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EECS 101

HW 6

1) a) What is the solid angle subtended by the moon as viewed from the earth if we assume the moon to be a sphere of radius R at a distance d?

b) What is the range of possible solid angles subtended by a flat circular plate of radius R at a distance d?

2) Consider a room in the shape of a cube of dimension 100 feet × 100 feet × 100 feet. Consider a square patch of size 1 foot by 1 foot on the ceiling. Suppose that the patch is exactly in the center of the ceiling.

a) What is the solid angle subtended by the square patch as viewed from a corner of the room on the floor?

b) What is the solid angle subtended by the square patch as viewed from a corner of the room on the ceiling?

3) Consider a Lambertian plane in three dimensions defined by the equation

7x + sqrt(50)y + z + 2 = 0

z = -7x - sqrt(50)y - 2

a) What is the surface gradient (p, q) for the plane?

b) Suppose that the plane is in a dark room with a single point light source. Consider the point

P = (0, 0,−2) on the plane. Determine the location (x, y, z) where we should put the point light source so that the light source is a distance 20 from the point P and the reflected radiance from

P in the direction of (0, 0, 0) is as large as possible.

Normal of given plane

Plane equation for light source

Point of light source

Radiance map equation

Maximum when radiance map equals 1

This is satisfied when both p = ps and q = qs