PRESESENTAÇÃO DE PRIMITIVAS E TRANSFORMAÇÕES GEOMÉTRICAS

Prof. Dr. Davi Marcondes Rocha

Disciplina: Computação Gráfica

Câmpus Santa Helena

REPRESENTAÇÃO DE PRIMITIVAS

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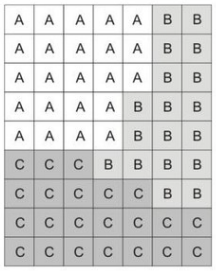
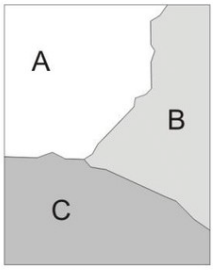
VETORIAL X RASTER

- Matricial ou Raster
- Vetorial

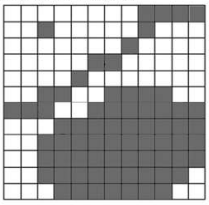


Raster

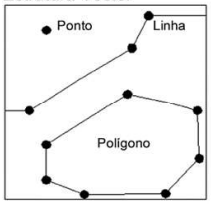


Vetor

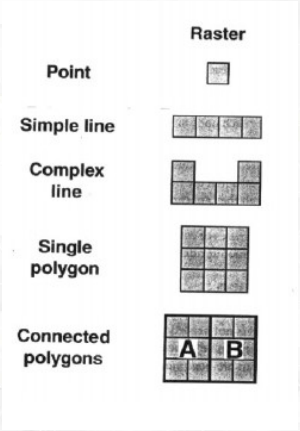
Estrutura Raster



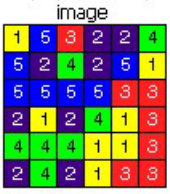
Estrutura Vector



VETORIAL X RASTER

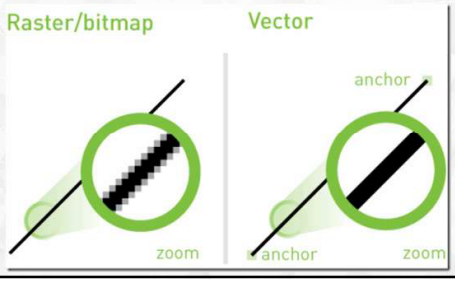


Display color map image



Color map

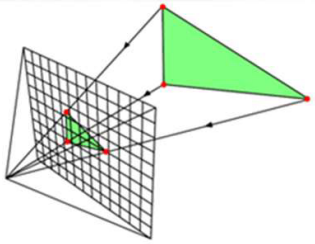
	Red	Green	Blue
1	255	255	0
2	64	0	128
3	255	32	32
4	0	255	0
5	0	0	255

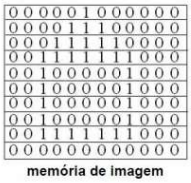


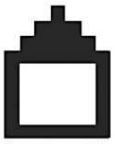
VETORIAL

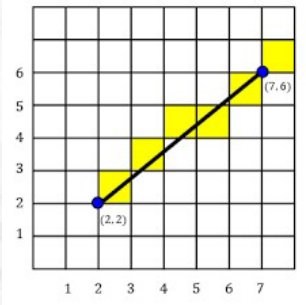
- Características
  - Mais “leve”
  - Qualidade
  - Isolar objetos/zonas

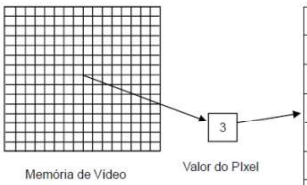
Rasterização







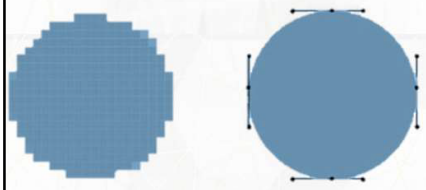




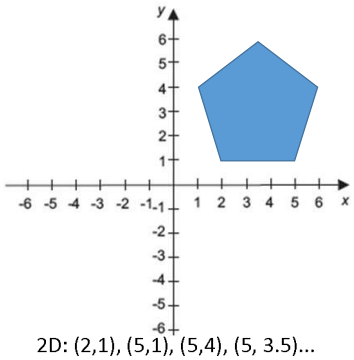
Cor	Red	Green	Blue
1	253	25	23
2	30	40	2
3	2	2	253
4	255	0	253
5	123	203	209
6	178	43	69
7			....

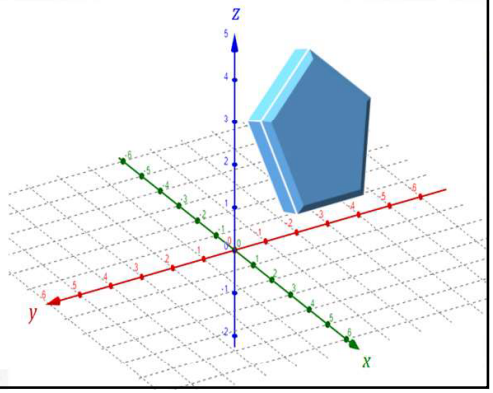
Tabela de Cores

Vetorização



3D: (-1,-2, 1), (-1,-4, 1), (-5,-4, 3)...



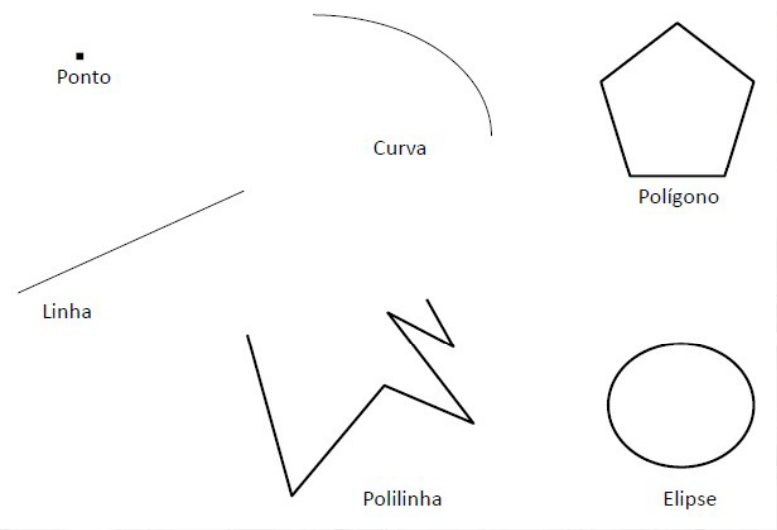


2D: (2,1), (5,1), (5,4), (5, 3.5)...

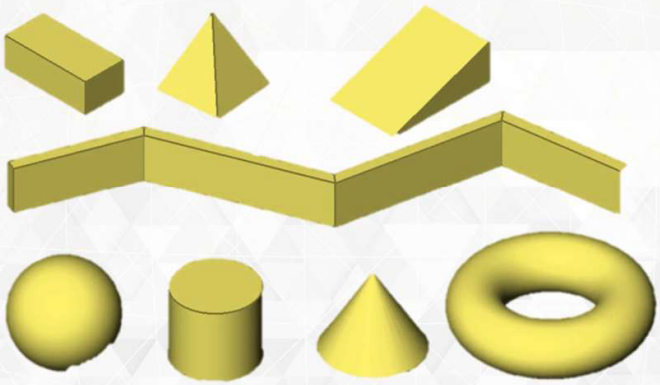
Conceitos Básicos

- Primitivas básicas;
- Sistema de coordenadas: a Geometria Analítica é uma ferramenta indispensável.
  - Através do sistema de coordenadas cartesiano, que se constrói a base da computação gráfica;
- Transformações geométricas
  - Quando as figuras são submetidas a operações de escalonamento, translação e rotação.

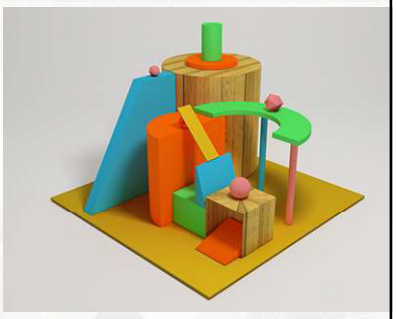
Primitivas 2D (x, y)

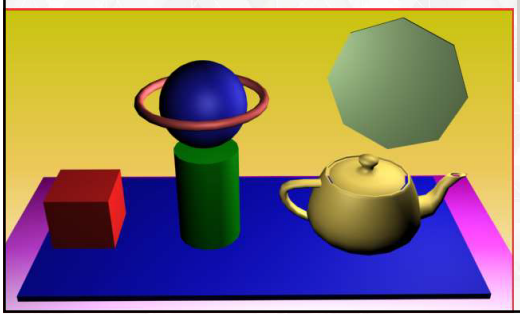


Primitivas 3D (x, y, z)

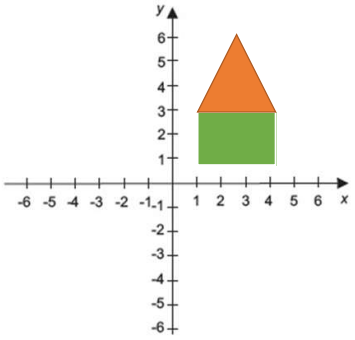


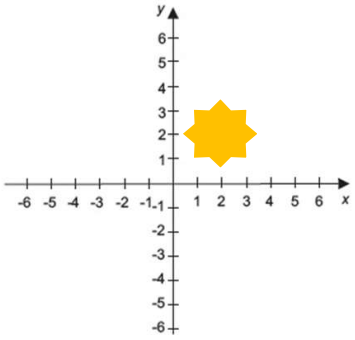
Composição



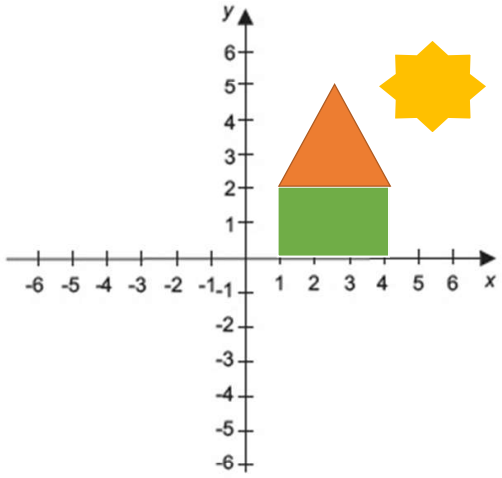


Modelos





Modelos



TRANSFORMAÇÃO GEOMÉTRICA

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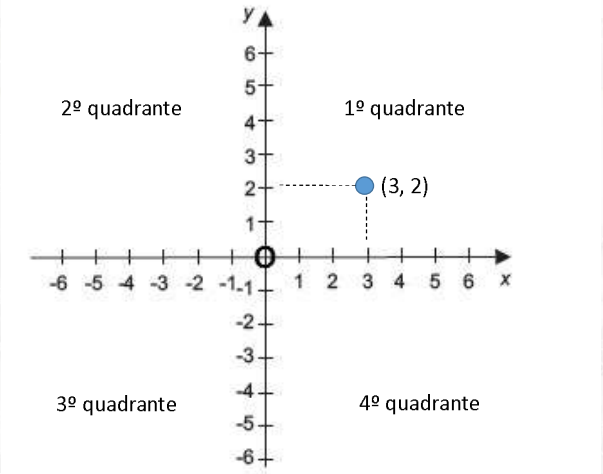
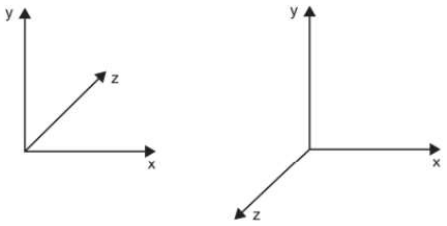
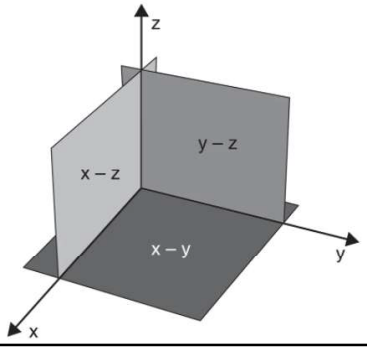
Sistema de Coordenadas



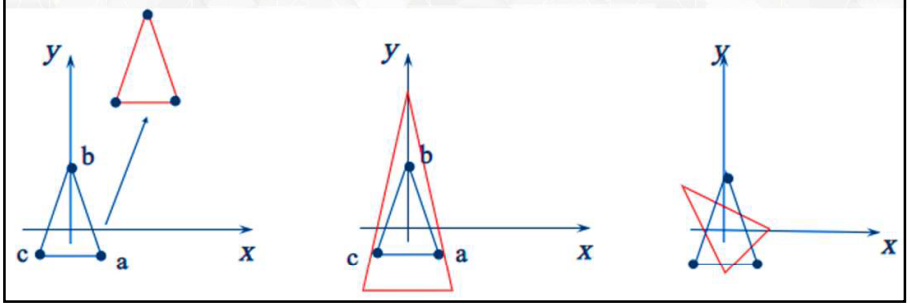
Sistema de Coordenadas





Transformações

- Translação
- Escala
- Rotação

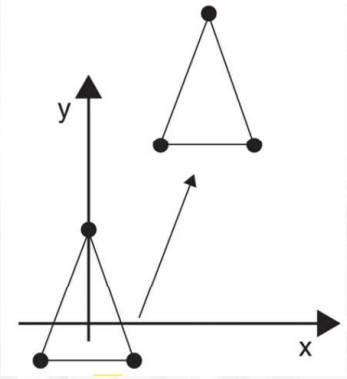


Translação

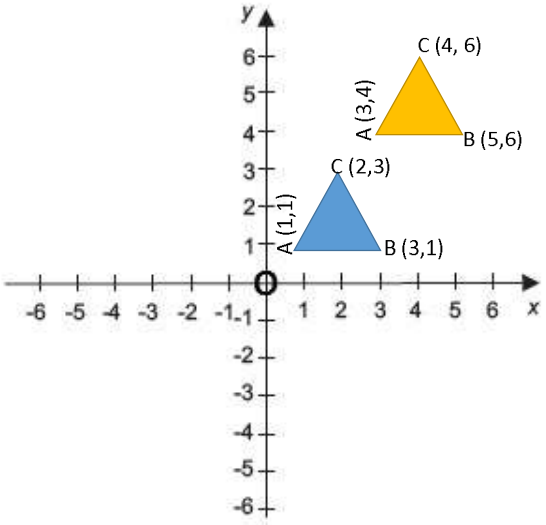
$$\begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \\ t_z \end{bmatrix}$$

$2D: p' = (x + t_x, y + t_y)$

$3D: p' = (x + t_x, y + t_y, z + t_z)$



Translação (2x, 3y)



$x' = x + tx$
$x_A' = 1 + 2 = 3$
$x_B' = 3 + 2 = 5$
$x_C' = 2 + 2 = 4$

$y' = y + ty$
$y_A' = 1 + 3 = 4$
$y_B' = 1 + 3 = 4$
$y_C' = 3 + 3 = 6$

A(1, 1)
B(3, 1)
C(2, 3)

A'(3, 4)
B'(5, 4)
C'(4, 6)

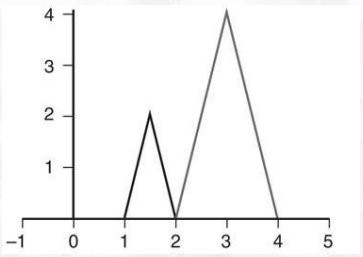
ESCALA

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

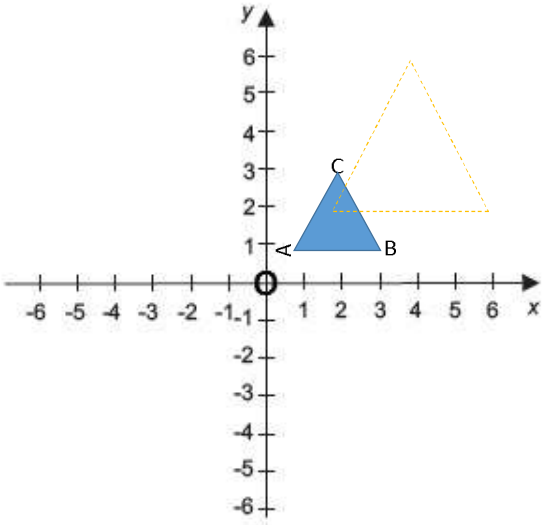
$$\begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} s_x & 0 & 0 \\ 0 & s_y & 0 \\ 0 & 0 & s_z \end{bmatrix} * \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

$x' = S_x * x$

$y' = S_y * y$



ESCALA (2x, 2y)



$x' = x + Sx$
$x_A' = 1 * 2 = 2$
$x_B' = 3 * 2 = 6$
$x_C' = 2 * 2 = 4$

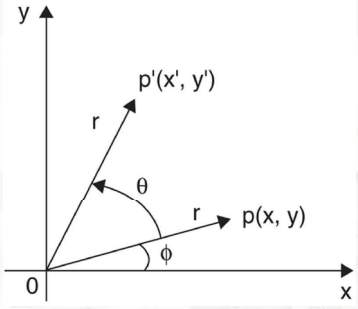
$y' = y * Sy$
$y_A' = 1 * 2 = 2$
$y_B' = 1 * 2 = 2$
$y_C' = 3 * 2 = 6$

A(1, 1)
B(3, 1)
C(2, 3)

A'(2, 2)
B'(6, 2)
C'(4, 6)

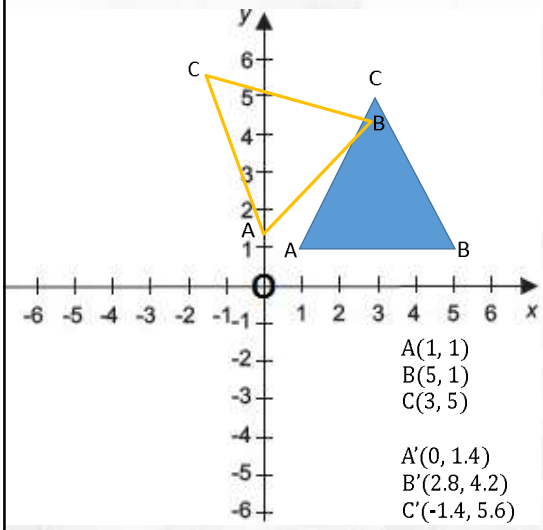
ROTAÇÃO

$$p[x', y'] = p[x, y].\begin{bmatrix} cos\theta & sen\theta \\ -sen\theta & cos\theta \end{bmatrix}$$



$x' = x * \cos(\sigma) + y * (-sen(\sigma))$
$y' = x * \text{sen}(\sigma) + y * cos(\sigma)$

Rotação (45°)



$x' = x * \cos(\sigma) + y * (-sen(\sigma))$
$x_A' = 1 * \cos(45) + 1 * (-sen(45))$
$x_A' = 0,7 + (-0,7)$
$x_A' = 0$

$x_B' = 5 * \cos(45) + 1 * (-sen(45))$
$x_B' = 3,5 + (-0,7)$
$x_B' = 2,8$

$x_C' = 3 * \cos(45) + 5 * (-sen(45))$
$x_C' = 0,21 + (-3,5)$
$x_C' = -1,4$

$Y' = x * sen(\sigma) + y * cos(\sigma)$
$Y_A' = 1 * sen(45) + 1 * cos(45)$
$Y_A' = 0,7 + 0,7$
$Y_A' = 1,4$

$Y_B' = 5 * sen(45) + 1 * cos(45)$
$Y_B' = 3,5 + 0,7$
$Y_B' = 4,2$

$Y_C' = 3 * sen(45) + 5 * cos(45)$
$Y_C' = 2,1 + 3,5$
$Y_C' = 5,6$