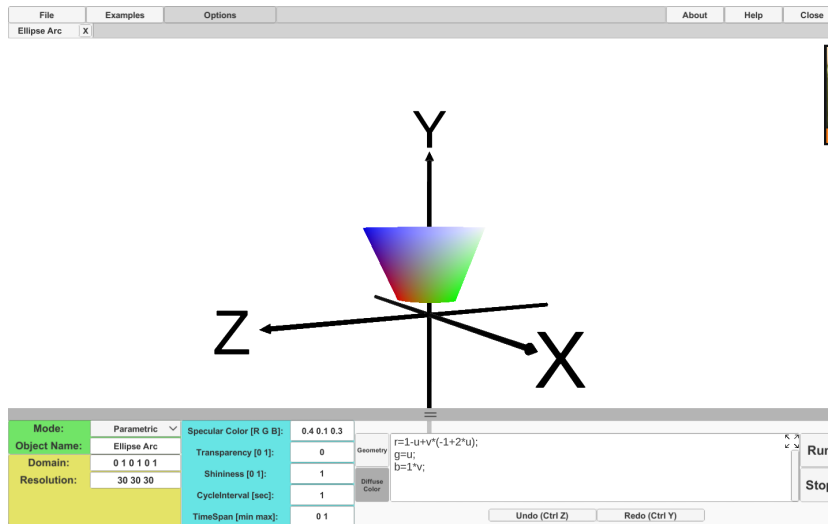


Q1. we can abstract the color as the bilinear space

	P_1	P_2	P_3	P_4
r	1	0	0	1
g	0	1	0	1
b	0	0	1	1

 $\Rightarrow \begin{cases} r = 1 - u + v \cdot (2u - 1) \\ g = u \\ b = v \end{cases}$



Q2. (i)

	P_1	P_2	P_3	P_4
x	10	4	16	12
y	30	20	10	5
z	0	0	2	2

 $\Rightarrow \begin{cases} x = 10 + (-6) \cdot s + 6t + 2 \cdot s \cdot t \\ y = 30 + (-10) \cdot s + (-20) \cdot t + 5 \cdot s \cdot t \\ z = 2 \cdot t \end{cases} \quad s, t \in [0, 1]$

② convert the parameter to range $[0, 1]$

$$\frac{i}{100} = s \quad \frac{j}{160} = t$$

③ the point $(9.8, 18, 0.8)$ is in the surface

$$\therefore \begin{cases} 2t = 0.8 \Rightarrow t = 0.4 \end{cases}$$

$$\begin{cases} 30 - 10s - 20t + 5 \cdot s \cdot t = 18 \Rightarrow 30 - 10s - 8 + 2s = 18 \Rightarrow s = 0.5 \end{cases}$$

$$\therefore i = 100s = 50 \quad j = 160t = 64$$

$$r(i, j) = 0.9 \cdot \sin^2\left(\frac{\pi}{2} \cdot \frac{50}{100}\right) = 0.9 \quad g(i, j) = \frac{1}{8} \cdot \frac{j}{160} = 0.375 \quad b(i, j) = 0.5$$

\therefore the color is $(0.9, 0.375, 0.5)$

$$(ii) \quad i = 100s \quad j = 160t$$

$$\therefore \begin{cases} \Delta x = 0.9 \cdot \sin^2\left(\frac{\pi}{2} \left\lfloor \frac{10}{3}s \right\rfloor\right) \\ \Delta y = \frac{1}{8} \cdot \lfloor 8t \rfloor \\ \Delta z = 0.5 \end{cases}$$

$$\text{thus } \begin{cases} x = 10 + (-6) \cdot s + 6t + 2 \cdot s \cdot t + 0.9 \cdot \sin^2\left(\frac{\pi}{2} \left\lfloor \frac{10}{3}s \right\rfloor\right) \\ y = 30 + (-10) \cdot s + (-20) \cdot t + 5 \cdot s \cdot t + \frac{1}{8} \cdot \lfloor 8t \rfloor \\ z = 2 \cdot t + 0.5 \end{cases}$$

Q3. center (0,0,0) radius 3.3