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Pop Quiz (Week 4) [10 mins] – 14 pts

1) [3+3+2=8] Consider a view set up with eye at origin, image plane perpendicular to the Z-axis and Y-axis as the view-up vector. Let the distance to the image plane be 10 units. Consider the 3D point P at (200, 300, 100).

a) What is the projection of P on the image plane?

X projection = $\frac{200}{(100/10)} = 20$

Y projection = $\frac{300}{(100/10)} = 30$

b) Write the matrix M which when pre-multiplied with P gives this projection?

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1/10 & 0 \end{bmatrix}$$

c) What value would you store at the third coordinate post to assure correct screen space depth interpolation?

$$1/100$$

2) [3+3=6] Consider a surface point P with normal (0,1,0). Let the light direction be (1,1,1) and the view direction be (0,0,1). Let the coefficient of diffused and specular reflection be 0.2 and 0.3 respectively. Let the intensity of point light be 1.0. (No need to normalize vectors)

a) Find the diffused reflection at P?

$$1.0 \times 0.2 \times (\mathbf{N}.\mathbf{L}) = 0.2$$

b) Find the specular reflection at P?

$$1.0 \times 0.3 \times (R.V)^n$$

Since R = {2N(N.L) – L} = (-1, 1, -1), then R.V = -1. Whenever R.V is negative, it means that the light reflection and view direction are on opposite sides, therefore the intensity of specular refection will be 0.