

SKYBOXES: THE OPENGL APPROACH

OUTLINE

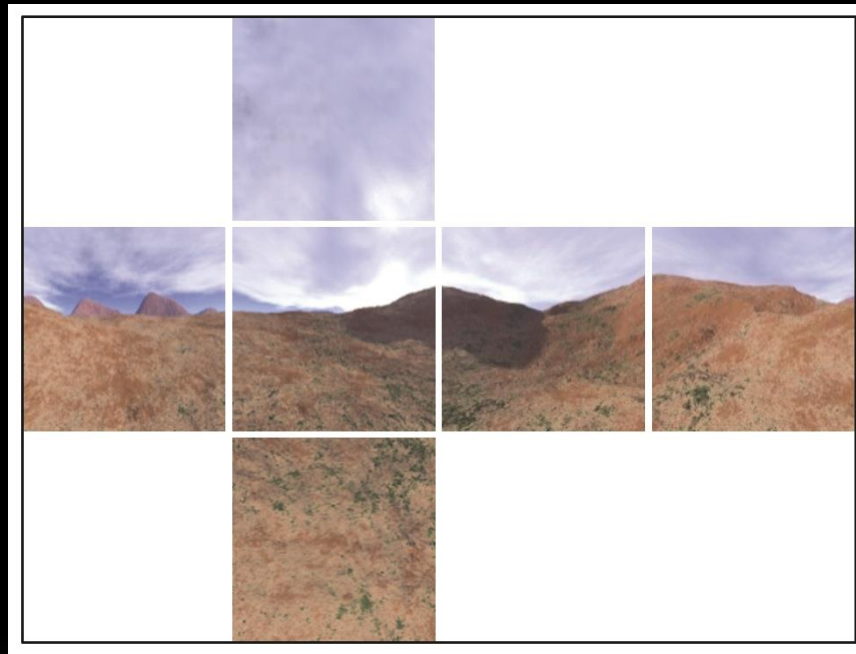
- Implementing a Skybox using OpenGL
- Environment Mapping

SKYBOXES – THE STRATEGY

- Instantiate a cube object
- Texture the cube with the desired scene
- Position the camera inside the cube

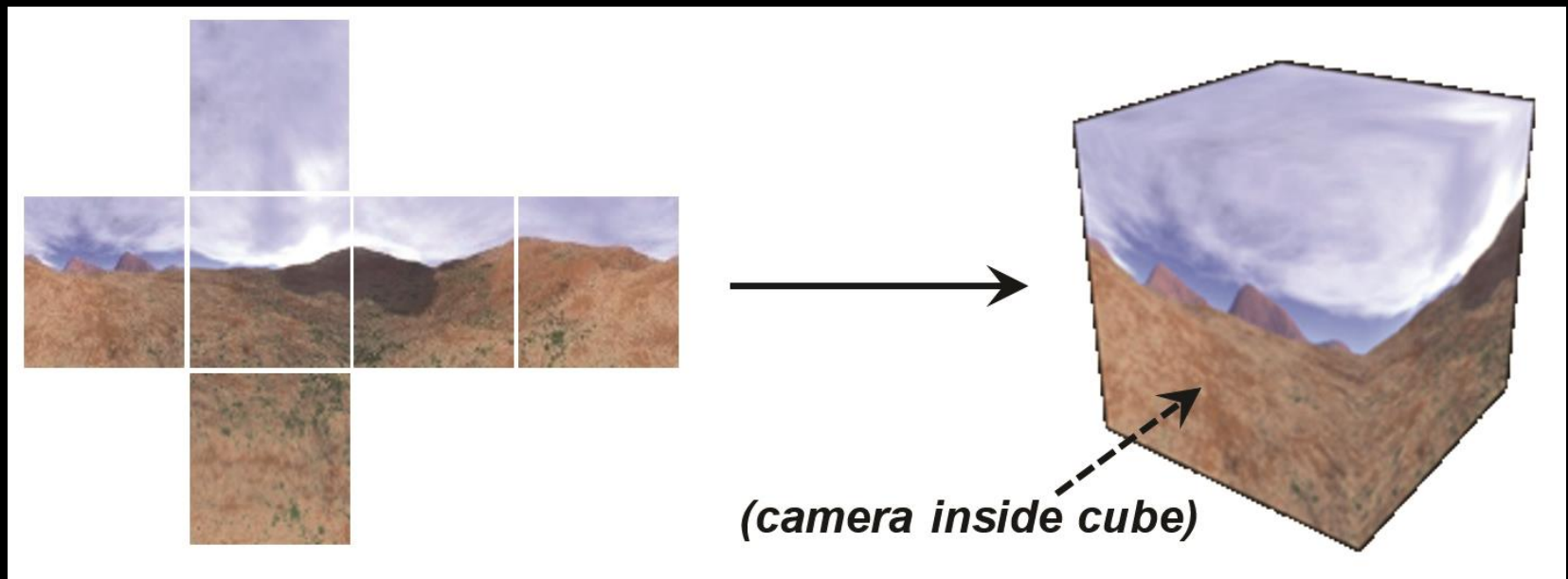
CUBE MAP

- Texture cube map
 - Used to texture all six faces of the cube



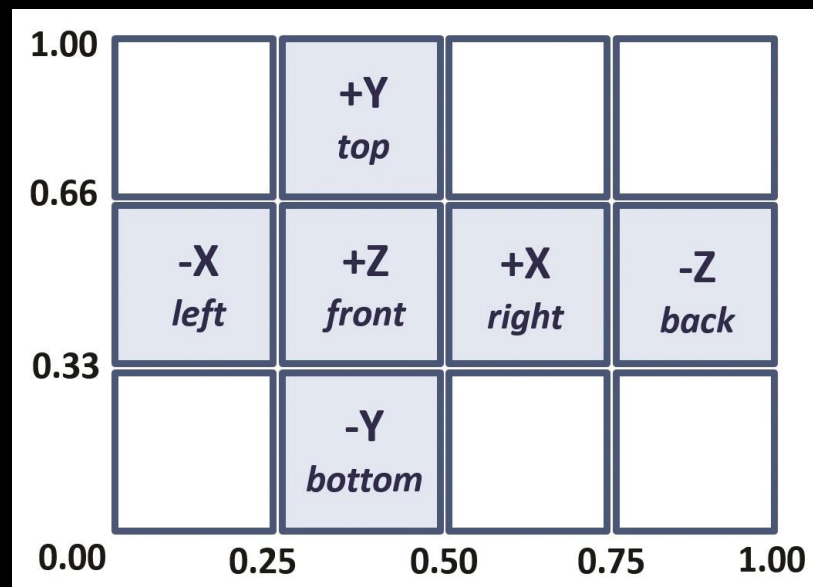
CUBE TEXTURED WITH MAP

- Doesn't look great from the outside
 - But the camera is placed on the inside



TEXTURE COORDINATES

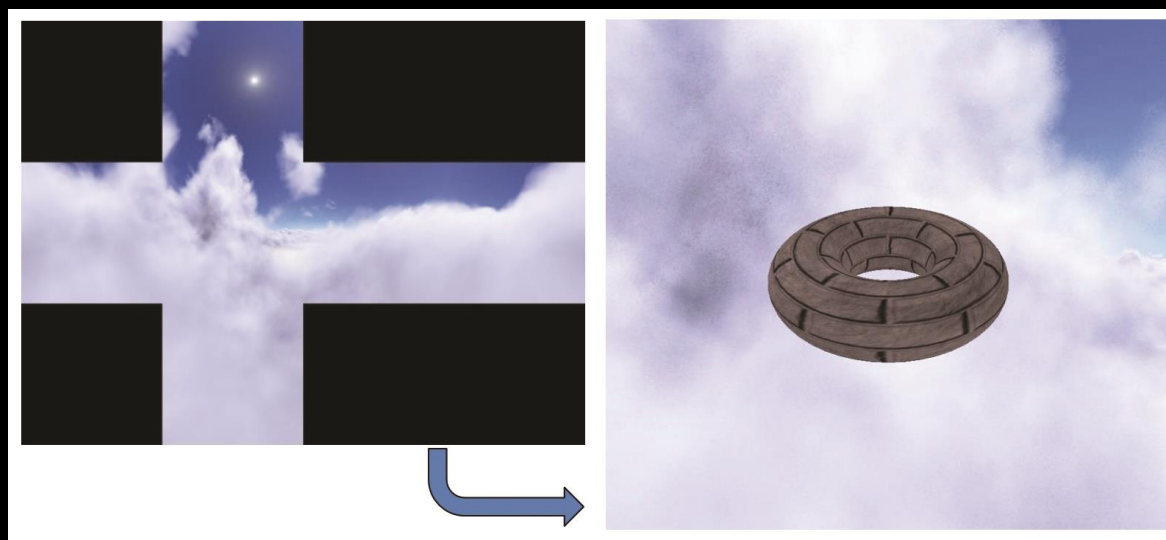
- Can use appropriate coordinates from below to texture each of the faces



MAKING THE SKYBOX APPEAR DISTANT

- Making the cube very large ends up distorting texture
- Instead:
 - Disable depth testing
 - Render the skybox
 - Enable depth testing
 - Render other objects in the scene
 - Move the skybox with the camera
- This assumes you are using a scene that is contained within the 2x2x2 default cube

EXAMPLE



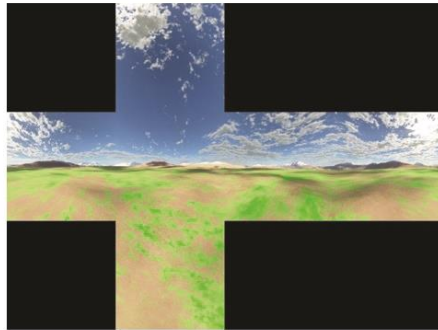
IMPLEMENTING A SKYBOX

- Skyboxes used more than skydomes
- More support in OpenGL
 - Which works out well for environment mapping
- Can build one from scratch

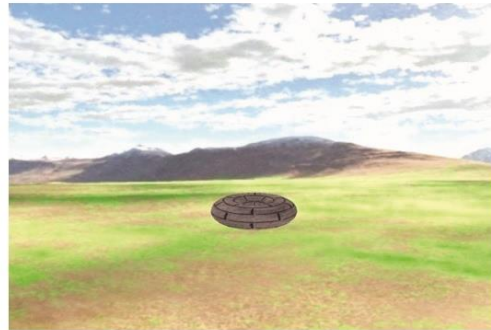
- OR

- Can use OpenGL cube maps

SKYBOX RESULTS



texture cube map (1)



resulting scene with textured skybox



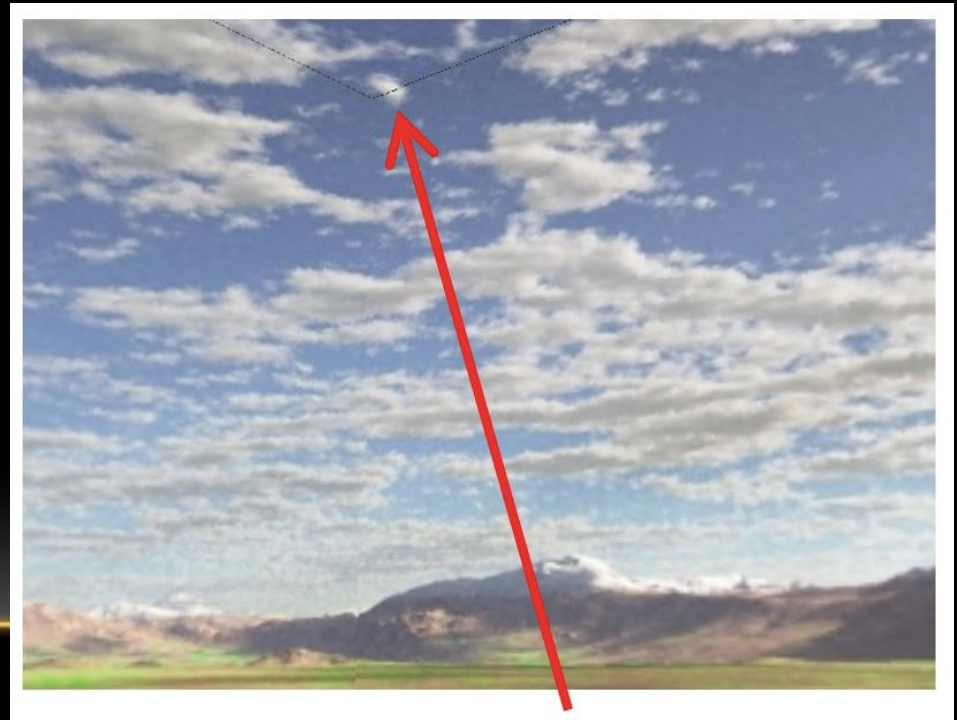
texture cube map (2)



resulting scene with textured skybox

SKYBOX SEAM ARTIFACT

- Visible seams are a potential artifact
 - To avoid this, need to be careful with:
 - Construction of the cube map image
 - Precise texture coordinates



OPENGL CUBE MAPS

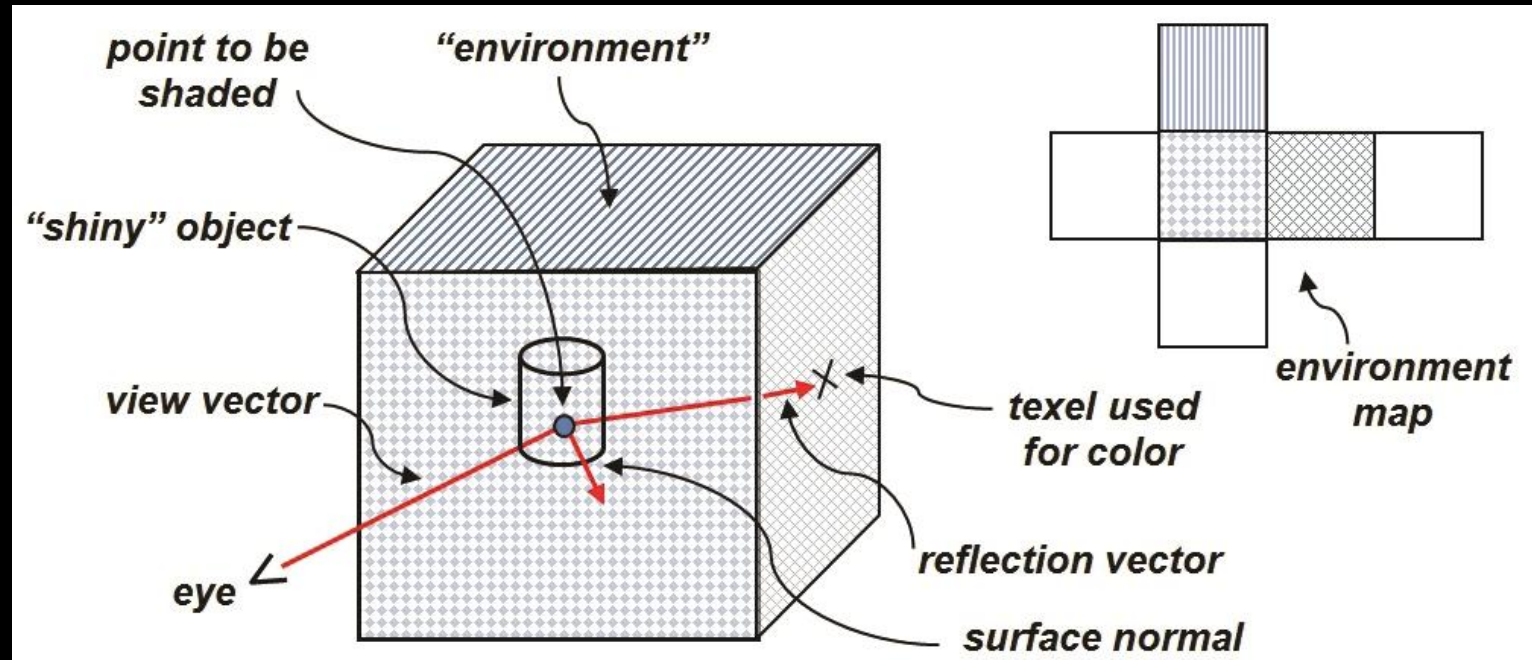
- Advantages:
 - Seam reduction
 - Support for environment mapping
- Disadvantage:
 - More complex

OPENGL CUBE MAPS

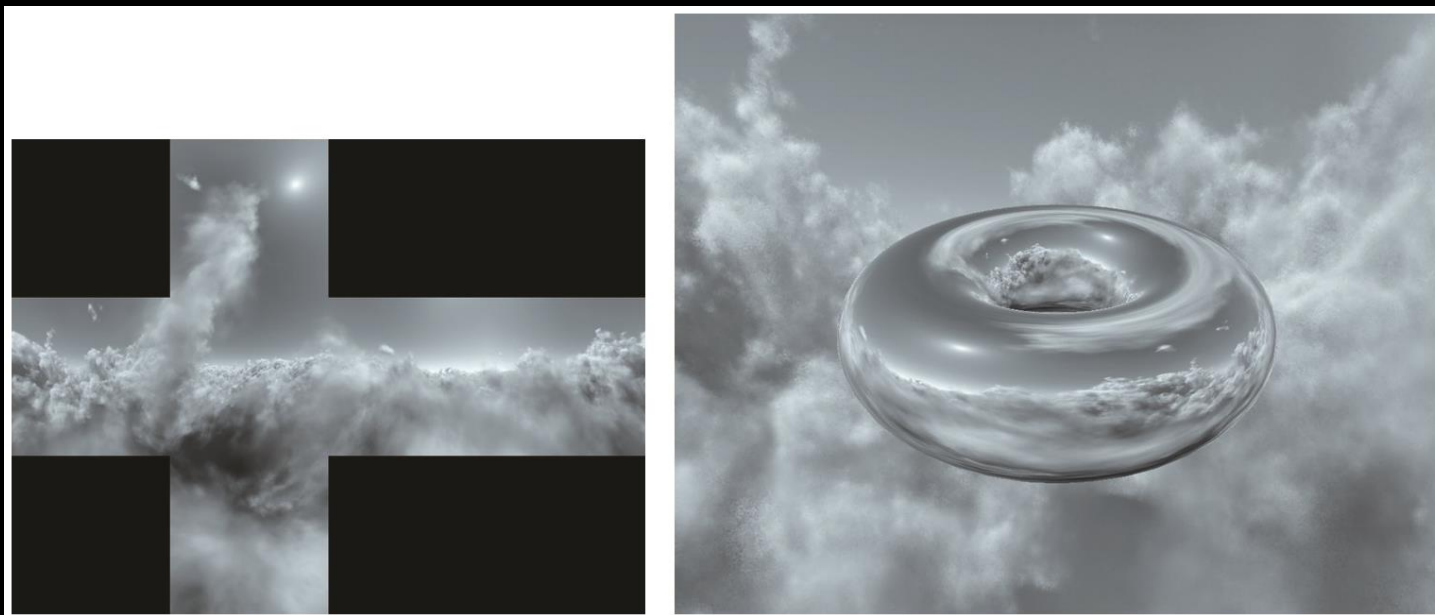
- Similar to 3D textures (coming soon)
 - Three coordinates, not two
- Texture coordinate (0, 0, 0) is at upper left of texture image
- Six images are read in, one for each face
 - Instead of one image with all faces represented
- Can reduce artifacts by setting texture to `GL_CLAMP_TO_EDGE`
 - Needs to be done for all three coordinates (s, t and r)
- Enable `GL_TEXTURE_CUBE_MAP_SEAMLESS`
 - OpenGL will attempt to blend edges



PREVIEW OF ENVIRONMENT MAPPING



ENVIRONMENT MAPPING EXAMPLE



SUMMARY

- Implementing a Skybox
- Environment Mapping

