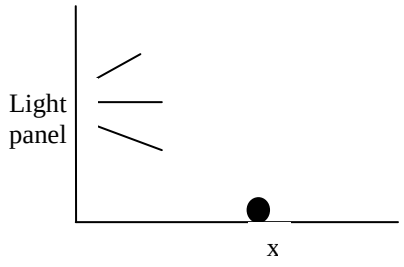
Homework
CIS 782, Fall 2006

1. Assuming someone wants to use hierarchical bounding spheres to speed up a ray tracer. Consider 6 equally sized spheres in a space +/- 1 in x, y, and z. Give the worst-case (or at least 'pretty bad case') object size, object distribution, and view configuration for considering the spheres in the space +/- 1 in x, y, and z. Explain why the distribution is worst-case for the hierarchical bounding spheres.

2. What the CIE chromaticity diagram and how does it relate to the CIE XYZ coordinates?

3. **Consider a point x on a surface that is 5 units away from a flat light panel that sits perpendicular to the surface the point is on. The light panel is 10x10 units. Ns is the vector normal to the surface and Nlp is the vector normal to the light panel. The intensity of light going out from the panel is $\cos^2(\theta)$ where θ is the angle an light vector makes with Nlp. The reflectance function of the surface is $\cos(\psi)$ where ψ is the angle an incoming vector makes with Ns (the incoming vector is negated when determing ψ). What is the irradiance at the point? What is the radiosity? Identify what equations you need to use, other information you might need, and how to set up the calculations specific to this problem. You don't need to actually work out all the details – just explain what those details are and how they could be worked out.**



4. Given the image below with intensities from 0-20, describe how a perceptual, local adaptation tone-mapping algorithm would process this image and how the image intensities would be mapped to the range 0-4.

3	2	3	4	15	16
3	2	3	4	15	16
3	2	2	4	5	6
7	5	4	3	2	1
7	5	4	3	12	12
7	5	4	4	12	11

5. What is ideal sampling and reconstruction of a continuous 1D signal? Show it in the spatial domain and the frequency domain.