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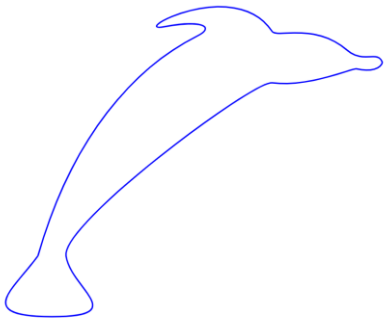
TEMA 3 TPAG

Pentru realizarea temei, am hotarat sa construim figura unui delfin:



Primul punct de racord de clasa C^2:

Punctele:

$b_0 = (300, 650)$, $b_1 = (400, 300)$, $d = (900, -250)$, $b5 = (650, 145)$, $b6 = (570,160)$

Fie numerele reale:

$u_0 = 0$, $u_1 = 1$, $u_2 = 2$

Vom consturi poligoanele de control (poligonul 1: b_0, b_1, b_2, b_3) și (poligonul 2: b_3, b_4, b_5, b_6) astfel încât curbele Bezier asociate acestor poligoane, definite pe intervalele [0, 1] și [1, 2] să aibă un racord de clasă C^2.

Cunoastem:

$$r(b_1, b_2, d) = r(d, b_4, b_5) = r(b_2, b_3, b_4) = r(u_0, u_1, u_2) = 1$$

Dupa formula:

$$r(u_0, u_1, u_2) = \frac{u_1 - u_0}{u_2 - u_1} = \frac{1-0}{2-1} = 1$$

Calcule:

$$b_2 = \frac{1}{2} b_1 + \frac{1}{2} d = \left(\frac{300+900}{2}, \frac{650-250}{2}\right) = (600, 200)$$

$$b_4 = \frac{1}{2} d + \frac{1}{2} b_5 = \left(\frac{900+460}{2}, \frac{-250+570}{2}\right) = (680, 160)$$

$$b_3 = \frac{1}{2}\mathrm{b}_2 + \frac{1}{2}b_4 = \left(\frac{600+680}{2}, \frac{200+160}{2}\right) = (640,180)$$

Al doilea punct de racord de clasa C^2:

Punctele:

$b_3 = (640,180)$, $b_4 = (680, 160)$, $d = (620, 130)$, $b_8 = (360, 220)$, $b_9 = (800,170)$

Fie numerele reale:

$u_0 = 0$, $u_1 = 1$, $u_2 = 2$

Cunoastem:

$$\mathrm{r}(b_4, b_5, \mathrm{d}) = \mathrm{r}(\mathrm{d}, b_7, b_8) = \mathrm{r}(b_5, b_6, b_7) = \mathrm{r}(u_0, u_1, u_2) = 1$$

Dupa formula:

$$\mathrm{r}(u_0, u_1, u_2) = \frac{u_1 - u_0}{u_2 - u_1} = \frac{1-0}{2-1} = 1$$

Calcule:

$$b_5 = \frac{1}{2}b_4 + \frac{1}{2}d = \left(\frac{680+620}{2}, \frac{160+130}{2}\right) = (650,145)$$

$$b_7 = \frac{1}{2}\mathrm{d} + \frac{1}{2}b_8 = \left(\frac{620+360}{2}, \frac{130+220}{2}\right) = (490,175)$$

$$b_6 = \frac{1}{2}\mathrm{b}_5 + \frac{1}{2}b_7 = \left(\frac{650+490}{2}, \frac{145+175}{2}\right) = (570,160)$$

Primul punct de racord de clasa GC1:

Punctele:

$b_6 = (570, 160)$, $b_7 = (490, 175)$, $b_8 = (720, 50)$, $b_9 = (800, 170)$, $b_{10} = (810, 185)$, $b_{11} = (890, 150)$, $b_{12} = (960, 210)$

Avem:

$\overrightarrow{b_8b_9} = b_9 - b_8 = (80,120)$, $\overrightarrow{b_8b_{10}} = b_{10} - b_8 = (90,135)$, $r=9/8$

Cei doi vectori sunt liniar dependenti, adica punctele b_8, b_9, b_{10} sunt coliniare. Prin urmare, cubicele Bezier asociate poligoanelor de control ($b_6, b_7, b_8 b_9$), ($b_9, b_{10}, b_{11}, b_{12}$) au un racord de clasa GC1 in b_9.

Al doilea punct de racord de clasa GC1:

Punctele:

b_9 = (800, 170), b_{10} = (810, 185), b_{11} = (890, 150), b_{12} = (960, 210) b_{13} = (995, 240), b_{14} = (1025, 210), b_{15} = (1035, 235)

Avem:

$\overrightarrow{b_{10}b_{11}} = b_{11} - b_{10} = (70,60)$, $\overrightarrow{b_{10}b_{12}} = b_{12} - b_{10} = (105,90)$, r=3/2

Cei doi vectori sunt liniar dependenti, adica punctele b_{11}, b_{12}, b_{13} sunt coliniare. Prin urmare, cubicele Bezier asociate poligoanelor de control (b_9, b_{10}, b_{11}, b_{12}), (b_{12}, b_{13}, b_{14} b_{15}) au un racord de clasa GC1 in b_{12}.

Al treilea punct de racord de clasa GC1:

Punctele:

b_{12} = (960, 210), b_{13} = (995, 240), b_{14} = (1025, 210), b_{15} = (1035, 235), b_{16} = (1037, 240), b_{17} = (1025, 260), b_{18} = (980, 250)

Avem:

$\overrightarrow{b_{14}b_{15}} = b_{15} - b_{14} = (10,25)$, $\overrightarrow{b_{15}b_{16}} = b_{16} - b_{15} = (2,5)$, r=5

Cei doi vectori sunt liniar dependenti, adica punctele b_{14}, b_{15}, b_{16} sunt coliniare. Prin urmare, cubicele Bezier asociate poligoanelor de control (b_{12}, b_{13}, b_{14} b_{15}), (b_{15}, b_{16}, b_{17}, b_{18}) au un racord de clasa GC1 in b_{15}.

Al patrulea punct de racord de clasa GC1:

Punctele:

b_{15} = (1035, 235), b_{16} = (1037, 240), b_{17} = (1025, 260), b_{18} = (980, 250), b_{19} = (972, 248), b_{20} = (880, 290), b_{21} = (800, 280)

Avem:

$\overrightarrow{b_{17}b_{18}} = b_{18} - b_{17} = (-45,-10)$, $\overrightarrow{b_{17}b_{19}} = b_{19} - b_{17} = (-54,-12)$, r= 6/5

Cei doi vectori sunt liniar dependenti, adica punctele b_{17}, b_{18}, b_{19} sunt coliniare. Prin urmare, cubicele Bezier asociate poligoanelor de control (b_{15}, b_{16}, b_{17}, b_{18}), (b_{18}, b_{19}, b_{20}, b_{21}) au un racord de clasa GC1 in b_{18}.

Al cincilea punct de racord de clasa GC1:

Punctele:

b_{18} = (980,250) b_{19} = (972,248) b_{20} = (880,290) b_{21} = (800,280) b_{22} = (760 275) b_{23} = (350,580) b_{24} = (360,650)

Avem:

$\overrightarrow{b_{20}b_{21}} = b_{21} - b_{20} = (-80,-10)$, $\overrightarrow{b_{20}b_{22}} = b_{22} - b_{20} = (-120,-15)$, r= 3/2

Cei doi vectori sunt liniar dependenti, adica punctele b_{20}, b_{21}, b_{22} sunt coliniare. Prin urmare, cubicele Bezier asociate poligoanelor de control (b_{18}, b_{19}, b_{20}, b_{21}), (b_{21}, b_{22}, b_{23}, b_{24}) au un racord de clasa GC1 in b_{21}.

Al saselea punct de racord de clasa GC1:

Punctele:

b_{21} = (800,280) b_{22} = (760 275) b_{23} = (350,580) b_{24} = (360,650) b_{25} = (370,720) b_{26} = (500,780) b_{27} = (330,780)

Avem:

$\overrightarrow{b_{23}b_{24}} = b_{24} - b_{23} = (10,70)$, $\overrightarrow{b_{23}b_{25}} = b_{25} - b_{23} = (20,140)$, r=2

Cei doi vectori sunt liniar dependenti, adica punctele b_{23}, b_{24}, b_{25} sunt coliniare. Prin urmare, cubicele Bezier asociate poligoanelor de control (b_{21}, b_{22}, b_{23}, b_{24}), (b_{24}, b_{25}, b_{26}, b_{27}) au un racord de clasa GC1 in b_{24}.

Svg-ul:

```
<svg width="1500" height="1500" viewbox="-300 -300 1500 1500">
    <path d="M 300 650
    C 400 300 600 200 640 180
    C 680 160 650 145 570 160
    C 490 175 720 50 800 170
    C 810 185 890 150 960 210
    C 995 240 1025 210 1035 235
    C 1037 240 1025 260 980 250
    C 972 248 880 290 800 280
    C 760 275 350 580 360 650
    C 370 720 500 780 330 780
    C 160 780 250 720 300 650" stroke="blue" stroke-width="3" fill="none"/>

</svg>
```

Sau, explicit:

```svg
<svg width="1500" height="1500" viewbox="-300 -300 1500 1500">
    <!-- b0 b1 b2 b3  -->
    <path d="M 300 650 C 400 300 600 200 640 180" stroke="blue" stroke-width="3" fill="none"/>
    <!-- b3 b4 b5 b6 -->
    <path d="M 640 180 C 680 160 650 145 570 160" stroke="blue" stroke-width="3" fill="none"/>
    <!-- b6 b7 b8 b9 -->
    <path d="M 570 160 C 490 175 720 50 800 170" stroke="blue" stroke-width="3" fill="none"/>
    <!-- b9 b10 b11 b12 -->
    <path d="M 800 170 C 810 185 890 150 960 210" stroke="blue" stroke-width="3" fill="none"/>
    <!-- b12 b13 b14 b15 -->
    <path d="M 960 210 C 995 240 1025 210 1035 235 " stroke="blue" stroke-width="3" fill="none"/>
    <!-- b15 b16 b17 b18 -->
    <path d="M 1035 235 C 1037 240 1025 260 980 250 " stroke="blue" stroke-width="3" fill="none"/>
    <!-- b18 b19 b20 b21 -->
    <path d="M 980 250 C 972 248 880 290 800 280 " stroke="blue" stroke-width="3" fill="none"/>
    <!-- b21 b22 b23 b24 -->
    <path d="M 800 280 C 760 275 350 580 360 650 " stroke="blue" stroke-width="3" fill="none"/>
    <!-- b24 b25 b26 b27 -->
    <path d="M 360 650 C 370 720 500 780 330 780 " stroke="blue" stroke-width="3" fill="none"/>
    <!-- b27 b28 b29 b30 -->
    <path d="M 330 780 C 160 780 250 720 300 650" stroke="blue" stroke-width="3" fill="none"/>

</svg>
```

Mentionam ca, in ceea ce priveste cine ce calcule a realizat, Alina s-a ocupat de primul racord C2 si primele 3 racorduri GC1, iar Andreea de al doilea racord C2 si restul racordurilor GC1 (tot 3).