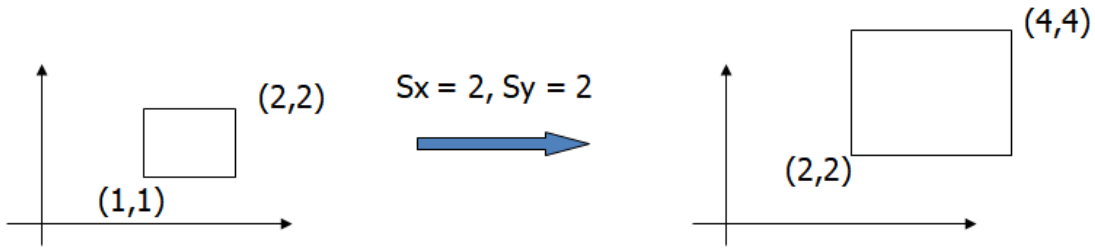
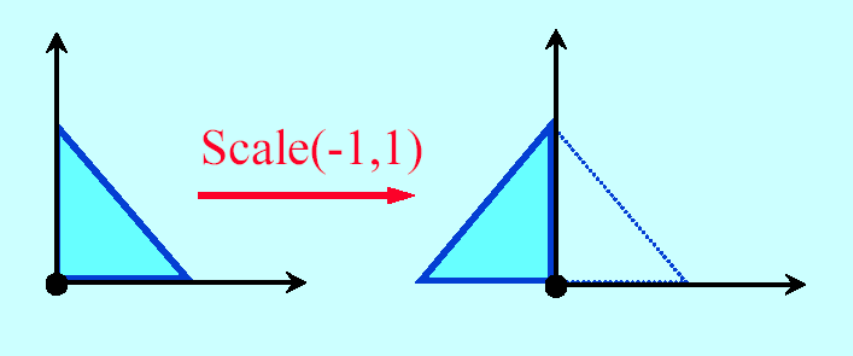
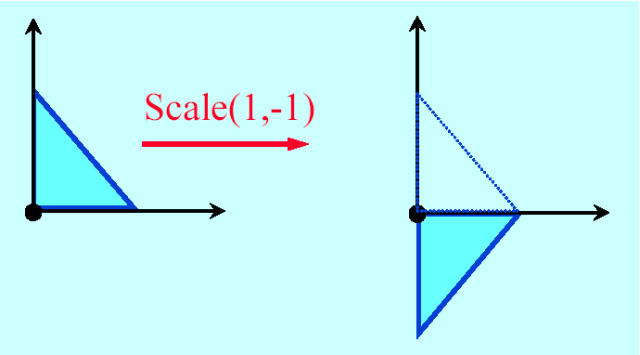


- Not only the object size is changed, it also moved!!
- Usually this is an undesirable effect
- We will discuss later (soon) how to fix it

Scaling facts





Put it all together

- Translation:

$$\begin{vmatrix} x' \\ y' \end{vmatrix} = \begin{vmatrix} x \\ y \end{vmatrix} + \begin{vmatrix} t_x \\ t_y \end{vmatrix}$$

- Rotation:

$$\begin{vmatrix} x' \\ y' \end{vmatrix} = \begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix} \cdot \begin{vmatrix} t_x \\ t_y \end{vmatrix}$$

- Scaling:

$$\begin{vmatrix} x' \\ y' \end{vmatrix} = \begin{vmatrix} s_x & 0 \\ 0 & s_y \end{vmatrix} \cdot \begin{vmatrix} t_x \\ t_y \end{vmatrix}$$

Lecture No 22Topic: Homogeneous Coordinates -1

- It is well known that many application involves sequences of geometric transformations
- For example, an animation might require an object to be translated, rotated and scaled at each increment of the motion
- If you want to first rotates an object, then scales it, you can combine those two transformation to a composite transformation like the following equation

$$A = S * R = \begin{bmatrix} S_x & 0 \\ 0 & S_y \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} = \begin{bmatrix} S_x \cos\theta & -S_x \sin\theta \\ S_y \sin\theta & S_y \cos\theta \end{bmatrix}$$

Homogeneous Coordinates -2

- However, it will be difficult to deal with the above composite transformation and translation together. Because, translation is not 2 by 2 matrix representation
- Consider how the matrix representations discussed in the previous sections can be reformulated so that such transformation sequences can be efficiently processed