A6—Shaders

Due: Monday March 21, at 7am

1. Enhance your interactive graphics application with shader support. Write GPU shaders for rendering reflections of nearby objects using billboards; a billboard is a rectangle texture mapped with an image of the object, with a transparent background.
   1. If the reflected ray does not intersect a billboard, look it up in the environment map.
   2. It is OK to precompute the billboards and to load them at run time.
   3. There should be at least two billboards: one for a table top or ground plane, and one for a diffuse object close to the reflective object.
2. Write GPU shaders to render soft shadows for a scene with three boxes moving on a ground plane and a moving rectangular light source.



* 1. The boxes do not intersect
  2. The shadows of at least two boxes should intersect
  3. The boxes should not only cast but also receive shadows
  4. Soft shadows should be computed by estimating visibility to 16x16 light samples

1. Extra credit 2%. For the reflection shaders, animate the reflector by deformation, e.g. by morphing it to a sphere, or by perturbing the vertices as a result of a user mouse-click.
2. Extra credit 2%. For the reflection shaders, compute the billboards on the fly to support moving reflected objects.
3. Extra credit 2%. For the soft shadow shaders, carve the box surfaces with the help of two “stencil” textures that you design
   1. One texture is to be used for the top face of the boxes
   2. The other texture is to be used for the side faces of the boxes
   3. The texture should have white and black pixels; white means “hole”, that is “absence of material”; black means “solid”, that is “presence of material”
   4. The top texture should be continuous with the lateral texture at all four of its sides
   5. 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.
4. Extra credit XXX%. Write shaders for any compelling visual experience.
5. Make a 60s video to illustrate your work, including any extra credit feature you have completed.
6. Turn in via blackboard one zip archive that contains
   1. Source code
   2. Executable
   3. Video file

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