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Batch-A

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CG Tutorial - 7

1. $P_1 (10, 30)$

$P_2 (80, 90)$

$x_{min}, y_{min} = (20, 20)$

$x_{max}, y_{max} = (90, 90)$

Find region codes:

Region codes of P_1:

bit 1: $x - x_{min} = 10 - 20 = -10$

$\therefore$ bit 1 = 1

bit 2: $x_{max} - x = 90 - 10 = 80$

$\therefore$ bit 2 = 0

bit 3: $y - y_{min} = 30 - 20 = 10$

$\therefore$ bit 3 = 0

bit 4: $y_{max} - y = 90 - 30 = 40$

$\therefore$ bit 4 = 0

$\therefore$ Region Code (P_1) = 0001

Region code of P_2:

bit 1: $x_p - x_{min} = 80 - 20 = 60$

$\therefore$ bit 1 = 0

bit 2: $x_{max} - x_q = 90 - 80 = 10$

$\therefore$ bit 2 = 0

bit 3: $y - y_{min} = 90 - 20 = 70$

$\therefore$ bit 3 = 0

bit 4: $y_{max} - y = 90 - 90 = -20$

$\therefore$ bit 4 = 1

$\therefore$ Region Code (P_2) = 1000

$1000 + 0001 = 0000$

$\therefore$ line is inside the boundary.

$M = \dfrac{90 - 30}{80 - 10} = \dfrac{6}{7}$

To find top edge

$$x = \frac{x_0 + y_{max} \cdot d - y_0}{m}$$

$$= \frac{80 + 20 - 90}{6/7} = 56.6 \approx 57$$

To find left edge

$$y = y_0 + m (x - x_0) \qquad = 30 + m(20 - 10)$$

$$= 30 + 6/7 \times 10 = 38.57 = 39$$

∴ Line segment in clipping is from $(20, 39)$ to $(57, 80)$

2. $Q_1 (10, 0)$

$Q_2 (80, 90)$

$x_{min}, y_{min} = (20, 20)$

$x_{max}, y_{max} = (90, 80)$

Region bits of $Q_1 = 0110$

Region bits of $Q_2 = 1000$

The lines are not completely inside or outside the clipping window and the points do not fall on the boundary.

Testing for intersection points.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{90}{70} = 9/7$$

$$(y - y_1) = m (x - x_1)$$

$$y = 9/7 \, x - 9/7 \times 10$$

$$7y = 9x - 90$$

$x = x_{min}$.

$$7y = 9 \times 20 - 90 = 90$$

$$y = 90/7 = 12.8 < y_{min}$$

∴ Left Boundary does not intersect.

$y = y_{min}$ $\quad 7 \times 20 + 90 = 9x$, $x = 29.55$

$x_{min} < x < x_{max}$ ∴ Bottom edge intersects

To find intersection at top edge, set $y = y_{max}$

$$7 \times 20 + 90 = 9x, \quad x = 64.44$$

∴ Line segment in clipping window is $(29.55, 20)$ to $(64.44, 70)$