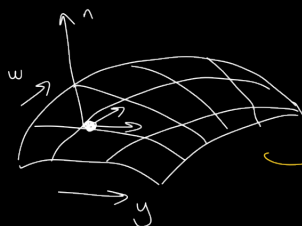


Interactive Computer Graphics

$$\begin{bmatrix} x_1 & y_1 & z_1 & h_1 \\ x_2 & y_2 & z_2 & h_2 \\ \vdots & \vdots & \vdots & \vdots \\ x_n & y_n & z_n & h_n \end{bmatrix} \times \begin{bmatrix} \text{Transformation Matrix} \end{bmatrix} = \begin{bmatrix} \text{Transformed Object} \end{bmatrix}$$



* with h_i we add new dimension for three-dimension object.



we are working points of any real-world objects

1. Computer Graphics with OpenGL
Donald Heery, M. Pauline Baker
Prentice Hall, 2004
2. Interactive Computer Graphics
A Top-down Approach with OpenGL
Edward Angel
3. Mathematical Elements for Computer Graphics
David F. Rogers, J. Alan Adams
McGraw-Hill
4. Procedural Elements for Computer Graphics
David F. Rogers
McGraw-Hill
5. Computer Graphics
A Programming Approach
Steven Harrington
McGraw-Hill 1997

BİLGİSAYAR GRAFİKLERİ KONULARI

1. 2D'li Geometrik Transformasyonlar, Noktalar, Doğrular ve Sonsuzdaki Noktalar
2. 3D'li Geometrik Transformasyonlar ve Projeksiyonlar
3. Düzlem Eğriler ve Parametrik Eğri Kavramı
4. Uzak Eğriler ve Spline'lar
5. Grafik Kütüphaneler ve OpenGL Komutları
6. Geometrik Örnekler ve OpenGL Program Örnekleri
7. Parametrik Yüzey Üretimi
8. Grafik Görüntüleme Cihazları: CRT ve LCD Monitörler
9. Raster Tarama Grafikleri
10. Antialiasing Temelleri
11. Aydınlatma Modelleri ve Boyama Teknikleri (Illumination Models and Toning)
12. Görünen-Yüzey Algılama Yöntemleri (Visible-Surface Detection Methods)
13. Gölgeleme (Shadowing)
14. Yüzey Ayrıntılarının Üretimi-Doku Üretimi (Texture Generation)
15. Esnek Cisimlerin Üretimi (Bayrak ve Kumaş Dalgalanması gibi)
16. Fraktal Cisimler

Caption

Transformation of Points

$$\begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} (ax+by) & (bx+dy) \end{bmatrix} = \begin{bmatrix} x^* & y^* \end{bmatrix}$$

$$\textcircled{1} \quad a=d=1 \Rightarrow \begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} a & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} ax & y \end{bmatrix} = \begin{bmatrix} x^* & y^* \end{bmatrix}$$

$x^* = ax$ This operation defined as stretching at x-axis

$$b,c=0 \Rightarrow \begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} a & 0 \\ 0 & d \end{bmatrix} = \begin{bmatrix} ax & dy \end{bmatrix} = \begin{bmatrix} x^* & y^* \end{bmatrix}$$

This operation defined as stretching at x and y-axis

$$\textcircled{2} \quad a \text{ and/or } d \text{ is negative}$$

$$\begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} -x & y \end{bmatrix}$$

This operation defined as reflection on y-axis

$$a \text{ and/or } d \text{ is negative}$$

$$\begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} -x & -y \end{bmatrix}$$

This operation defined as reflection at x and y axis

$$\textcircled{3} \quad a=d=1, c \neq 0$$

$$\begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} 1 & b \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} x & (bx+y) \end{bmatrix}$$

This operation defined as shearing

$$\textcircled{4} \quad a = \cos \theta, b = \sin \theta, c = -\sin \theta, d = \cos \theta$$

$$\begin{bmatrix} x & y \end{bmatrix} \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix} = \begin{bmatrix} x^* & y^* \end{bmatrix}$$

This operation named as rotation effect

$$x^* = r \cos(\theta + \phi) = x \cos \theta - y \sin \theta$$

$$y^* = r \sin(\theta + \phi) = y \cos \theta + x \sin \theta$$

* We are detect infinite coordinates with homogene coordinates.

$$\textcircled{5} \quad \begin{bmatrix} x & y & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ m & n \end{bmatrix} = \begin{bmatrix} x+mx & y+ny \end{bmatrix} = \begin{bmatrix} x^* & y^* \end{bmatrix}$$

$h=1 \Rightarrow$ physical coordinates

$h \neq 1 \Rightarrow$ homogene coordinates

$$\begin{bmatrix} x^* & y^* & 1 \end{bmatrix} = \begin{bmatrix} \frac{x}{h} & \frac{y}{h} & \frac{1}{h} \end{bmatrix}$$

translation elements

This operation defined as translation

