

A5—Environment Mapping

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

1. Implement a cube map class
 - a. 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.
 - b. Direction lookup
 - i. Input: direction
 - ii. Output: color
 - iii. Start with face where previous lookup was found
 - iv. Use bilinear interpolation for the lookup
2. Implement environment mapping of distant geometry
 - a. Eye rays looked up in cube map
3. Implement environment mapped specular reflections
 - a. Per-pixel reflected rays looked up in cube map
4. Demonstrate the new capabilities of your renderer
 - a. Create a scene with uffizi_cross.tiff as environment map
 - b. Place reflective object (e.g. teapot) in center of scene
 - c. Restrict camera navigation to revolution around center of reflective object; three degrees of freedom: revolution left-right, revolution up-down, roll
 - d. Make a 20s 30Hz 720p video to illustrate environment mapping of distant geometry and of reflections.
5. Extra credit
 - a. Implement first surface refraction 1%
 - b. Implement mipmapping for the cube map lookup 2%
 - c. Improve reflections of objects close to reflector 3%
 - i. model an object close to the reflector with a billboard
 - ii. intersect reflected ray with billboard
 - d. 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 360° at the horizon) 2%
 - e. Anything else that creates a compelling visual experience x%
6. Turn in via blackboard one zip archive that contains
 - a. Source code
 - b. Executable
 - c. Video file