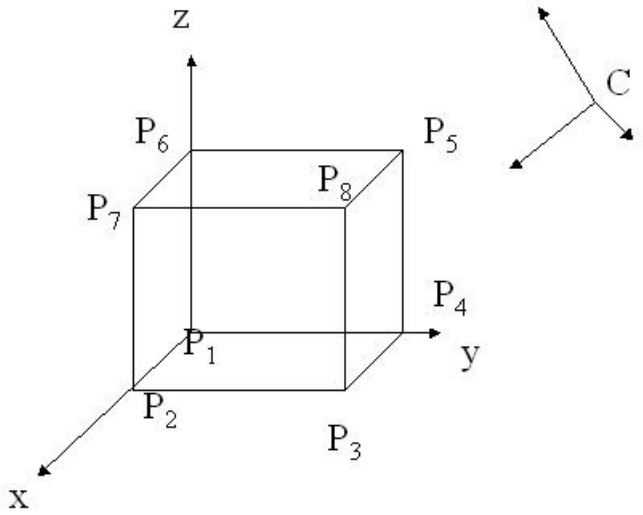
3080/GV10 – Exercises

Exercise 1:

Consider the following scene configuration, where P1(0,0,0), P2(1,0,0), P3(1,1,0), P4(0,1,0), P5(0,1,1), P6(0,0,1), P7(1,0,1), P8(1,1,1) and C(1,2,2). Calculate the coordinate of each point Pi in the camera coordinate system, centred in C and pointing at P1, with a VUV(-1, -1, 1).



Exercise 2:

Calculate the transformation matrix $M_{WC->VC}$ when:

- VRP (10,20,20),
- VUV(1, 1, -1)
- the camera points at (0,0,10) in the WC system.

What is the matrix $M_{VC->WC}$ that maps the View Coordinates to the World Coordinates?

Exercise 3:

Consider the scene configuration of Figure 1 and monochromatic light. Using ray casting, calculate the intensity to display at point p.

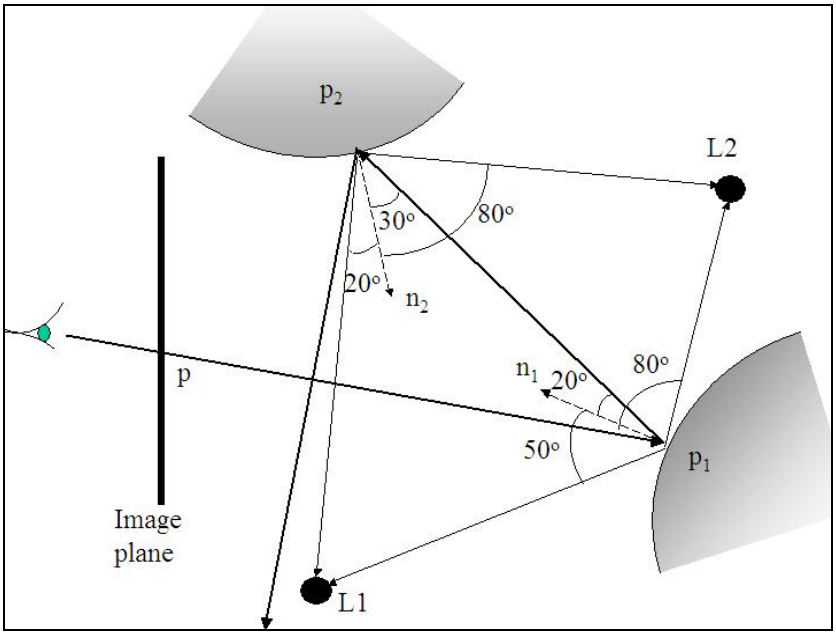


Figure 1.

The input parameters are:
Light intensity for L1 I_1= 10, Light intensity for L2 I_2= 20, Ambient light intensity I_a= 5, Background intensity I_b = 0.5
Material property:

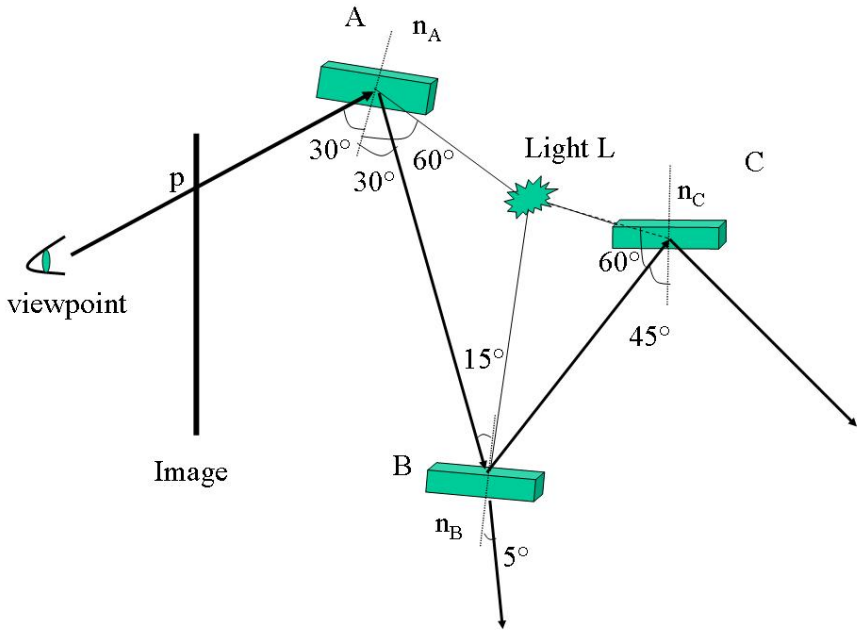
- object 1, on which the ray intersects in p1: K_d=0.4, K_s = 0.2, K_a = 0.1, m=0.5
- object 2, on which the ray intersects in p2: K_d=0.2, K_s = 0.4, K_a = 0.1, m =0.5

Exercise 4:

Apply the ray-tracing algorithm to compute the colour of pixel p for a monochromatic light, given the following scene configuration, with:

Intensity of light L = 1.0,
Intensity of ambient colour = 0.1,
Background colour = 0.1
Material of surface A: Ka = 0.2, Kd = 0.3, Ks = 0.2, m = 2, Kt = 0
Material of surface B: Ka = 0.1, Kd = 0.01, Ks = 0.3, m = 3, Kt = 0.3
Material of surface C: Ka = 0.2, Kd = 0.3, Ks = 0.1, m = 1, Kt = 0

cos(0) = 1, cos(5)=0.99 , cos(7.5)=0.98, cos(15)= 0.96, cos(30)= 0.87 , cos(45)= 0.71, cos (60)=0.5



Exercise 5:

A light source is situated at L(0,10,-2). Calculate the intensity at each point P_1(-3,5,-10), P_2(-3, -3,-5), P_3 (5,-5, -10), of a polygon, for each primary ray cast from the centre of projection situated at COP(0,0,10). The parameters are the following: I_a = (10,10,10), K_a = (0.3,0.3,0.3), K_d = (0.1, 0.1, 0.4), K_s = (0.2, 0.2, 0.2), m = 1, I_L = (20,20,20).