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## **Assignment in Computer Graphics II**

Assignment 4 –
Computer Graphics and
Multimedia Systems Group
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Assignment 1 [1 Point] De Boor algorithm (uniform knot vector)

Given the following ploted de Boor points of an 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 [1 Point] De Boor algorithm (non-uniform knot vector)

Given 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.

## Assignment 3 [1 Point] Programm De Boor-Algorithmus

Your task is to implement the De Boor-algorithm. Download the given code fragment on our website. Then expand the method "getDPoints()" in the "main.cpp" file.

A control polygon consisting of the points  $D_0$  bis  $D_5$  is in the global vector cPoints pre-initialized (See "createTestPoints()"). This correspond in ratio to the following points:

$$\mathbf{D}_0 = \begin{pmatrix} 9\\ 9 \end{pmatrix}, \quad \mathbf{D}_1 = \begin{pmatrix} 0\\ 9 \end{pmatrix}, \quad \mathbf{D}_2 = \begin{pmatrix} 9\\ 0 \end{pmatrix}, \quad \mathbf{D}_3 = \begin{pmatrix} 18\\ 0 \end{pmatrix}, \quad \mathbf{D}_4 = \begin{pmatrix} 27\\ 9 \end{pmatrix}, \quad \mathbf{D}_5 = \begin{pmatrix} 18\\ 9 \end{pmatrix}$$

Your curve for the control polygon should therefore look like this:



- Try also out:
  - 1. What happens if you set the degree of the curve to be drawn on two?
  - 2. What happens when three consecutive  $t_i$  are the same? e. g.  $T = \{0, 1, 2, 3, 4, 4, 4, 6, 7, 8, 9\}$

## Submission: 06.11.2014, before /at the beginning of the exercise.

Submit task 1 and 2 on paper and send for task 3 an email with the modified main.cpp.  $\rightarrow$  Email to: david.bulczak@uni-siegen.de, christoph.schikora@uni-siegen.de

The **deadline** is the same for all tasks, e.g. emails will only be accepted till Thursday 12:00 clock. If we receive your mail, we will send you as soon as possible a confirmation.