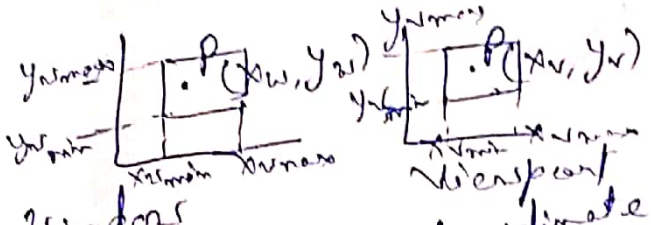
Window to Viewport Transformation —



$$\frac{x_v - x_{v_{min}}}{x_{v_{max}} - x_{v_{min}}} = \frac{x_w - x_{w_{min}}}{x_{w_{max}} - x_{w_{min}}} \quad \text{—— (1)}$$

$$\frac{y_v - y_{v_{min}}}{y_{v_{max}} - y_{v_{min}}} = \frac{y_w - y_{w_{min}}}{y_{w_{max}} - y_{w_{min}}} \quad \text{—— (2)}$$

From (1) ——

$$x_v = \frac{x_w - x_{w_{min}}}{x_{w_{max}} - x_{w_{min}}} \times (x_{v_{max}} - x_{v_{min}}) + x_{v_{min}}$$

$$= x_{v_{min}} + (x_w - x_{w_{min}})\, S_x \quad \left(\text{Scaling factor}\right)$$

$$y_v = y_{v_{min}} + (y_w - y_{w_{min}})\, S_y$$

Find the normalization transformation that maps a window whose lower left corner is at (1, 1) and upper right corner is at (3, 5) onto a viewport that is entire normalized device screen.

$$N = \begin{pmatrix} 1 & 0 & v_{x_{min}} \\ 0 & 1 & v_{y_{min}} \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} S_x & 0 & 0 \\ 0 & S_y & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 & -w_{x_{min}} \\ 0 & 1 & -w_{y_{min}} \\ 0 & 0 & 1 \end{pmatrix}$$

$v_{x_{min}}$ $v_{y_{min}}$ $v_{x_{max}}$ $v_{y_{max}}$

(0, 0) (1, 1)

$w_{x_{max}} = 3$

$w_{y_{max}} = 5$

(1, 1)

(0, 0)

$$S_x = \frac{(v_{x_{max}} - v_{x_{min}})}{(w_{x_{max}} - w_{x_{min}})}$$

$$S_y = \text{——}$$