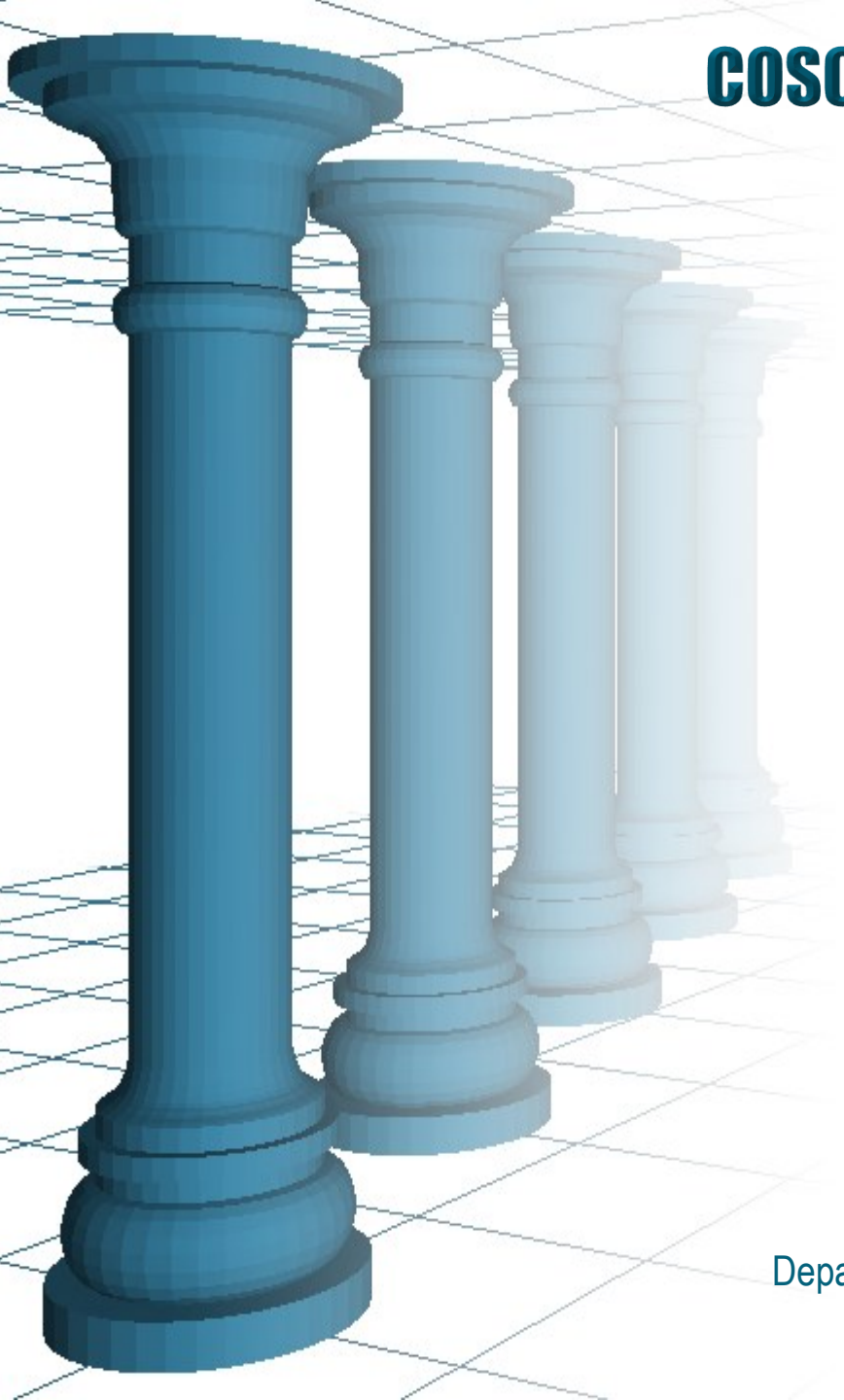

COSC363 Computer Graphics

Assignment-2

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Assignment-2

- Due: 11:55pm, 2 June 2022.
- Maximum Marks: 20
- Assignment handout available on Learn page.
- Your submission must be based off Lab6,7 code. Implementations using shaders, path tracing, photon mapping etc., not allowed.
- Not a group project. Your submission must represent your own individual work
- Students are encouraged to discuss assignment related problems using course forum. However, code segments or any part of your assignment submission should not be posted on Learn.

Assignment Specs

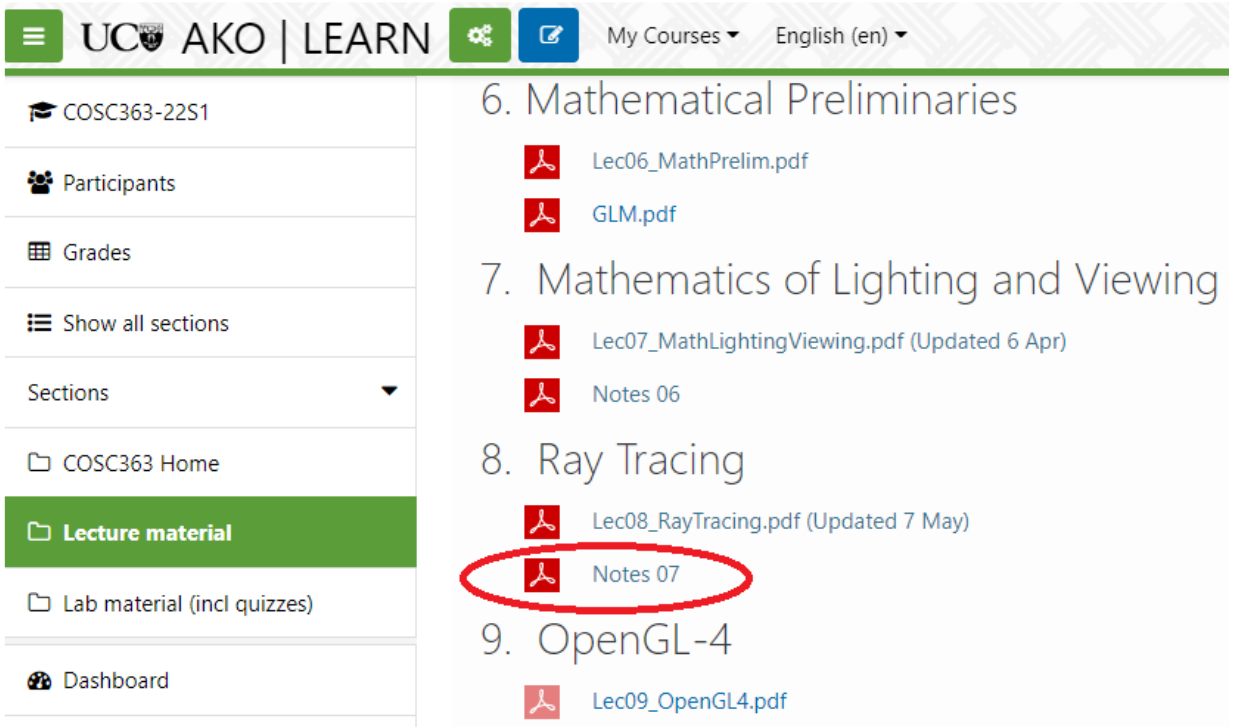
- Minimum Reqs (Max. 10 marks)
  - A good spatial arrangement of objects
  - At least one transparent object (not refractive)
  - Shadows
    - lighter shadows for transparent and refractive objects
  - Object constructed using a set of planes
    - E.g., cube, tetrahedron, pyramid
  - Chequered pattern on a planar surface

Assignment Specs

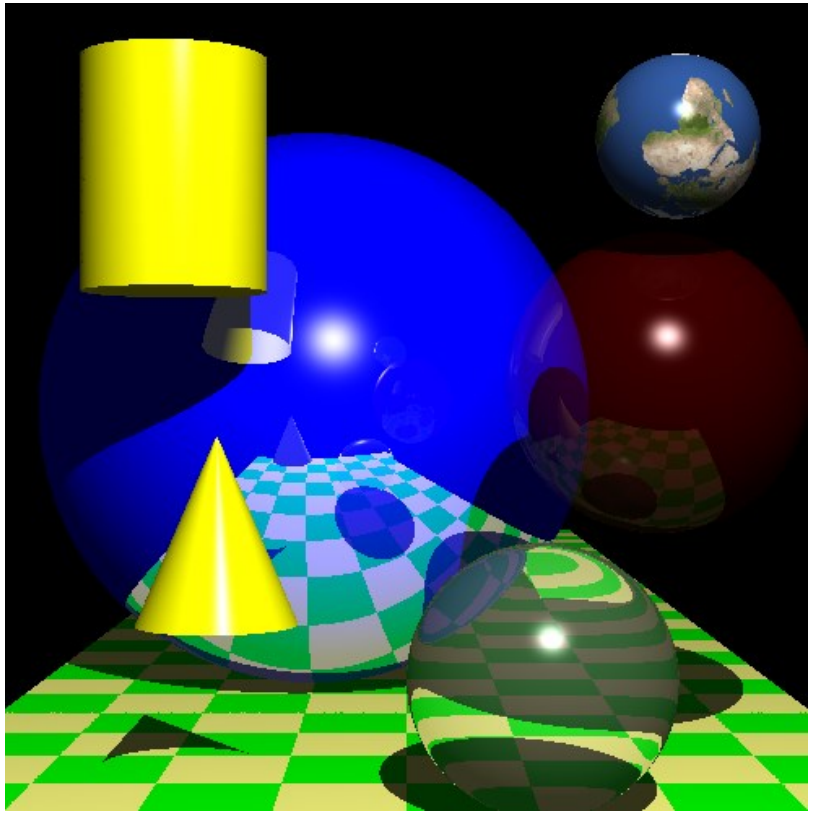
- Extensions (Max. 7 marks)
  - Cone, Cylinder, Torus (?)
  - Refraction
  - Multiple light sources → multiple shadows, specular highlights
  - Spotlight
  - Anti-aliasing
  - Non-planar object textured using an image
    - E.g., textured sphere, textured cylinder.
  - Procedural patterns
  - Fog

Supplementary Notes

- Information on modelling transparency, multiple light sources and shadows, spotlights, and fog can be found in "**Notes 07**" (Note07_RayTracing.pdf) in lecture material section.

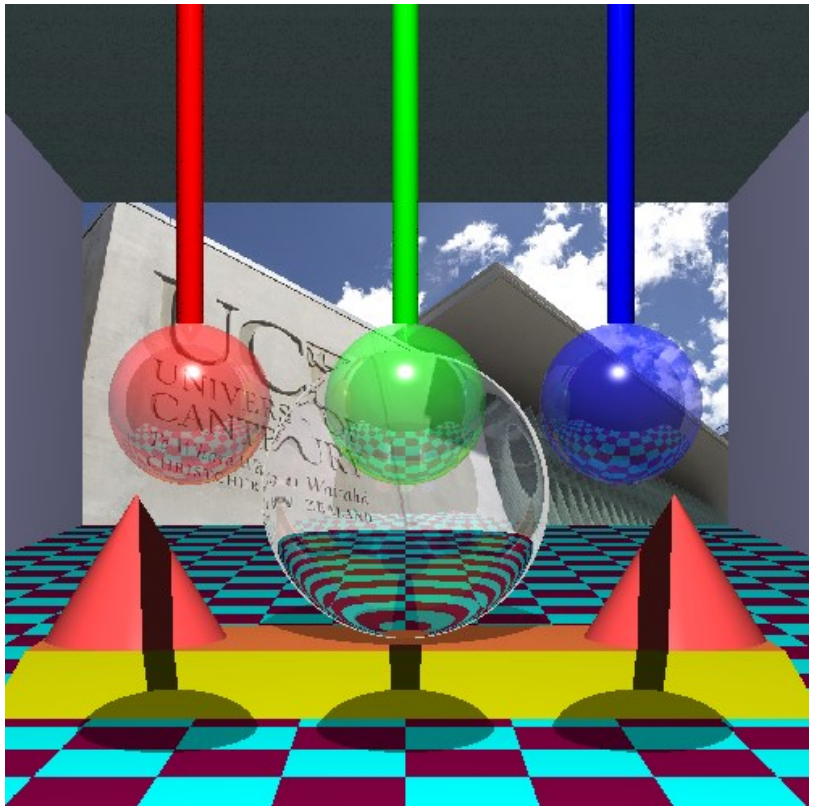


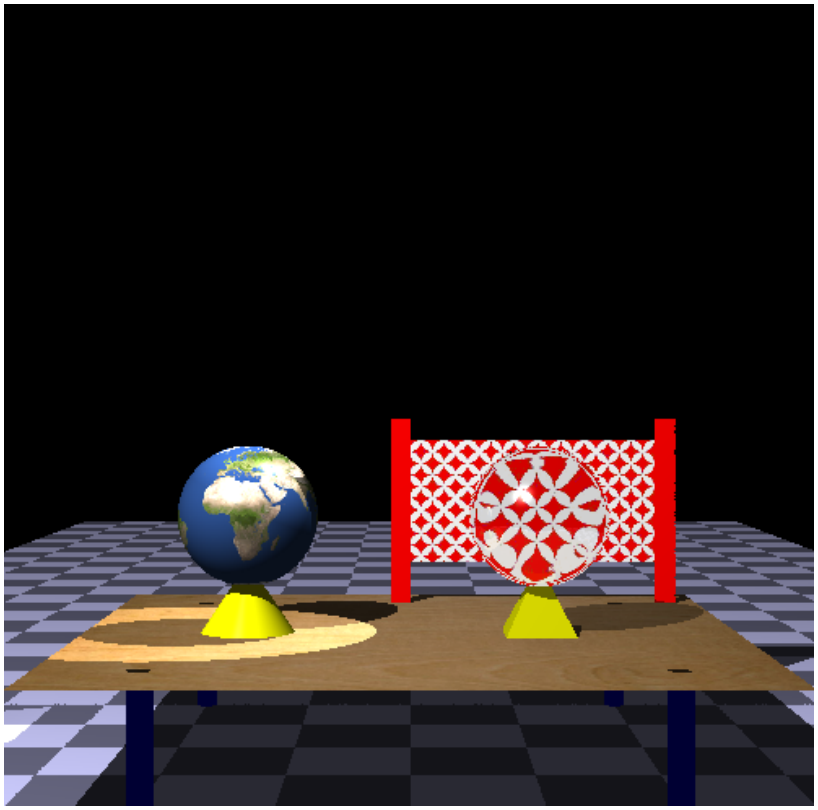
Spatial Arrangement: Bad Design



- Random placement of objects
- Scene clutter
- Incorrect mapping of textures

Good Design: Examples



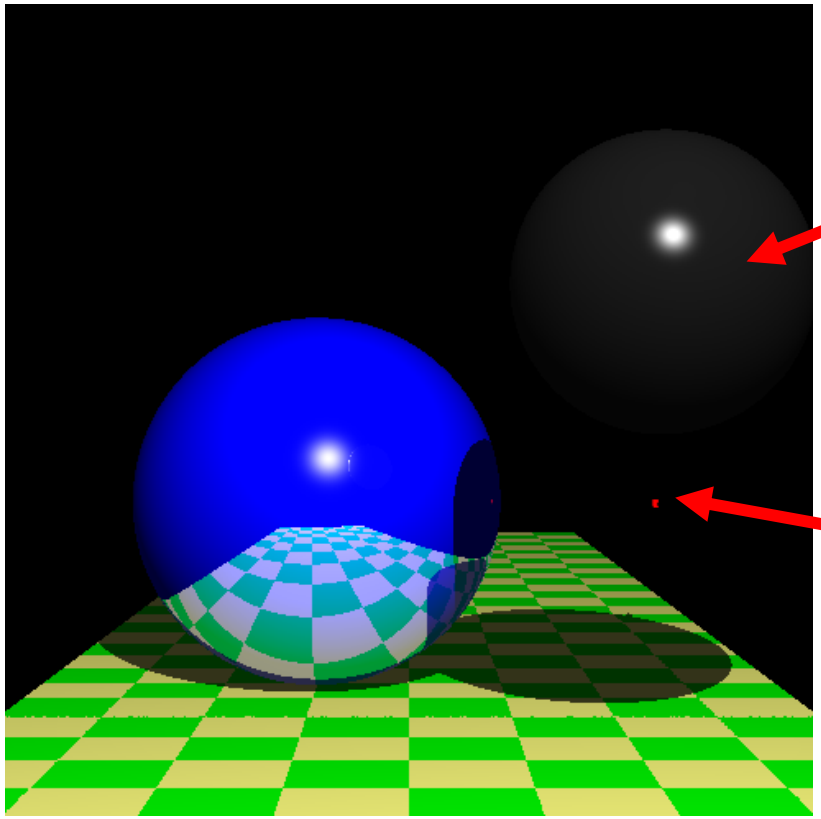


Object Using Set of Planes

- E.g., Boxes, pyramids, tetrahedrons
- The plane class can be used for constructing triangles or quads.
  - Remember to specify the vertices in an anti-clockwise sense with respect to the required outward normal direction.

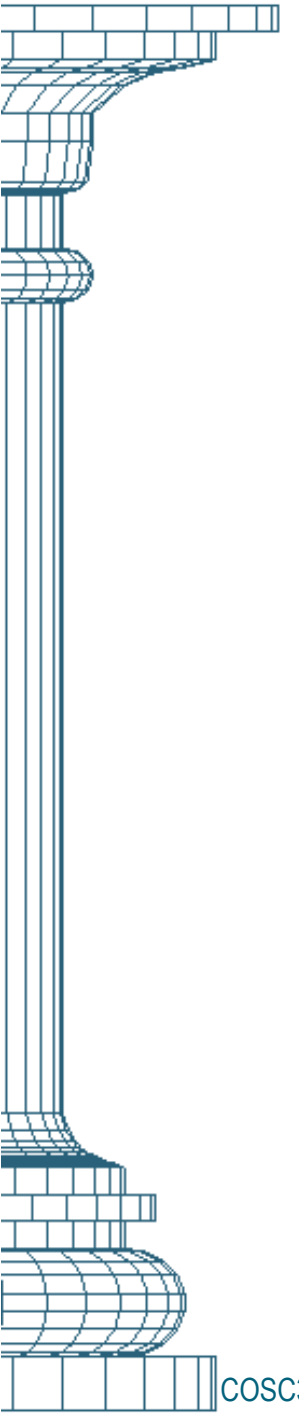
Feature Rendering

Marks will not be given to features not clearly visible in the output.



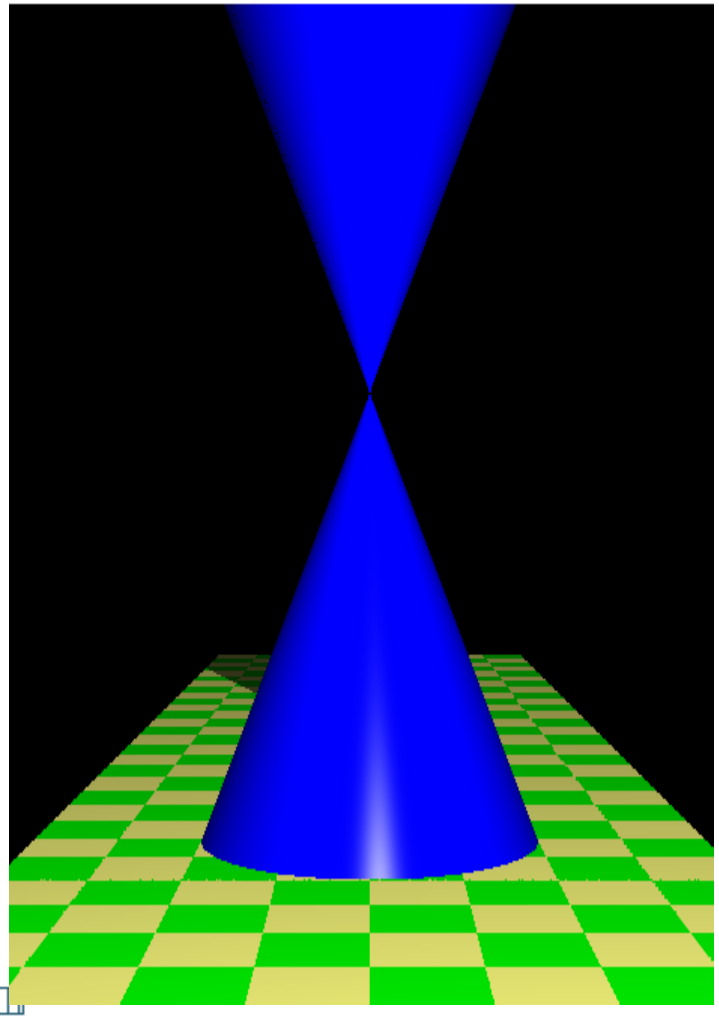
Refractive sphere ?

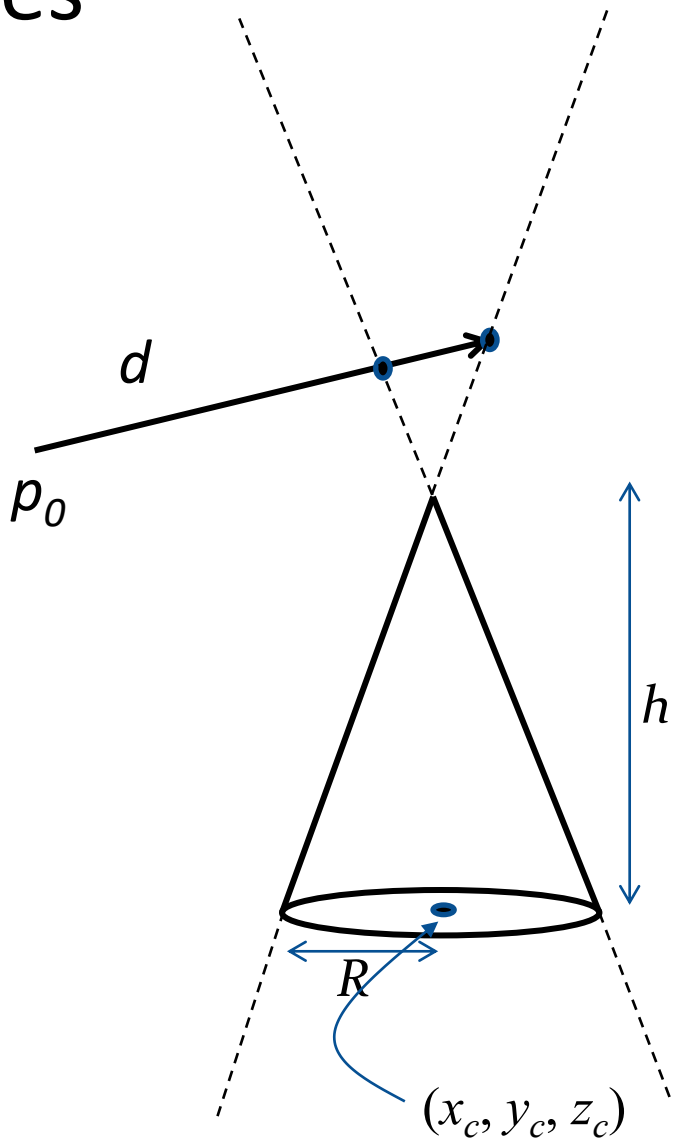
Cylinder ? Cone ?



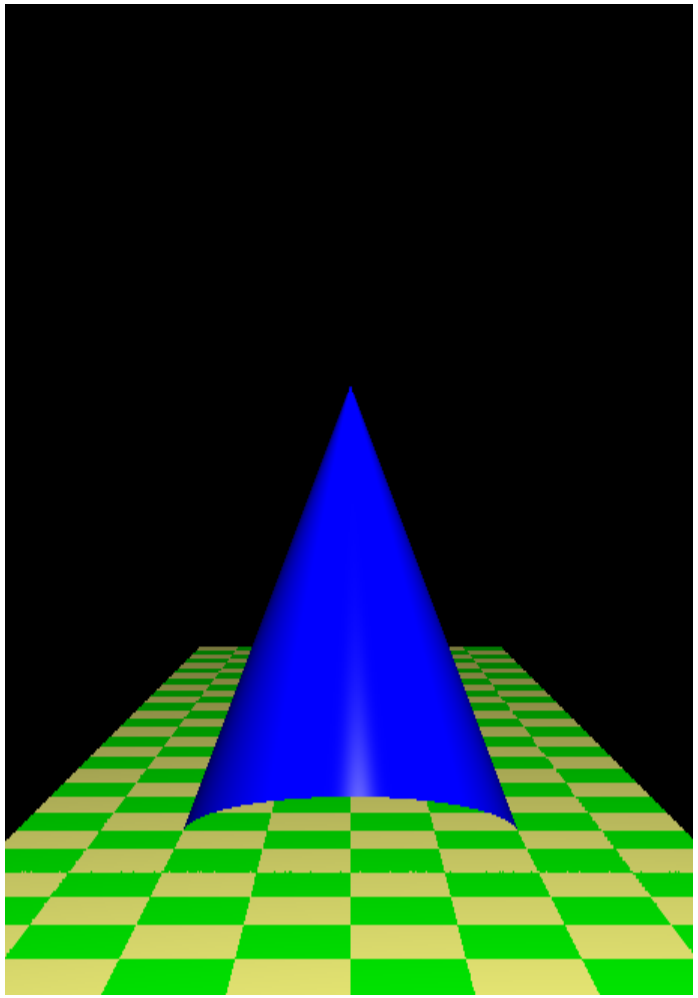
Extra Features

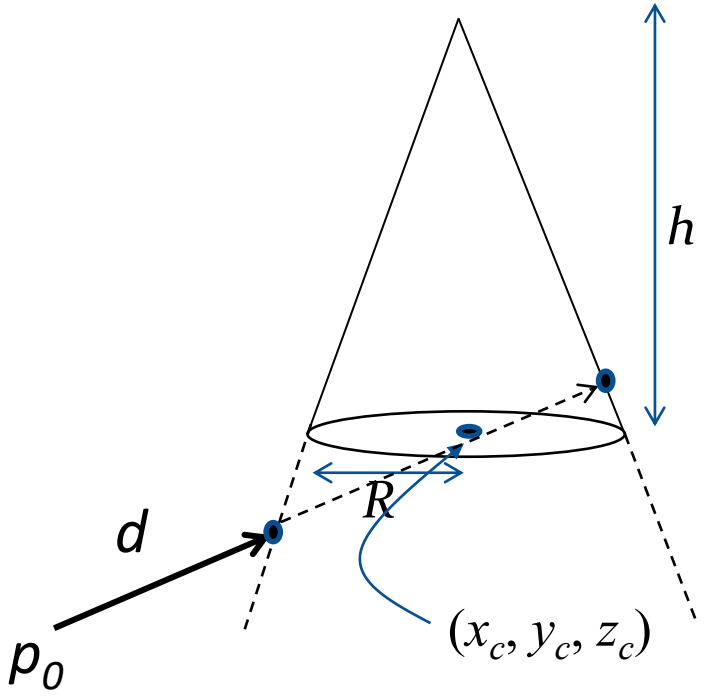
Cones



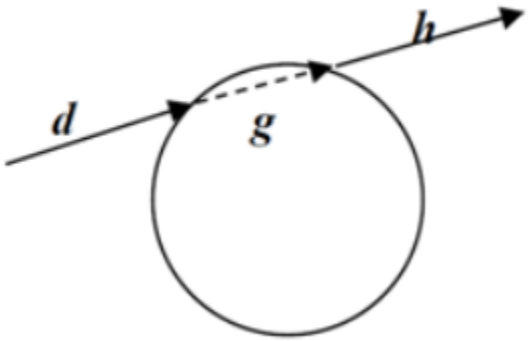


Broken Cones



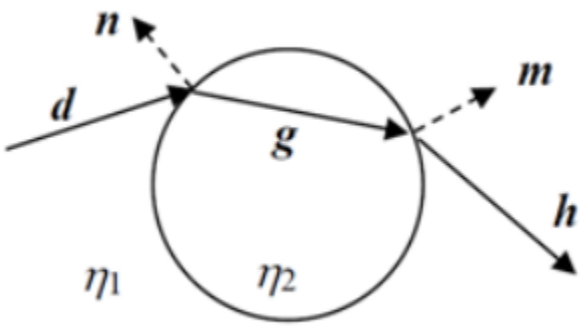


Transparency vs. Refraction



Transparency

$d = g = h$



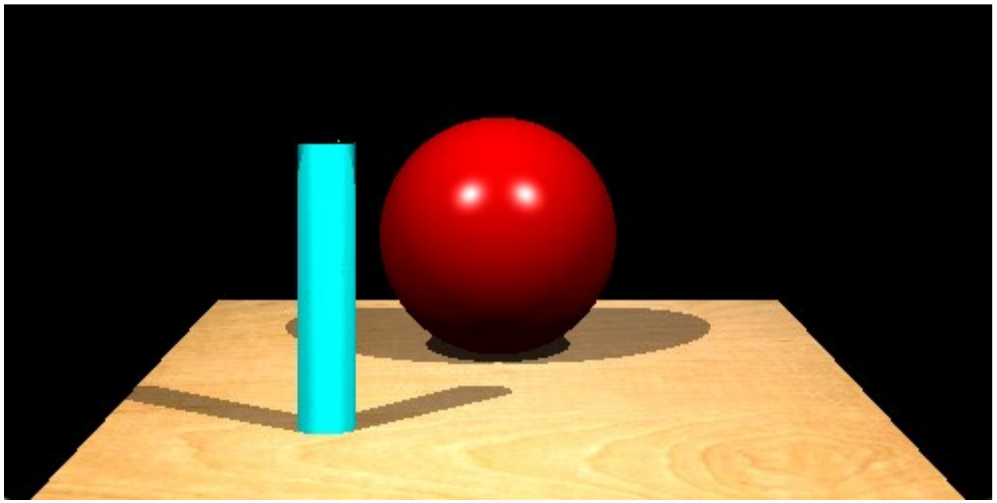
Refraction

$g = refract(d, \ldots)$

$h = refract(g, \ldots)$

Even though transparency may be treated as a special case of refraction where $\eta_1 = \eta_2$, the implementation of transparency effect does not require the refract() function.

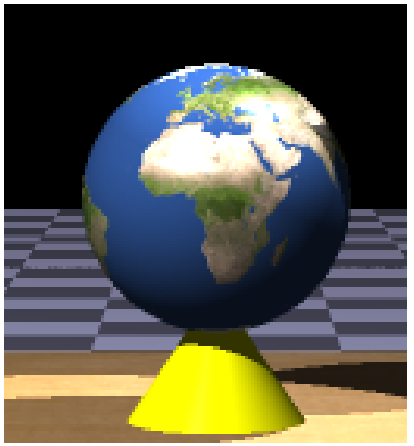
Multiple Lights



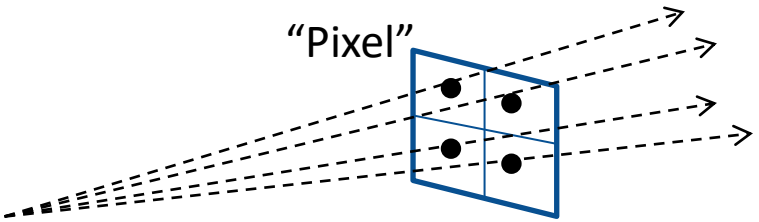
- Please trace shadow rays to each of the light sources to generate multiple shadows of objects in the scene.
- Multiple specular highlights must be visible on at least one object.

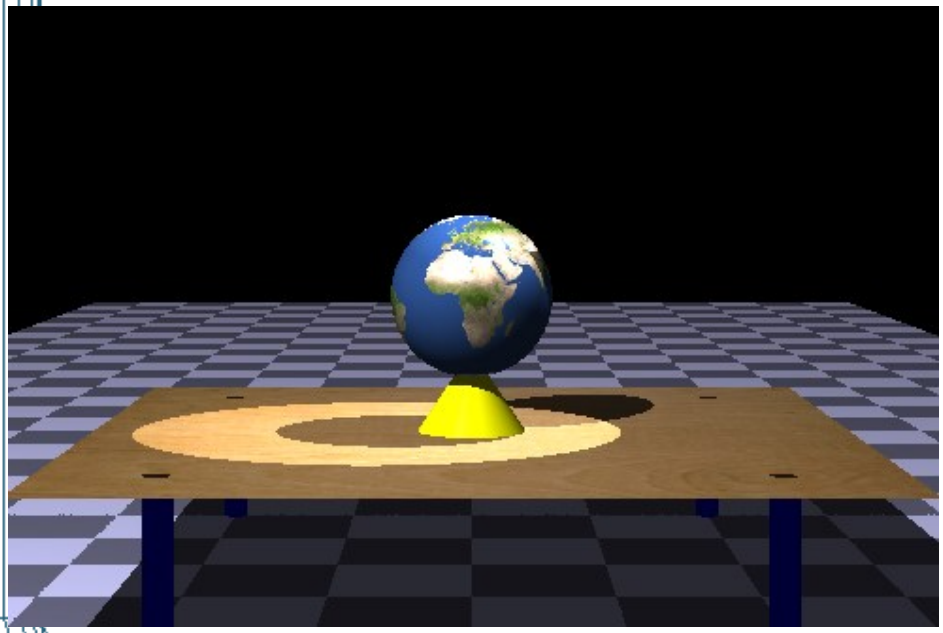
Texturing a Non-Planar Object

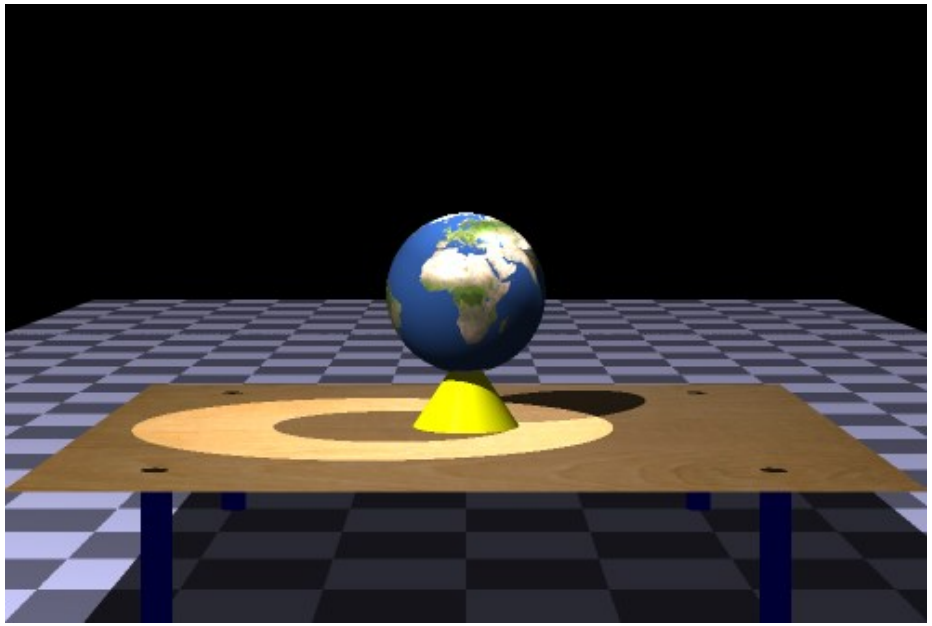
- Sphere: Compute spherical angles α, δ
  - Convert α to texture coordinate *s*
  - Convert δ to texture coordinate *t*
  - Ref: Wikipedia: UV Mapping
- Cylinder: Computer cylindrical angle α
  - Convert α to texture coordinate *s*
  - Convert *y* to texture coordinate *t*
- *BMP files*
  - 24 bits per pixel (not indexed color)
  - Uncompressed



Anti-Aliasing

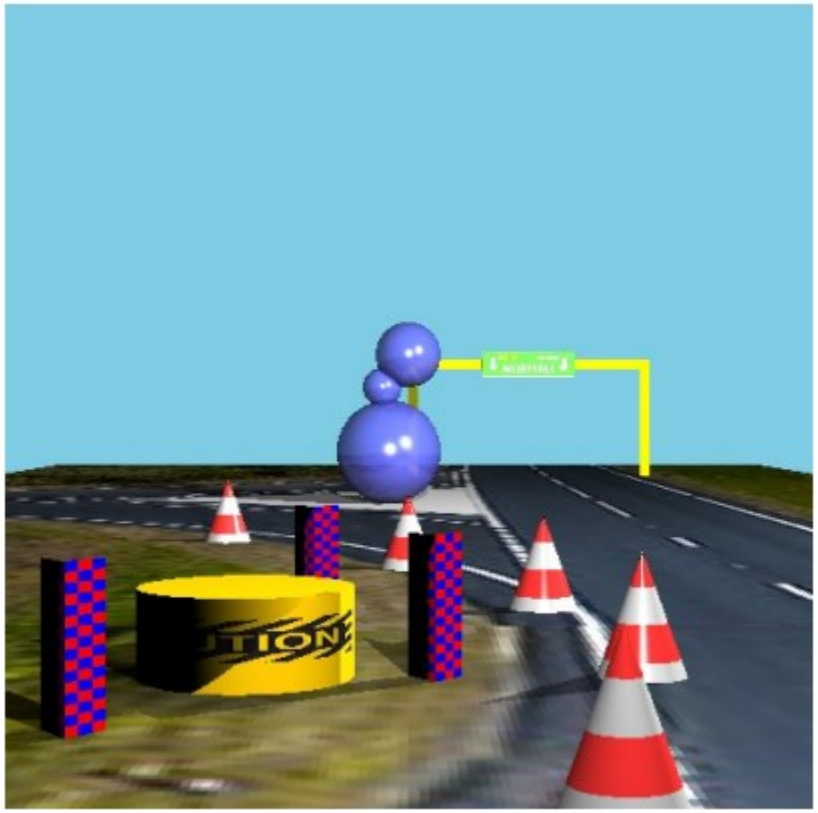


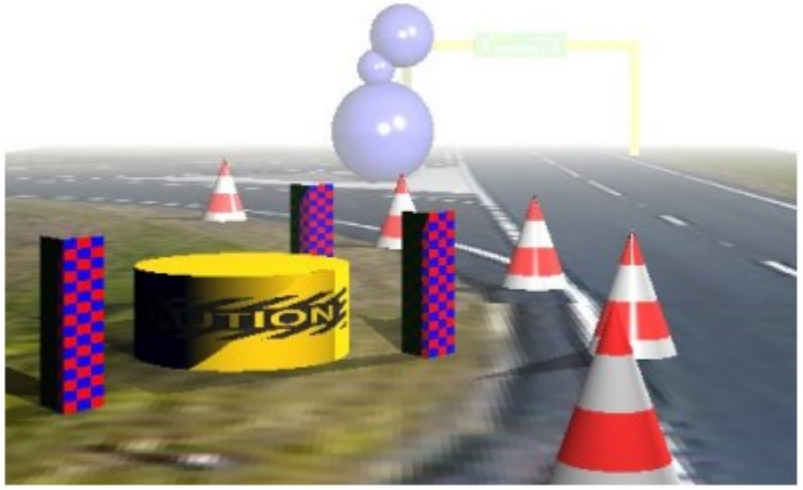




Please include screenshots of outputs with and without anti-aliasing.

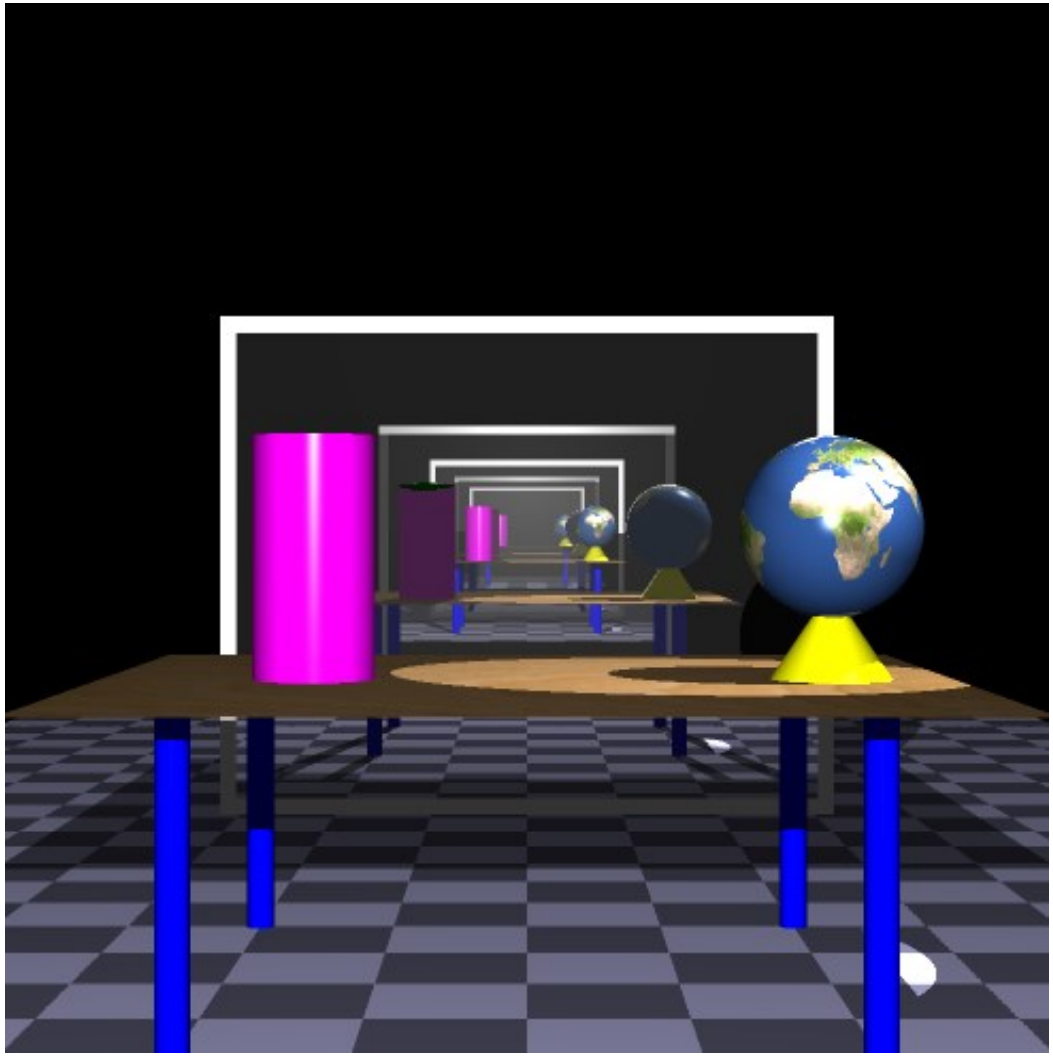
Fog





Please include screenshots of outputs with and without fog.

Multiple Reflections



The camera must be placed between the two reflecting surfaces

Assignment Submission

- Provide build details/command in the report
- Please submit report in PDF format only
- Please package the files as a zip file.