A5—Environment Mapping

Due: Friday November 2nd, at 11:59pm

1. Implement a cube map 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
   1. Eye rays looked up in cube map
3. Implement environment mapped specular reflections
   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
   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

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