Azmari Sultana

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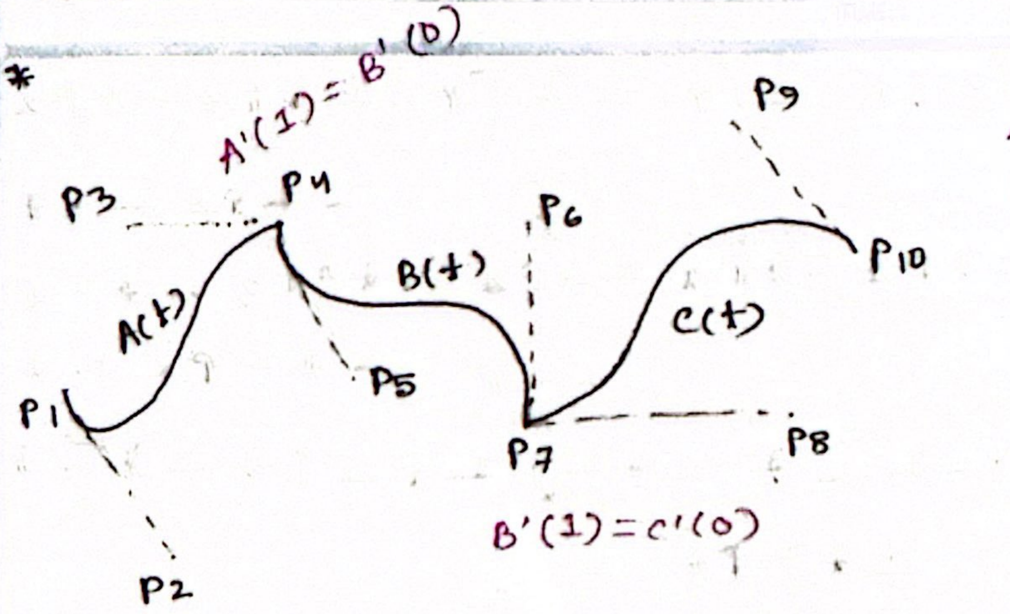

P_4, P_7 এ C_1 continuous হলে পুরো spline C_1 continuity match করবে।

$$Q(t) = (1-3t+3t^2-t^3)P_1 + (3t-6t^2+3t^3)P_2 + (3t^2-3t^3)P_3 + t^3P_4$$

$$A'(t) = (-3+6t-3t^2)P_1 + (3-12t+9t^2)P_2 + (6t-9t^2)P_3 + 3t^2P_4$$

$$B'(t) = (-3+6t-3t^2)P_4 + (3-12t+9t^2)P_5 + (6t-9t^2)P_6 + 3t^2P_7$$

$$C'(t) = (-3+6t-3t^2)P_7 + (3-12t+9t^2)P_8 + (6t-9t^2)P_9 + 3t^2P_{10}$$

$$A'(1) = (-3+6-3)P_1 + (3-12+9)P_2 + (6-9)P_3 + 3P_4$$

$$= -3P_3 + 3P_4$$

$$A'(1) = 3(P_4 - P_3)$$

$P_3 \longrightarrow P_4$

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$$B'(0) = (-3)P_4 + 3P_5$$

$$= 3(P_5 - P_4)$$

$$3(P_4 - P_3) = 3(P_5 - P_4)$$

$$\Rightarrow \boxed{P_5 = 2P_4 - P_3}$$

$$B'(1) = (-3+6-3)P_4 + (3-12+9)P_5 + (6-9)P_6 + 3P_7$$

$$= -3P_6 + 3P_7$$

$$= 3(P_7 - P_6)$$

$$P_6 \longrightarrow P_7$$

$$C'(0) = -3P_7 + 3P_8$$

$$= 3(P_8 - P_7)$$

$$P_7 \longrightarrow P_8$$

$$3(P_7 - P_6) = 3(P_8 - P_7)$$

$$\therefore \boxed{P_8 = 2P_7 - P_6}$$

$$A''(t) = (6-6t)P_1 + (-12+18t)P_2 + (6-18t)P_3 + 6tP_4$$

$$B''(t) = (6-6t)P_4 + (-12+18t)P_5 + (6-18t)P_6 + 6tP_7$$

$$C''(t) = (6-6t)P_7 + (-12+18t)P_8 + (6-18t)P_9 + 6tP_{10}$$

$$P_5 = 2P_4 - P_3$$

$$P_8 = 2P_7 - P_6$$

$$A''(1) = B''(0)$$

$$\Rightarrow 6P_2 - 12P_3 + 6P_4 = 6P_4 - 12P_5 + 6P_6$$

$$\Rightarrow 6P_2 - 12P_3 + 6P_4 - 6P_4 = -12(2P_4 - P_3) + 6P_6$$

$$\Rightarrow 6P_2 - 12P_3 = -24P_4 + 12P_3 + 6P_6$$

$$\Rightarrow P_6 = \frac{6P_2 - 12P_3 - 12P_3 + 24P_4}{6}$$

$$= \frac{6P_2 - 24P_3 + 24P_4}{6}$$

$$= P_2 - 4P_3 + 4P_4$$

$$\boxed{P_6 = P_2 + 4(P_4 - P_3)}$$

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$$B''(1) = C''(0)$$

$$\Rightarrow 6P_5 - 12P_6 + 6P_7 = 6P_7 - 12P_8 + 6P_9$$

$$\Rightarrow 6P_5 - 12P_6 = -12P_8 + 6P_9$$

$$\Rightarrow 6P_5 - 12P_6 = -24P_7 + 12P_6 + 6P_9$$

$$\Rightarrow 6P_5 - 12P_6 + 24P_7 - 12P_6 = 6P_9$$

$$\Rightarrow 6P_5 - 24P_6 + 24P_7 = 6P_9$$

$$\Rightarrow P_5 - 4P_6 + 4P_7 = P_9$$

$$\Rightarrow \boxed{P_9 = P_5 + 4(P_7 - P_6)}$$

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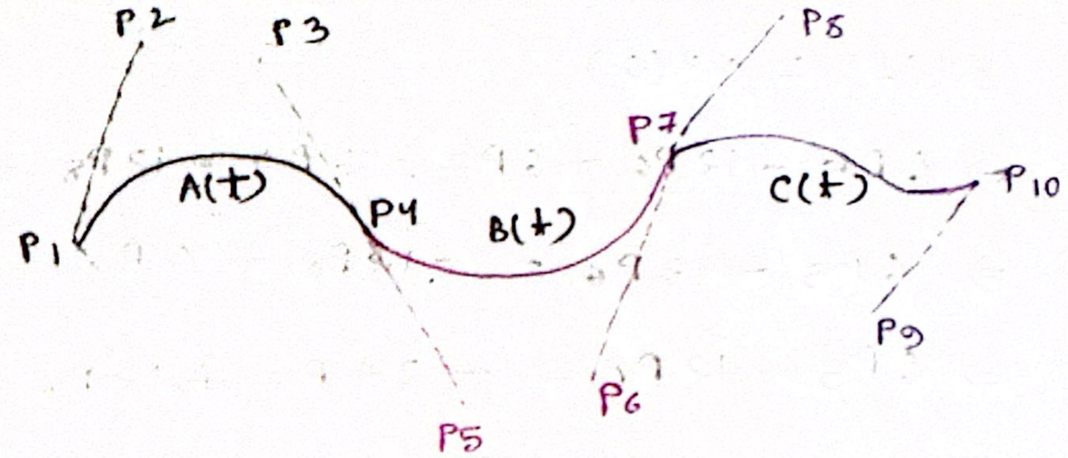

For C^0 continuity:

$$A(1) = B(0)$$

For C^1 continuity:

$$A'(1) = B'(0)$$

$$P_5 = 2P_4 - P_3$$

P_5: Basically 2nd control point of the 2nd curve needs to be equal to

P_4: Last control point of previous curve

P_3: 2nd last control point of previous curve

$$P_8 = 2P_7 - P_6$$

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For C^2 continuity :

$$A''(1) = B''(0)$$

$$P_6 = P_2 + 4(P_4 - P_3)$$

3rd control point of curve

2nd control point of previous

4th control point of previous

3rd control point of previous

$$P_9 = P_5 + 4(P_7 - P_6)$$

* P1 (0,0)
P2 (1,2)
P3 (2,2)
P4 (3,0)
} A

P4 (3,0)
P5 (4,-2)
P6 (5,-2)
P7 (6,0)
} B

P7 (6,0)
P8 (7,2)
P9 (8,2)
P10 (9,0)
} C

C^1 continuity

$$P_5 = 2P_4 - P_3$$

$$\Rightarrow (4,-2) = 2(3,0) - (2,2)$$

$$= (6,0) - (2,2)$$

$$= (4,-2)$$

A, B $\rightarrow$ C^1 continuous

$$P_8 = 2P_7 - P_6$$

$$\Rightarrow (7,2) = 2(6,0) - (5,-2)$$

$$= (12,0) + (5,-2) = (7,2)$$

B, C $\rightarrow$ C^1 continuous

C^2 continuity

$$P_6 = P_2 + 4(P_4 - P_3)$$

$$(5,-2) = (1,2) + 4((3,0) - (2,2))$$

$$= (1,2) + 4(1,-2)$$

$$= (1,2) + (4,-8)$$

$$= (5,-6)$$

$$(5,-2) \neq (5,-6)$$

A, B $\rightarrow$ not C^2 continuous

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$P_9 = P_5 + 1(P_7 - P_6)$

$\Rightarrow (8,2) = (1,-2) + 1((6,0) - (5,-2))$

$= (4,-2) + 4(1,2)$

$= (4,-2) + (4,8)$

$= (8,6)$

$(8,2) \neq (8,6)$

B, C $\rightarrow$ not C^2 continuous

If I update P6 as $(5,-6)$ and P9 as $(8,6)$, we'll have C^2 continuous for both curve.

Azmari