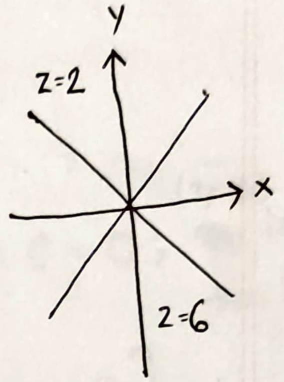
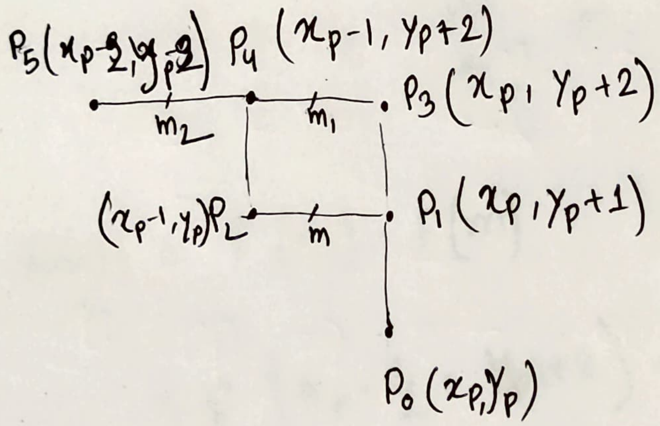
Shamim Bin Zahid | Computer Graphics Theory

Roll: 43 | Assignment-1

(1) Let, we are currently on $P_0(x_p, y_p)$ which is on zone-2 $(z=2)$.





m is a point between P_1 & P_2, and is the mid point

$$\Rightarrow m\left(x_p - \frac{1}{2},\ y_p + 1\right)$$

m_1 is the midpoint of P_3 & P_4 $\Rightarrow m_1\left(x_p - 1/2,\ y_p + 2\right)$

m_2 is the midpoint of P_4 & P_5 $\Rightarrow m_2\left(x_p - 3/2,\ y_p + 2\right)$

$$d_{int} = f(m) = F\left(x_p - \frac{1}{2},\ y_p + 1\right)$$

$$= A\left(x_p - \frac{1}{2}\right) + B\left(y_p + 1\right) + C$$

$$= Ax_p + By_p + C - \frac{A}{2} + B$$

$$= -\frac{A}{2} - B \quad \left[Ax_p + By_p + C = 0;\ (x_p, y_p) \text{ is on the line} \right]$$

$$= -\frac{dy}{2} - dx \quad \left[A = dy;\ B = -dx \right]$$

$\therefore$ del N $= f(m_1) - f(m)$

$$= f\left(x_p - \frac{1}{2},\ y_p + 2\right) - f\left(x_p - \frac{1}{2},\ y_p + 1\right)$$

$$= A\left(x_p - \frac{1}{2}\right) + B\left(y_p + 2\right) + C - A\left(x_p - \frac{1}{2}\right) - B\left(y_p + 1\right) - C$$

$$= By_p + 2B - By_p - B$$

$$= B$$

$$= -dx$$

$$\text{delNW} = F(m_2) - F(m)$$

$$= F\left(x_p - 3/2,\ y_p + 2\right) - F\left(x_p - 1/2,\ y_p + 1\right)$$

$$= A\left(x_p - 3/2\right) + B\left(y_p + 2\right) + C - A\left(x_p - 1/2\right) - B\left(y_p + 1\right) - C$$

$$= Ax_p - 3/2\,A + By_p + 2B \mp C$$

$$= -A + B \quad = -dy - dx$$

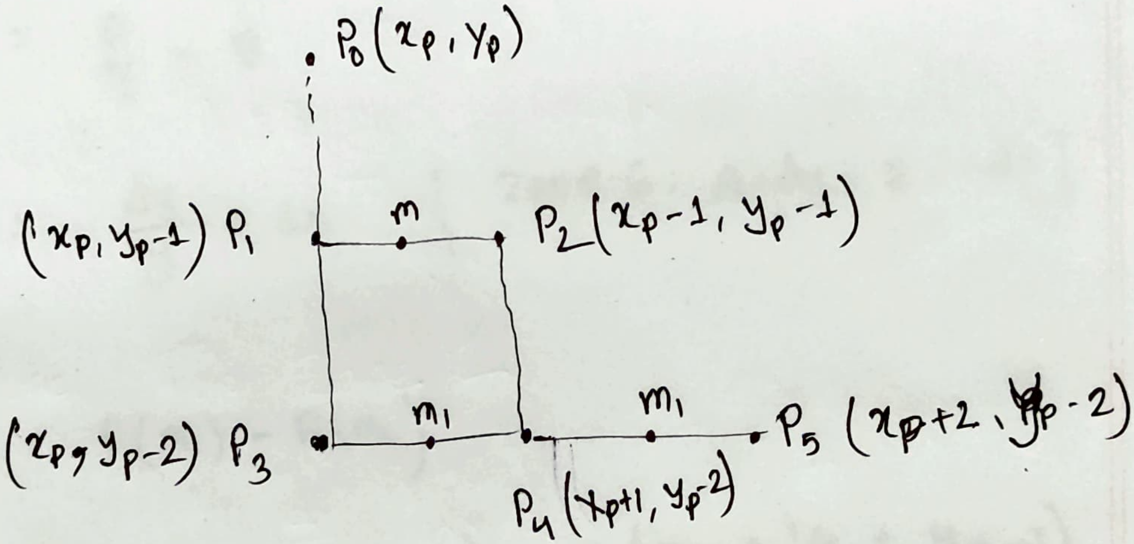
Therefore, for Zone-2

$$d_{int} = -\frac{dy}{2} - dx$$

$$\text{delN} = -dx$$

$$\text{delNW} = -dy - dx$$

(2) We reconsider $P_0(x_p, y_p)$ this time to be on zone-6. So this time we have to make a decision between a south point and a south-east point.



In the diagram,

$m\left(x_p+\frac{1}{2}, y_p-1\right)$

$m_1\left(x_p+\frac{1}{2}, y_p-2\right)$

$m_2\left(x_p+\frac{3}{2}, y_p-2\right)$

Now,

$$d_{int} = f(m) = f\left(x_p + \tfrac{1}{2},\ y_p - 1\right)$$

$$= A\left(x_p + 1/2\right) + B\left(y_p - 1\right) + C$$

$$= Ax_p + By_p + C + A/2 - B$$

$$= \frac{A}{2} - B$$

$$= \frac{dy}{y} + dx \quad \left[\text{zone-6; } A = dy,\ B = -dx\right]$$

$$delS = f(m_1) - f(m_2)$$

$$= F\left(x_p + \tfrac{1}{2},\ y_p - 2\right) - F\left(x_p + \tfrac{1}{2} + y_p - 1\right)$$

$$= By_p + -2B - By_p + B + A\left(x_p + \tfrac{1}{2}\right) - A\left(x_p + \tfrac{1}{2}\right) + C - C$$

$$= -B = dx$$

~~delOld~~

$$\text{delSE} = f(m_2) - F(m)$$

$$= F\left(x_p + 3/2,\ y_p - 2\right) - F\left(x_p + 1/2,\ y_p - 1\right)$$

$$= \tfrac{3}{2}A - \tfrac{1}{2}A - 2B + B$$

$$= A - B = dy + dx$$

Therefore, for zone-6 :

$$d_{int} = \frac{dy}{2} + dx$$

$$\text{delS} = dx$$

$$\text{delSE} = dy + dx$$