Lab 9

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Vectorul de noduri:

$t = 0{,}5,\ 0{,}8,\ 1{,}4,\ 2{,}1,\ 2{,}4,\ 2{,}9,\ 4{,}0,\ 4{,}5,\ 4{,}9.$

$t_0 = 0{,}5$
$t_1 = 0{,}8$
$t_2 = 1{,}4$
$t_3 = 2{,}1$
$t_4 = 2{,}4$
$t_5 = 2{,}9$
$t_6 = 4{,}0$
$t_7 = 4{,}5$
$t_8 = 4{,}9$

și punctele de control:

$d_1(-2,-3)$
$d_2(-1,2)$
$d_3(2,2)$
$d_4(3,0)$
$d_5(1,-3)$

a) Determinați vectorul de noduri și punctele de control ale derivatei curbei

$$d_1' = \frac{(3-1+1)(d_2-d_1)}{t_4-t_1} = \frac{3\cdot((-1,2)-(-2,-3))}{2{,}4-0{,}8} =$$

$$= (1{,}875;\ 9{,}375)$$

$$d_2' = \frac{3\cdot(d_3 - d_2)}{t_5 - t_2} = 3\cdot\frac{(2,2)-(1,2)}{2,9-1,4} = 3\cdot\frac{(3,0)}{1,5} = 6,0.$$

$$d_3' = 3\cdot\frac{d_4 - d_3}{t_6 - t_3} = 3\,\frac{1,1-2}{1,9} = (1,578;\ -3,157)$$

$$d_4' = 3\left(\frac{(d_5 - d_4)}{t_7 - t_4}\right) = 3\cdot\frac{(-2,-3)}{2,1} = (-2,857;\ -4,285).$$

b) Folosiți algoritmul lui de Boore pentru a derivată pentru a calcula $r'(2,8)$.

$$M_n^i(t)' = \frac{n}{t_{i+n-1} - t_{i-1}} M_{n-1}^i(t) - \frac{n}{t_{i+n} - t_i} M_{n-1}^{i+1}(t)$$

$$r^{(k)}(t) = \sum_{i=1}^{n+4-k} d_i^{(k)} M_{n-k}^{i(k)}(t)$$

$$M_0^i(t)\begin{cases} 1, & t\in[t_{i-1}, t_i] \\ 0 & \text{contrar.}\end{cases}$$

$n=3 \Rightarrow 4=2$

$\alpha=4$

$2,8 \notin [t_0, t_1]$

$M_0^1(t) = 0$

$M_0^2(t) = 0$

$M_0^3(t) = 0$

$$M_1^1(t) = 0$$

$$M_1^2(t) = 0$$

$$M_1^3(t) = 0 + \frac{(t_4 - t)}{t_4 - t_3} \cdot 1 = \frac{2{,}4 + 2{,}8}{0{,}3} = 1(3)$$

$$M_0^4(t) = 1 \qquad M_1^4(t) = \frac{t - t_3}{t_4 - t_3} \cdot 1 + 0 = \frac{2{,}8 + 2{,}4}{0{,}3} = 1{,}(3)$$

$$M_0^5(t) = 0 \qquad M_1^5(t) = 0$$

$$M_0^6(t) = 0 \qquad M_1^6(t) = 0$$

$$M_0^7(t) = 0 \qquad M_1^7(t) = 0$$

$$M_2^1(t) = 0 + \frac{t_2 - t}{t_3 - t_1} \cdot M_1^2 = 0$$

$$M_2^2(t) = 0 + \frac{t_4 - t}{t_4 - t_2} \cdot 1{,}(3)$$

$$M_2^3(t) = \frac{t - t_2}{t_4 - t_2} M_1^3(t) + \frac{t_5 - t}{t_5 - t_3} M_1^4(t)$$

$$M_2^4(t) = \frac{t - t_3}{t_5 - t_3} M_1^4 t + \text{—}\,\text{''}\,\text{—}\; \underbrace{M_1^5(t)}_{0}$$

$$M_2^5(t) = 0$$

$$M_2^6(t) = 0$$

$$N_3^1(t) = 0 + \frac{t_4 - t}{t_4 - t_2} N_2^2(t)$$

$$N_3^2(t) = \frac{t - t_1}{t_4 - t_1} N_2^2(t) + \frac{t_5 - t}{t_5 - t_2} N_2^3(t)$$

$$N_3^3(t) = \frac{t - t_2}{t_5 - t_2} N_2^3(t) + \frac{t_6 - t}{t_6 - t_3} N_2^4(t)$$

$$N_3^4(t) = \frac{t - t_3}{t_6 - t_3} N_2^4(t) + \frac{t_7 - t}{t_7 - t_4} N_2^5(t)$$

$$N_3^5(t) = \frac{t - t_4}{t_7 - t_4} N_2^5(t) + 0.$$

$$N_4^1(t) = \frac{t - t_0}{t_4 - t_0} N_3^1(t) + \frac{t_5 - t}{t_5 - t_1} N_3^2(t)$$

$$N_4^2(t) = \frac{t - t_1}{t_5 - t_1} N_3^2(t) + \frac{t_6 - t}{t_6 - t_2} N_3^3(t)$$

$$N_4^3(t) = \frac{t - t_2}{t_6 - t_2} N_3^3(t) + \frac{t_7 - t}{t_7 - t_3} N_3^4(t)$$

$$N_4^4(t) = \frac{t - t_3}{t_7 - t_3} N_3^4(t) + \frac{t_8 - t}{t_8 - t_4} \underbrace{N_3^5(t)}_{0.}$$

$$N_5^1(t) = \frac{t - t_0}{t_5 - t_0} N_4^1(t) + \frac{t_6 - t}{t_6 - t_1} N_4^2(t)$$

$$N_5^2(t) = \frac{t - t_1}{t_6 - t_1} N_4^2(t) + \frac{t_7 - t}{t_7 - t_2} N_4^3(t)$$

$$M_5^3(t) = \frac{t-t_1}{t_7-t_1} M_5^2(t) + \frac{t_8-t}{t_8-t_1} \cdot M_6^2(t)$$

$$M_7^1(t) = \frac{t-t_0}{t_7-t_0} M_6^1(t) \frac{t_8-t}{t_8-t_1} M_6^2(t).$$

$$M_6^1(t) = \frac{t-t_0}{t_6-t_1} M_5^1(t) + \frac{t_2-t}{t_7-t_1} M_5^2(t)$$

$$M_6^2(t) = \frac{t-t_1}{t_7-t_1} M_5^2(t) + \frac{t_8-t}{t_8-t_2} M_5^3(t)$$

$$r'(t) = \sum_{i=1}^{4} d_i' (M_2^i)'(t) \qquad i = 1,2,3,4$$

$$= d_1' \cdot (M_2^1)'(t) + d_2' (M_2^2)'(t) + d_3' (M_2^3)'(t) + d_4' (M_2^4)'(t)$$

$d_1' = (\ldots, \ldots)$

$d_2' = (\ldots, \ldots)$

$d_3'$,

$d_4'$

$$(M_2^1)'(t) = \frac{2}{t_2-t_0} \cdot M_1^1(t) - \frac{2}{t_3-t_1} \cdot M_1^2(t) = 0$$

$$(M_2^2)'(t) = \frac{2}{t_3-t_1} \cdot M_1^2(t) - \frac{2}{t_4-t_2} M_1^3(t) = 2(6)$$

$$(M_2^3)'(t) = \frac{2}{t_4-t_2} M_1^3(t) - \frac{2}{t_5-t_3} M_1^4(t) = -5(9)$$

$$(N_2^4)'(t) = \frac{2}{t_5 - t_3} N_1^4(t) - \frac{2}{t_6 - t_4} N_1^5(t) = 3(3)$$

$$x'(t) = 0 + (6,0) \cdot (-2(6)) + (1,578; -3,157) \cdot (5(9)) +$$
$$+ (-2,857; -4,285) \cdot (3(3)) = (15,996; 0) +$$
$$(9,466; 18,938) + (9,522; -14,281) =$$
$$= (34,984; 4,657)$$

$$x'(t) = (34,984; 4,657)$$