A4—Shadow Mapping & Projective Texture Mapping

Due: Monday October 26, at 7am

1. Enhance your graphics pipeline with shadow mapping

Given a 3D scene S modeled with triangles, a point light source defined by a 3D point L, and an output view modeled with a planar pinhole camera PPC, render S from PPC with hard shadows cast by L.

2. Enhance your graphics pipeline with projective texture mapping

Given a 3D scene S modeled with triangles, a projector modeled with a planar pinhole camera PPC_0, an image to be projected I, and an output view modeled with a planar pinhole camera PPC_1, render S from PPC_1 with I projected onto S from PPC_0. In other words, use the color of the projected image for a pixel that captures a surface point that is seen by the projector, and use the scene color for the other pixels.

3. Demonstrate the new capabilities of your graphics pipeline
    a. Shadow mapping in a scene with one planar receiver (i.e. object in shadow), one complex receiver, a complex blocker (i.e. object casting shadow), and a moving light. Complex means not a planar surface, e.g. a teapot, bunny, etc.
    b. Projective texture mapping in a complex environment (e.g. the auditorium scene), with a moving projector.
    c. Make a 20s 30Hz 720p video to illustrate shadow mapping and projective texture mapping; the video should have audio narration.
4. Extra credit
    a. Projecting an image with transparent pixels (e.g. project text) 1%.
    b. Four light sources that start at the same point and then move away from each other, casting 4 shadows 2%.
    c. Invisibility effect 5%. Given the geometry of a scene S, the geometry and the trajectory of a moving object O, a projector P and the position of an audience approximated with a 3D point A, compute the image P has to project to hide O from A. Make a 10s video that shows simultaneously what the audience would see without the effect, what they see with the effect, and what the projector projects; use a 3-way screen split.
5. Turn in via blackboard one zip archive that contains
    a. Source code
    b. Executable
    c. Video file