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COMPUTER GRAPHICS & MULTIMEDIA - Assignment-II

① Shearing

② A(0, 6, 2); B(6, 6, 6); C(6, 0, 1); D(0, 0, 0)

③ $F(x, y) = 0$

④ Constructive Solid geometry

⑤ Center of projection

Short Answers

① ⑥ It is a method for representing shapes using the limits

v_1 : x_1, y_1, z_1

v_2 : x_2, y_2, z_2

v_3 : x_3, y_3, z_3

v_4 : x_4, y_4, z_4

v_5 : x_5, y_5, z_5

④ ② ⑦

Object Space method	Image Space method
⑧ ③ ③ ① Operate on continuous object data	They operate on object data
⑪ Lot of calculations is	Can be enlarged without

image is too large to ~~be~~ clear enlarge	losing accuracy

(4) They are used in 2- ways.

(i) Translational Sweep

→ Define a shape as polygon vertex

→ Define a sweep path as a sequence of translation vectors

→ Translate the shape; continue building a vertex

→ Define a surface

(ii) Rotational Sweep

→ Define a shape as a polygon

→ Define a sweep path as a sequence of rotations

→ Rotate the shape.

(5) $\sum_j q_j B_j^{n+1}(t) = \sum_k P_k B_k^n(t) \Leftrightarrow q_j = \frac{j}{n+1} P_{j-1} + \frac{n+1-j}{n+1} P_j$

is the degree elevation formula for Bezier Curve.

Long Answer

(11) $$Q(u) = \sum_{i=0}^{2} P_i B_{i,2}(u), \quad 0 \le u \le 1$$

$$Q(u) = P_0 B_{0,2}(u) + P_1 B_{1,2}(u) + P_2 B_{2,2}(u)$$

$$\rightarrow x(u) = x_0 B_{0,2}(u) + x_1 B_{1,2}(u) + x_2 B_{2,2}(u)$$

$$y(u) = y_0 B_{0,2}(u) + y_1 B_{1,2}(u) + y_2 B_{2,2}(u)$$

$$B_{0,2}(u) \rightarrow (1-u)^2$$

$$B_{1,2}(u) = {}^2C_1 u^1 (1-u)^{2-1}$$

$$= \frac{2!}{1!(2-1)!} u(1-u)$$

$$= \frac{2!}{1*2} u(1-u)$$

$$= 2u(1-u)$$

$$B_{2,2}(u) = {}^2C_2 u^2 (1-u)^{2-2}$$

$$= u^2$$

$$x(u) = x_0(1-u)^2 + x_1 \cdot 2u(1-u) + x_2 u^2$$

$$y(u) = y_0(1-u)^2 + y_1 2u(1-u) + x_2 u^2$$

For:

$P_0(4,2)$ $P_1(8,8)$ $P_2(16,4)$

$$x(u) = 4(1-u)^2 + 8 \cdot 2u(1-u) + 16u^2$$

$$y(u) = 2(1-u)^2 + 8 \cdot 2u(1-u) + 4u^2$$

$$x(u) = 4(1-u)^2 + 16u - 16u^2 + 16u^2$$

$$= 4(1+u^2-2u) + 16u$$

$$= 4 + 4u^2 - 8u + 16u$$

$$\boxed{x(u) = 4 + 4u^2 + 8u}$$

$$y(u) = 2(1-u)^2 + 16u - 16u^2 + 4u^2$$

$$= 2(1+u^2-2u) + 16u - 12u^2$$

$$= 2 + 2u^2 - 4u + 16u - 12u^2$$

$$\boxed{y(u) = 2 - 10u^2 + 12u}$$

$$x(u) = 4 + 4u^2 + 8u$$

$$y(y) = 2 - 10u^2 + 12u$$

$u = 0$ $x(0) = 4$ $y(0) = 2$

$t = 0.2$

$x(0.2) = 4 + 4(0.2)^2 + 8(0.2)$

$= 4 + 0.16 + 1.6$

$= 5.76$

$y(0.2) = 2 - 10(0.2)^2 + 12(0.2)$

$= 2 - 0.4 + 2.4$

$= 4$

$t = 0.4$

$x(0.4) = 4 + 4(0.4)^2 + 8(0.4)$

$= 7.84$

$y(0.4) = 2 - 10(0.4)^2 + 12(0.4)$

$= 5.2$

$t = 0.6$

$x(0.6) = 4 + 4(0.6)^2 + 8(0.6)$

$= 10.24$

$y(0.6) = 5.6$

Ans

$u = 0.8$

$x(0.8) = 12.96$

$y(0.8) = 5.2$

$y(1) = 4$

Bezier Curve:-

$P_0(4,2)$; $P_1(8,8)$; $P_2(16,4)$

u	$x(u)$	$y(u)$
0	4	2
0.2	5.76	4
0.4	7.84	5.2
0.6	10.24	5.6
0.8	12.96	5.2
1	16	4