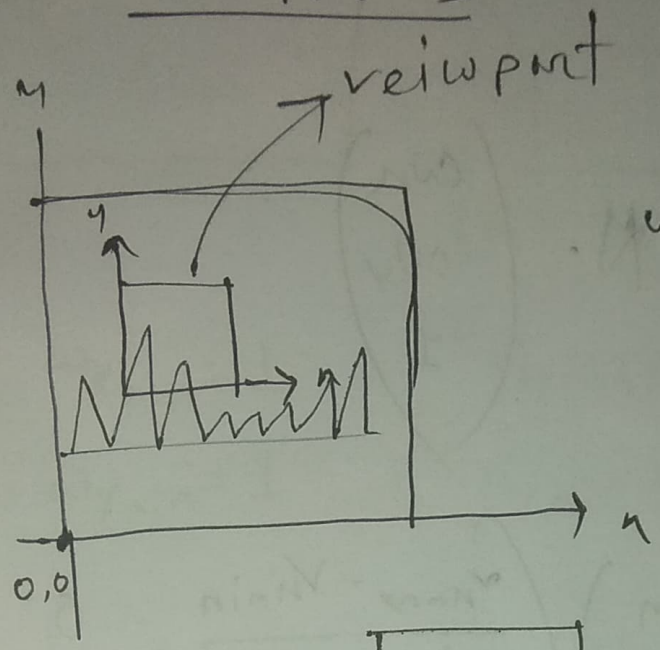
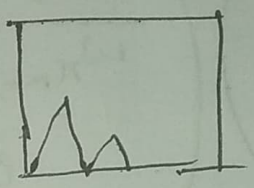
CG

13.09.122

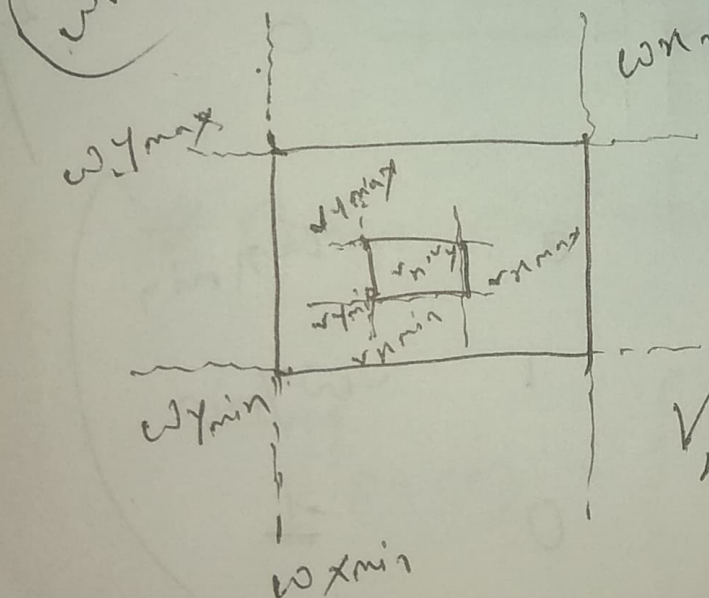
chapter 5



window to viewport mapping



WSC (world coordinate system)



$$\frac{w_x - w_{x\min}}{w_{x\max} - w_{x\min}} = \frac{v_x - v_{x\min}}{v_{x\max} - v_{x\min}}$$

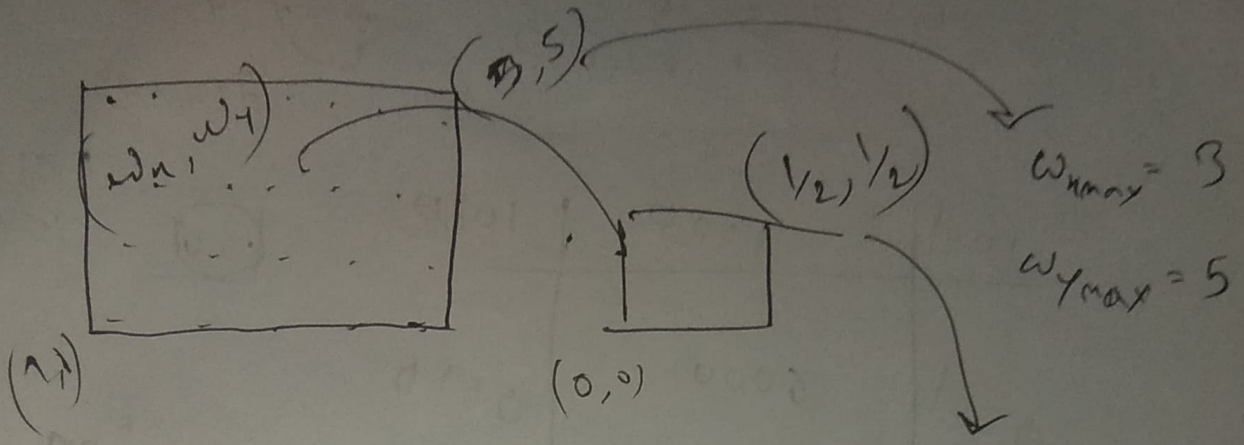
$$v_x = \frac{w_x - w_{x\min}}{w_{x\max} - w_{x\min}} \left(v_{x\max} - v_{x\min}\right) + v_{x\min}$$

$$v_y = \frac{w_y - w_{y\min}}{w_{y\max} - w_{y\min}} \left(v_{y\max} - v_{y\min}\right) + v_{y\min}$$

Viewport transformation Matrix

$$\begin{pmatrix} v_x \\ v_y \\ 1 \end{pmatrix} = N \cdot \begin{pmatrix} w_x \\ w_y \\ 1 \end{pmatrix}$$

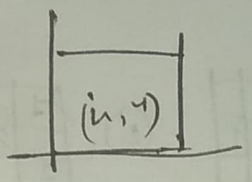
$$N = \begin{pmatrix} 1 & 0 & v_{x\min} \\ 0 & 1 & v_{y\min} \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} \frac{v_{x\max} - v_{x\min}}{w_{x\max} - w_{x\min}} & 0 & 0 \\ 0 & \frac{v_{y\max} - v_{y\min}}{w_{y\max} - w_{y\min}} & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 & -w_{x\min} \\ 0 & 1 & -w_{y\min} \\ 0 & 0 & 1 \end{pmatrix}$$



$w_{x_{min}} = 1$, $v_{x_{min}} = 0$ $v_{x_{max}} = \frac{1}{2}$

$w_{y_{min}} = 1$ $v_{y_{min}} = 0$ $v_{y_{max}} = \frac{1}{2}$

Point cliping



$x_{min} < x < x_{max}$

$y_{min} < y < y_{max}$

Cohen shatherland

~~sing~~

$$sign(x) = \begin{cases} 1 & ; +ve \\ 0 & ; -ve \end{cases}$$

Bit 1 = sign $(y - y_{max})$

Bit 2 = sign $(y_{min} - y)$

Bit 3 = sign $(x - x_{max})$

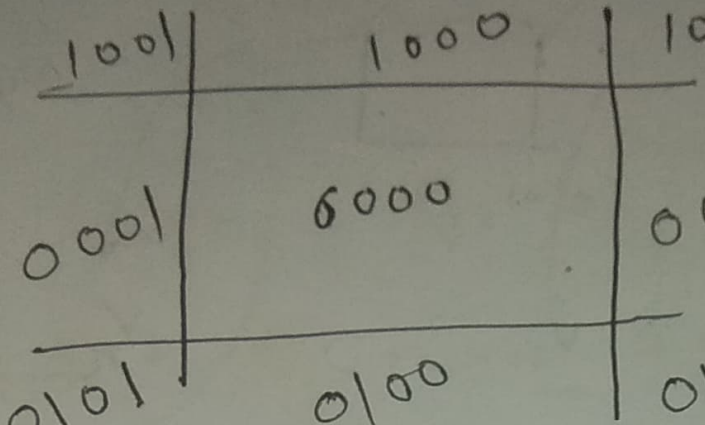
Bit 4 = sign $(x_{min} - x)$

5 5 5 5 5 5 ~~7 7 7~~

(A+2)×2

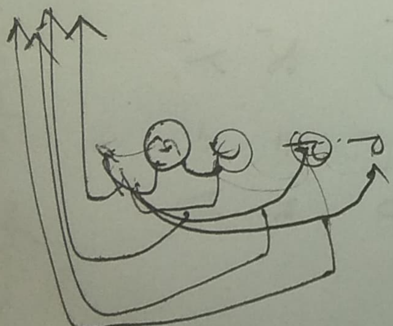
2×15
15 15

30



$$\begin{pmatrix} V_x \\ V_y \\ 1 \end{pmatrix} = N \cdot \begin{pmatrix} \omega_x \\ \omega_y \\ 1 \end{pmatrix}$$

$$N = \begin{pmatrix} 1 & 0 & V_{x_{min}} \\ 0 & 1 & V_{y_{min}} \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} \frac{V_{x_{max}} - V_{x_{min}}}{\omega_{x_{max}} - \omega_{x_{min}}} & 0 & 0 \\ 0 & \frac{V_{y_{max}} - V_{y_{min}}}{\omega_{y_{max}} - \omega_{y_{min}}} & 0 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 & 0 & -\omega_{x_{min}} \\ 0 & 1 & -\omega_{y_{min}} \\ 0 & 0 & 1 \end{pmatrix}$$



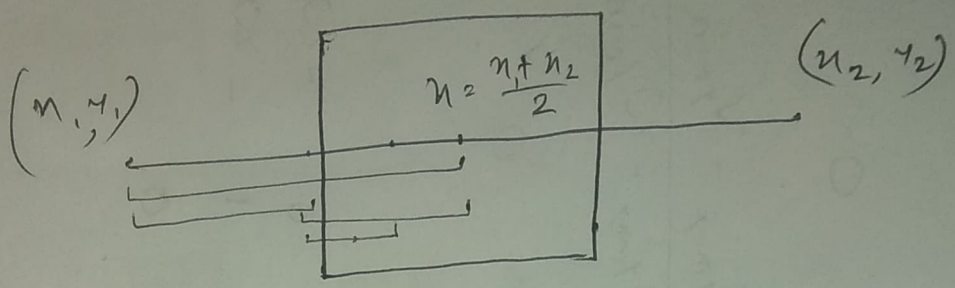
13.33
35.29
270

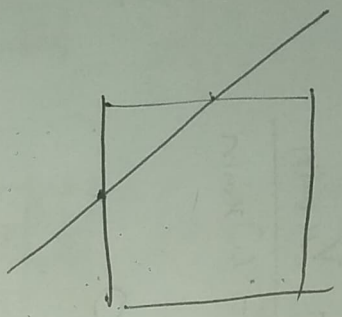
C.G — 16.09.22

chapter 5

Mid point subdivision algo

* Interative algo:





Liang - Barsky Algorithm

$u = \{u_1, u_2\}$

$x = x_1 + \Delta x . u$

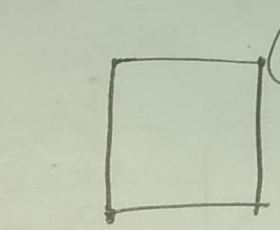
$y = y_1 + \Delta y . u$

page - 95

p_k	q_k
$p_1 = -\Delta x$	$q_1 = x_1 - x_{min}$ (left)
$p_2 = \Delta x$	$q_2 = x_{max} - x_1$ (right)
$p_3 = -\Delta y$	$q_3 = y_1 - y_{min}$ (bottom)
$p_4 = \Delta y$	$q_4 = y_{max} - y_1$ (top)

$p_k = 0 \rightarrow$ Parallel

$q_k < 0 \rightarrow$ outside



$(A, B) = (11, 5), (11, 10)$

$p_2 = \Delta x$

$= 0$

$q_2 = 9 - 11$

$= -2$

As ~~neg~~ $q_2 < 0$

(A, B) line is outside from

. . . . .

$P_1, P_2 < 0$

$P_3, P_4 > 0$

$U_1 = \min\left(1, \frac{q_1}{P_1}, \frac{q_2}{P_2}\right)$

$U_2 = \max\left(1, \frac{q_3}{P_3}, \frac{q_4}{P_4}\right)$

$U_1 < U_2$ visible

$U_1 > U_2$ invisible

C, D $= (3,7), (3,10)$

		$\frac{q_2}{P_k}$
$P_1 = 0$	$q_1 = 2$	0
$P_2 = 0$	$q_2 = 6$	0
$P_3 = -3$	$q_3 = 5$	$-5/3$
$P_4 = 3$	$q_4 = 1$	$\frac{1}{3}$

$U_1 = \min(1, -5/3) = -5/3$

$U_2 = \max(0, 1/3) = 1/3$