A6—Hardware Rendering

Due: Thursday December 3rd, at 7am

1. Enhance your interactive graphics application with fixed pipeline hardware rendering support. Provide the following features:
    a. Shared vertex triangle mesh rendering
    b. Filled mode and wireframe mode
    c. Vertex color interpolation
    d. Texture mapping
2. Enhance your interactive graphics application with shader support. Write GPU shaders for rendering reflections of nearby objects by approximating the nearby objects with billboards; a billboard approximating an object is a rectangle texture mapped with an image of the object, with a transparent background.
3. Extra credit 5%. Write GPU shaders to render soft shadows for a scene with three boxes moving on a ground plane and a moving rectangular light source.
    a. The boxes do not intersect
    b. The shadows of at least two boxes should intersect
    c. The boxes should not only cast but also receive shadows
    d. Soft shadows should be computed by estimating visibility to 16x16 light samples
4. Extra credit 2% (must complete extra credit feature above). Carve the box surfaces with the help of two "stencil" textures that you design
    a. One texture is to be used for the top face of the boxes
    b. The other texture is to be used for the side faces of the boxes
    c. The texture should have white and black pixels; white means "hole", that is "absence of material"; black means "solid", that is "presence of material"
    d. The top texture should be continuous with the lateral texture at all four of its sides
    e. Update your shaders to carve the boxes using the two textures; shadow computation should account for the modified geometry of the surfaces of the boxes.
5. Extra credit 2%. Add environment (cube) mapping to your shaders from Question 2 above. Use it to render distant geometry, as well as to render the reflected environment.
6. Make a 60s video to illustrate your work, including any extra credit feature you have completed.
7. Turn in via blackboard one zip archive that contains
    a. Source code
    b. Executable
    c. Video file