

Assignment in Computer Graphics II

– Assignment 5 –

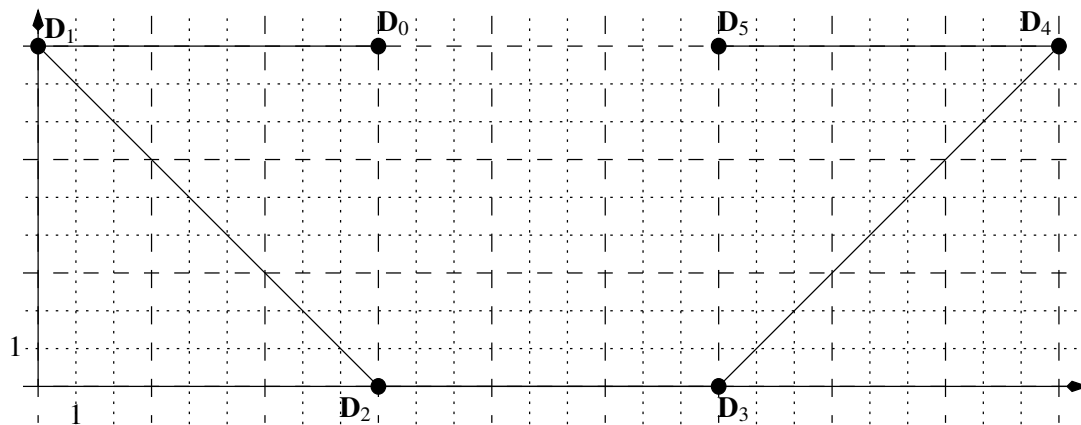
Computer Graphics and Multimedia Systems Group

David Bulczak, Christoph Schikora

Assignment 1 [2 Points] De Boor algorithm (uniform knot vector)

Given the following plotted de Boor points of a uniform, cubic B-Spline curve and the parameter $u = 4\frac{1}{3}$.

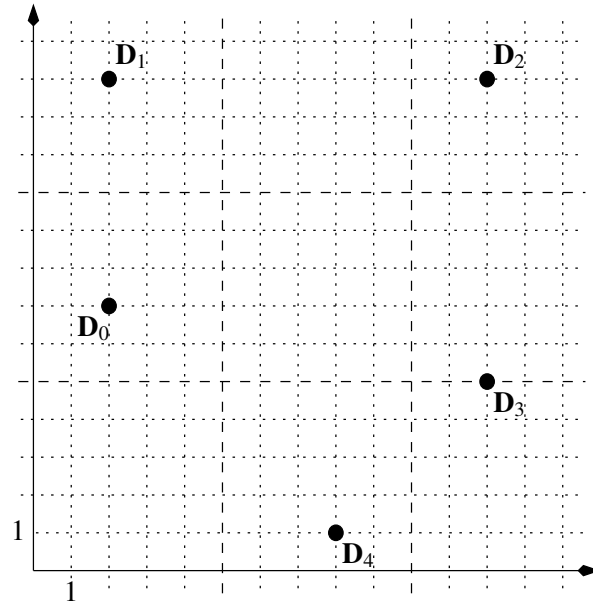
1. Which de Boor points are necessary for the evaluation of the curve at u .
2. Evaluate the curve geometrically and by calculation at u .



Assignment 2 [2 Points] De Boor algorithm (non-uniform knot vector)

Give a cubic B-Spline curve with $m = 4$, knot vector $T = \{0, 0, 0, 0, 1, 2, 2, 2, 2\}$ and control points

$$\mathbf{D}_0 = \begin{pmatrix} 2 \\ 7 \end{pmatrix}, \quad \mathbf{D}_1 = \begin{pmatrix} 2 \\ 13 \end{pmatrix}, \quad \mathbf{D}_2 = \begin{pmatrix} 12 \\ 13 \end{pmatrix}, \quad \mathbf{D}_3 = \begin{pmatrix} 12 \\ 5 \end{pmatrix}, \quad \mathbf{D}_4 = \begin{pmatrix} 8 \\ 1 \end{pmatrix}$$



- Calculate $D(u)$ at $u = 1$. Use the de Boor algorithm.
- Name the knots and control points and draw them into the sketch below.

Assignment 3 [2 Points] Data structures for polygon meshes

Given the following data structure for polygon mesh representation:

- All vertices are stored in a list with arbitrary order. Every vertex can be accessed by a unique ID.
- All faces are stored in a list with arbitrary order. For every face there is a list with vertex IDs. This list is ordered counter-clockwise.

You can assume that the polygon mesh is 2 manifold and that there are no holes i.e. every edge has two adjacent faces.

1. Develop pseudocode that turns these vertices/faces into the Winged-Edge structure.
2. Develop pseudocode that turns these vertices/faces into the Half-Edge structure.
3. What are the corresponding runtimes?

Hand in: 25.05.2016, until 18:00 in the mailbox of the chair (next to room H-A 7107) or via e-mail.