

B-Splines Cúbica C^2

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Abstract

Algoritmo para encontrar os pontos de controle de uma B-Spline Cúbica em C^2 e a Curva de Bézier correspondente.

1 Algoritmo

Considere o vetor de parametrização $[u_0, u_1, \dots, u_L]$. Sejam p_0, p_1, \dots, p_{L+3} os vértices da poligonal de controle e sejam d_0, d_1, \dots, d_{L+3} os pontos de controle da B-Spline Cúbica em C^2 $S(c)$ tais que:

1. $d_0 = p_0$
2. $d_1 = p_1$
3. $d_2 = (1 - \alpha)p_1 + \alpha p_2$, onde $\alpha = \frac{\Delta u_1}{\Delta u_1 + \Delta u_2}$
4. $d_{3L-3} = (1 - \alpha)p_{3L-4} + \alpha p_{3L-2}$, onde $\alpha = \frac{\Delta u_L}{\Delta u_L + \Delta u_{L+1}}$
5. $d_{3L-2} = (1 - \alpha)p_L + \alpha p_{L+1}$, onde $\alpha = \frac{\Delta u_L}{\Delta u_{L-1} + \Delta u_L}$
6. $d_{3L-1} = p_{L+1}$
7. $d_{3L} = p_{L+2}$
8. Para $i = 1, \dots, L - 2$
 - (a) $d_{3i} = (1 - \alpha)p_{3i-1} + \alpha p_{3i+1}$, onde $\alpha = \frac{\Delta u_i}{\Delta u_i + \Delta u_{i+1}}$
 - (b) $d_{3i+1} = (1 - \alpha)p_{i+1} + \alpha p_{i+2}$, onde $\alpha = \frac{\Delta u_i}{\Delta u_i + \Delta u_{i+1} + \Delta u_{i+2}}$
 - (c) $d_{3i+2} = (1 - \alpha)p_{i+1} + \alpha p_{i+2}$, onde $\alpha = \frac{\Delta u_i + \Delta u_{i+1}}{\Delta u_i + \Delta u_{i+1} + \Delta u_{i+2}}$

Considere ainda, para $j = 0, \dots, L$:

1. $u_0 = \text{dist}(d_0, d_2)$
2. $u_j = u_{j-1} + \text{dist}(d_j, d_{j+2})$

e $\Delta u_i = u_i - u_{i-1}$.