

Assignment in Computer Graphics II

– Assignment 3 – Computer Graphics and Multimedia Systems Group David Bulczak, Christoph Schikora

Assignment 1 [2 Points] A-Frame Construction

Given a cubic Bezier curve C with control points

$$\mathbf{C}_0 = \begin{pmatrix} 1 \\ 1 \end{pmatrix}, \quad \mathbf{C}_1 = \begin{pmatrix} 3 \\ 4 \end{pmatrix}, \quad \mathbf{C}_2 = \begin{pmatrix} 7 \\ 5 \end{pmatrix}, \quad \mathbf{C}_3 = \begin{pmatrix} 8 \\ 2 \end{pmatrix}.$$

Continue with another Bezier curve D from control point \mathbf{C}_3 to control point $\mathbf{D}_3 = \begin{pmatrix} 12 \\ 1 \end{pmatrix}$ so that the resulting curve is C^2 continuous.

1. Determine control points $\mathbf{D}_0, \mathbf{D}_1, \mathbf{D}_2$ for the new curve.
2. Specify a piecewise defined formula for the new curve $\mathbf{G}(v)$ with $v \in [0, 1]$ that passes through $\mathbf{C}_0, \mathbf{C}_3$ and \mathbf{D}_3 . Thus connect curves C and D in $v = \frac{1}{2}$.
3. Prove by calculation that the transition between C and D is C^2 continuous.

Assignment 2 [2 Points] Catmull-Rom Approach

Calculate according to the Catmull-Rom approach, all control points for a cubic Bezier spline through the points $\mathbf{P}_0, \mathbf{P}_1, \mathbf{P}_2$ whose tangents at the beginning and end are set by additional points \mathbf{P}_{-1} and \mathbf{P}_3 .

$$\mathbf{P}_{-1} = \begin{pmatrix} 0 \\ -3 \end{pmatrix}, \quad \mathbf{P}_0 = \begin{pmatrix} 6 \\ 0 \end{pmatrix}, \quad \mathbf{P}_1 = \begin{pmatrix} 24 \\ 3 \end{pmatrix}, \quad \mathbf{P}_2 = \begin{pmatrix} 12 \\ 6 \end{pmatrix}, \quad \mathbf{P}_3 = \begin{pmatrix} 12 \\ 9 \end{pmatrix}.$$

Hand in: 09.11.2015, at beginning of the lecture or until 10:00 in the mailbox of the chair (next to room H-A 7107)