# Draconifors

## Transformations in 2-D, Translation

Zubin Bhuyan,

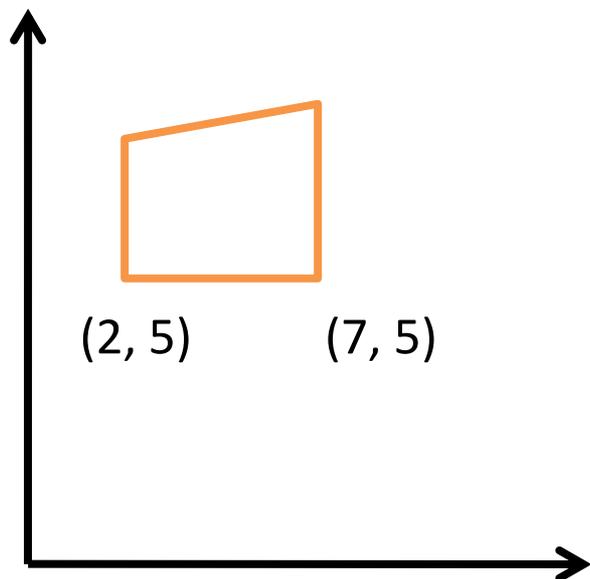Department of CSE, Tezpur University

http://www.tezu.ernet.in/~zubin
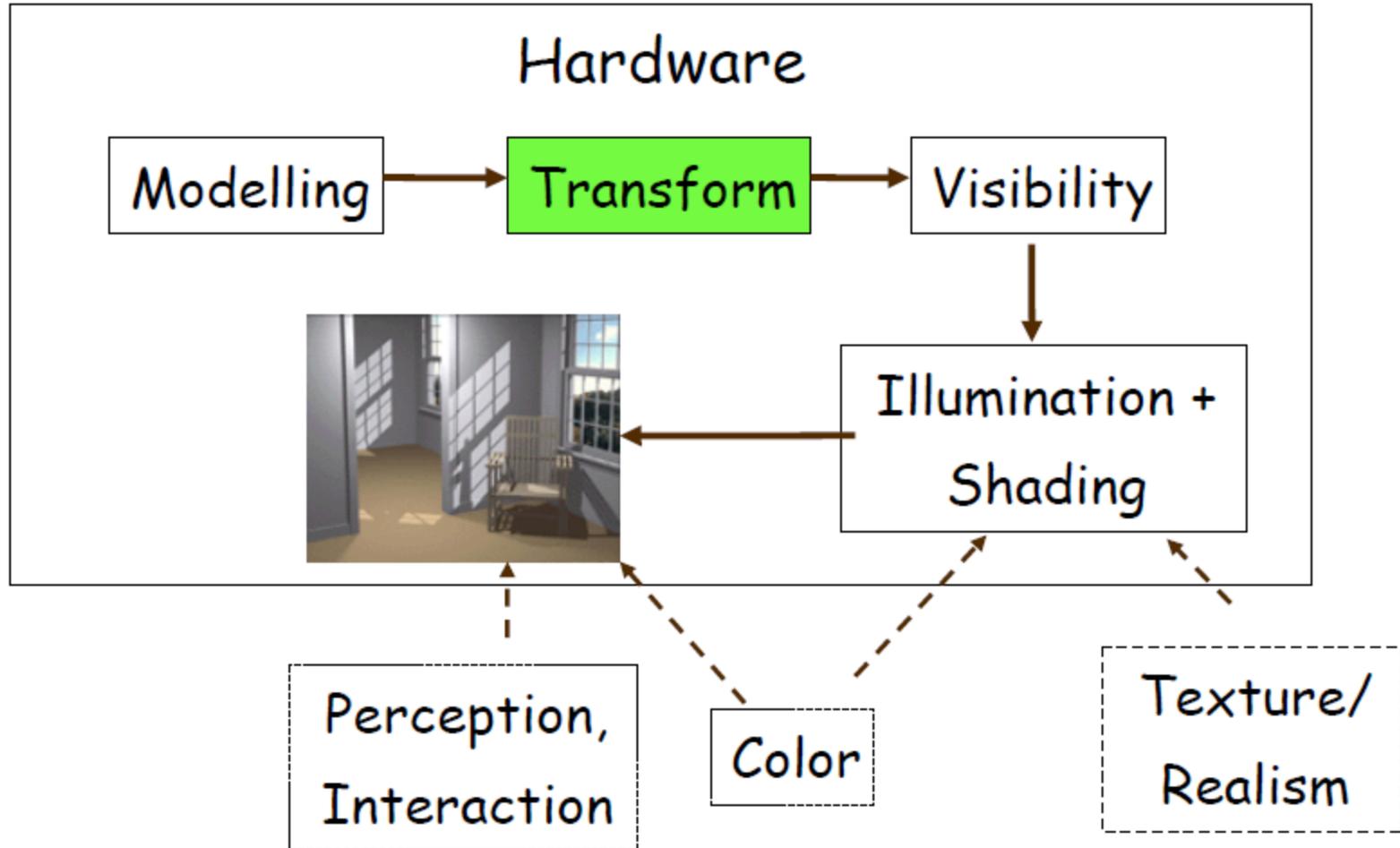
Source: Torsten Moller, "2D transformation"

# Recap: Most Basic Transformations

- Translation

- Scaling

- Rotation

- Shear

# Recap: Translation



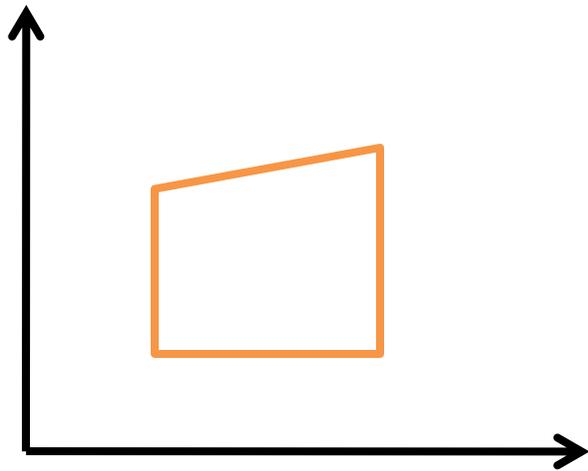(2, 5)          (7, 5)

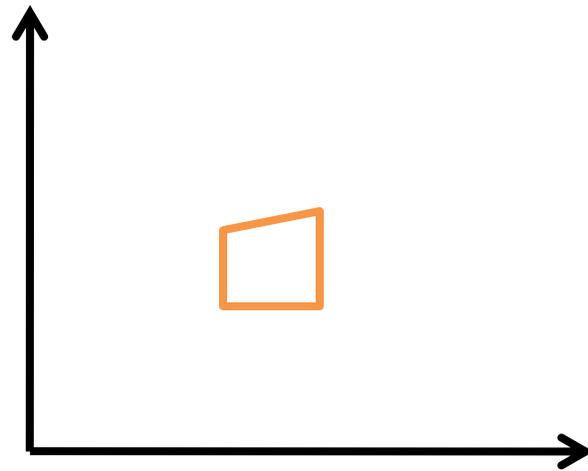Before transformation

$$P' = P + T$$

(7, 1)          (12, 1)
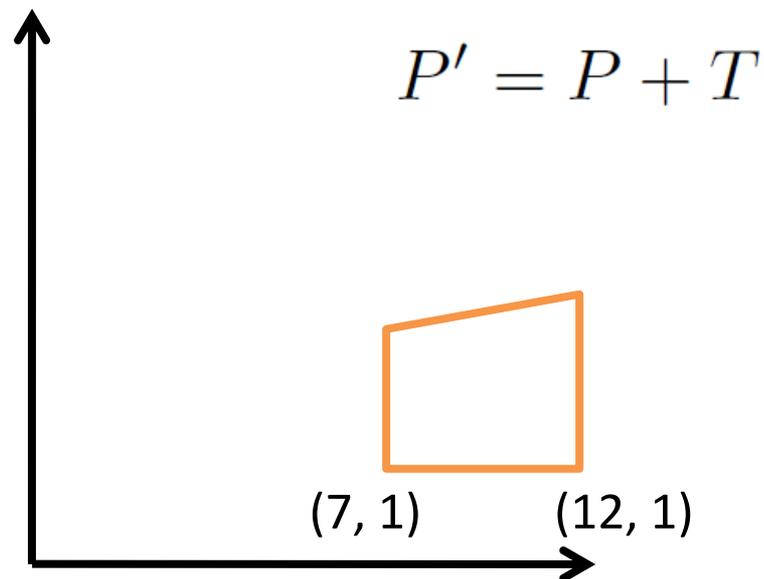
After transformation

$$x' = x + d_x$$
$$y' = y + d_y$$

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} d_x \\ d_y \end{bmatrix}$$

# Scaling

- Changing the size of an object.

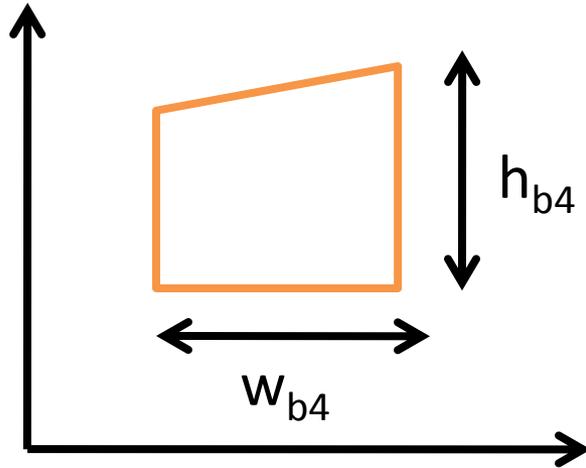- Scale an object by scaling the *X* and *Y* coordinates of each vertex in the object.
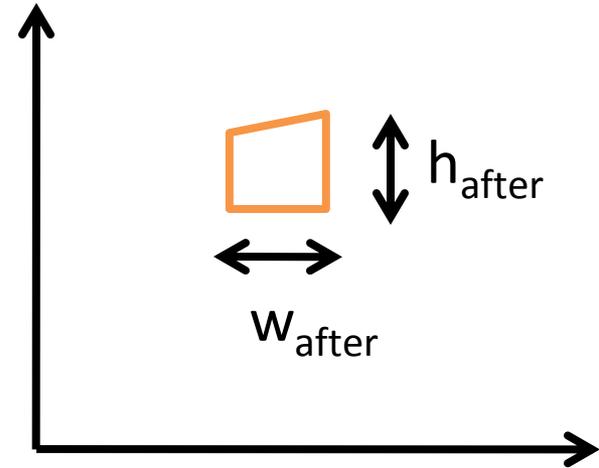
Before scaling

After scaling

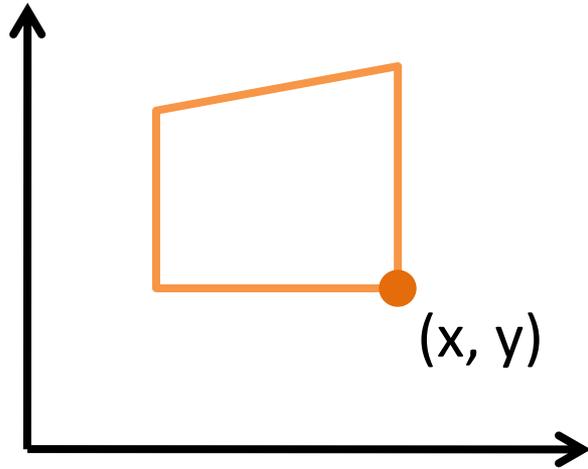# Scaling: The Idea



Before scaling

After scaling

$S_x = w_{after} / w_{b4}$
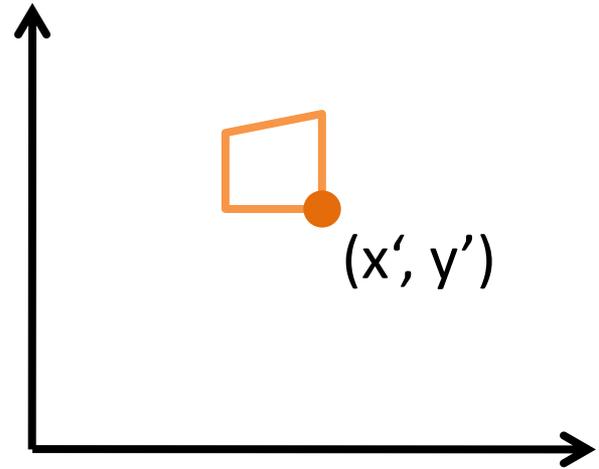$S_x = h_{after} / h_{b4}$

$x_{new} = s_x / x_{old}$
$y_{new} = s_y * y_{old}$

# Scaling: The New Point?



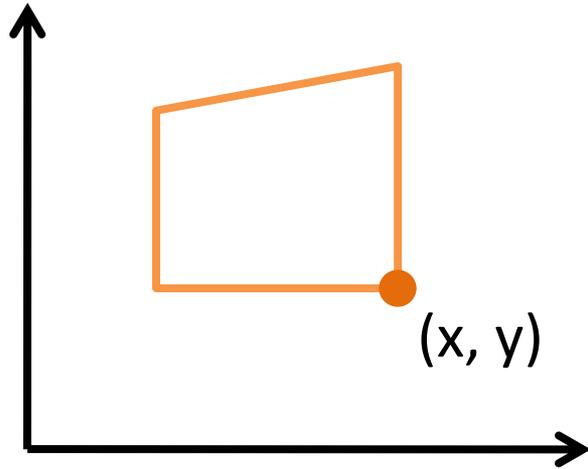Before scaling

After scaling

$(x, y)$
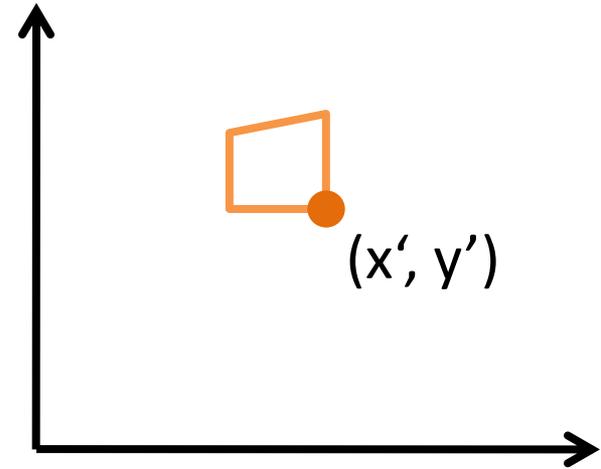
$(x', y')$

$$P' = S \times P$$

$$x' = s_x \times x$$

$$y' = s_y \times y$$

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} s_x & 0 \\ 0 & s_y \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix}$$

# Scaling



Before scaling

(x, y)

After scaling

(x', y')

$$\left[\begin{array}{c} x' \\ y' \end{array}\right] = \left[\begin{array}{cc} s_x & 0 \\ 0 & s_y \end{array}\right] \times \left[\begin{array}{c} x \\ y \end{array}\right]$$

- Uniform scaling: $s_x == s_y$
- Nonuniform scaling: $s_x \neq s_y$

THANKS!