

Applied Geometry For Computer Graphics And Cad

Hence the Cartesian coordinates of the point on the screen corresponding to the point (x, y) in the window are $(61x + 610, 102.4y + 512)$.

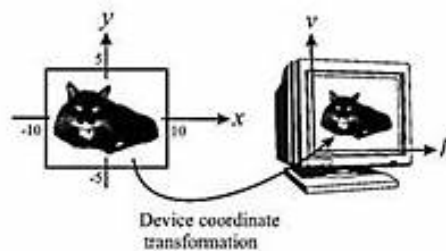


Figure 2.6 A device coordinate transformation makes Max a film star

Exercise 2.27

Suppose the window specified above is to be mapped onto a rectangular *device window* of the computer screen with lower left corner $(200, 200)$ and upper right corner $(600, 400)$. Determine the device coordinate transformation matrix.

2.7 Point and Line Geometry in Homogeneous Coordinates

The general equation of a line in the Cartesian plane is $ax + by + c = 0$. Suppose (X, Y, W) are the homogeneous coordinates of the point (x, y) , so that $x = X/W$ and $y = Y/W$. Substituting for x and y in the equation of the line, and multiplying through by W , yields the condition for (X, Y, W) to be a point on the line

$$aX + bY + cW = 0. \quad (2.12)$$

The equation is known as the *homogeneous line equation*. The line is uniquely defined by the coefficients a , b , and c , or any non-zero multiple ra , rb , and rc of them. Therefore, it is natural to specify the line by the homogeneous *line coordinates*

$$\ell = (a, b, c).$$

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