

## HOMEWORK #2

This assignment may be done in teams of two. *Due October 7, 2008 by 11:59PM.* The turnin name is cs433\_hw2. This homework is a continuation of hw1, with a few major changes.

- (1) Use perceptive projection, rather than orthographic. Choose the parameters of distance between the viewpoint and the projection plane, size of plate, and distance from the origin to the plate rotation axis, such that most of the display window is occupied by the plate, when in vertical position. Let  $d_1$  be denote the distance from the origin to the view point (always on the z-axis, and initially equals 0),  $d_2$  denote the distance from viewpoint to projection plane, and  $d_3$  denote the distance from the projection plane to the plate axis-of-rotation (always intersecting the z-axis, and contained in the yz-plane). See figure below.
- (2) Assume a point lamp centered at the origin (0,0,0), so the intensity of the a pixel  $(x, y)$  of the image is

$$I^{out}(x, y) = I^{in}(x, y)(0.2 + 0.8 \cos \alpha)$$

where  $\alpha$  is the angle between the z-axis and the normal from the plate. The terms  $0.2I^{in}(x, y)$  represents the ambient light.

- (3) Hitting the forward 'f' (resp. 'b') key moves the viewpoint forward (resp. backward). The location of the projection plane is not changed.
- (4) Hitting the forward 'F' (resp. 'B') key moves both viewpoint and projection plane forward (resp. backward), without changing their distance  $d_2$ .
- (5) Hitting 'esc' set the viewpoint back to the origin.
- (6) Hitting 'p' should start apply Phong model to the picture. Pick the value of  $n$  in this model so that the change is noticeable. Hitting 'esc' exits this mode.
- (7) Pick the unit of rotation so the change is noticeable.
- (8) Display on the console window the current values of  $d_1, d_2, d_3$  (as demonstrated in the figure), whether Phong mode is On/Off, and the value of  $n$  used.
- (9) For 10 points bouns, or mandatory for grad students: Hitting the 'r' key should rotate the line  $\ell$  (axis of rotation of the plate) about the z axis. The intersection point of  $\ell$  should not be changed, and it should stay in the yz-plane.

