflectedRay}\]
  • 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