A5—Environment Mapping

Due: Monday November 2nd, at noon

Please run Release x64. Exe is in project directory. Video is in output folder.

1. Implement a cube map class CubeMap class
   1. Construction by loading single image with 6 faces, e.g. uffizi\_cross.tiff, or by loading individual faces, e.g. by first splitting uffizi\_cross.tiff into six images using your favorite image processing SW tool.
   2. Direction lookup
      1. Input: direction
      2. Output: color
      3. Start with face where previous lookup was found
      4. Use bilinear interpolation for the lookup
2. Implement environment mapping of distant geometry FrameBuffer.cpp Clear()
   1. Eye rays looked up in cube map
3. Implement environment mapped specular reflections FrameBuffer.cpp DrawTriangles
   1. Per-pixel reflected rays looked up in cube map
4. Demonstrate the new capabilities of your renderer
   1. Create a scene with uffizi\_cross.tiff as environment map
   2. Place reflective object (e.g. teapot) in center of scene
   3. Restrict camera navigation to revolution around center of reflective object; three degrees of freedom: revolution left-right, revolution up-down, roll
   4. Make a 20s 30Hz 720p video to illustrate environment mapping of distant geometry and of reflections.
5. Extra credit Not Implemented
   1. Implement first surface refraction 1%
   2. Implement mipmapping for the cube map lookup 2%
   3. Improve reflections of objects close to reflector 3%
      1. model an object close to the reflector with a billboard
      2. intersect reflected ray with billboard
   4. Build your own cube map by acquiring a panorama with a phone camera (it is OK if the panorama is not complete, but you need to cover 360o at the horizon) 2%
   5. Anything else that creates a compelling visual experience x%
6. Turn in via blackboard one zip archive that contains
   1. Source code
   2. Executable
   3. Video file