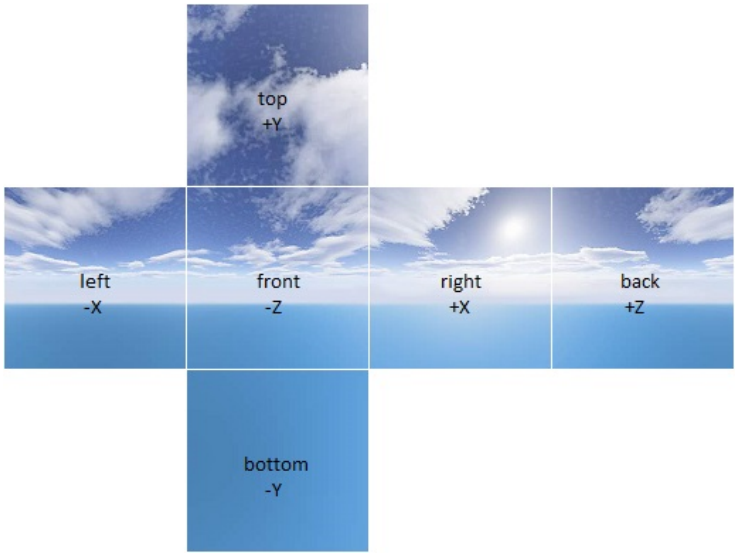
CS 418: Interactive Computer Graphics
In-class Worksheet: Environment Mapping

Cube Maps

1. Sampling a Cube Map



At run time, a cube map is sampled using a reflection vector.
For this question, use a reflection vector of $R = \langle 2,4,1 \rangle$
This vector is used to:

a. Determine which cube map wall to sample
Which wall in the image above would be sampled using R ?

b. Determine what (u,v) coordinates to use when sampling the wall
What (u,v) coordinates are generated using R ?
Assume that for each image, (u,v)=(0,0) is the lower left corner.

2. **Transparency**
   Imagine you are writing a shader for a transparent material. You need to write code to calculate a refraction vector which will be used to sample a cube map.
   a. Will the code to get a color sample from the cube map be in the vertex shader or the fragment shader?

   b. What data are needed to calculate the refraction vector?

   c. The GLSL function refract requires a variable `iorefr` representing the index of refraction. If we are simulating light entering glass from air, what is the value of `iorefr`?

Material	Refractive index
Air	1.00
Water	1.33
Ice	1.309
Glass	1.52
Diamond	2.42

3. **Semi-random Questions**
   a. If you have 2 reflective objects in a scene, how many cube maps are needed?

   b. If a reflective object is moving, how does the movement affect the cube map associated with the object?

   c. Name a visual effect related to reflection that is not supported by a cube map?