

# A5—Environment Mapping

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Due: Monday November 9, at 7am

1. Implement a cube map class
  - a. Construction by loading single image with 6 faces, e.g. uffizi\_cross.tiff
  - 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. Lookup per-pixel reflected ray 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:
    - i. revolution left-right
    - ii. revolution up-down
    - iii. 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. 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