

Übung zu Computergraphik II

– Assignment 11 –

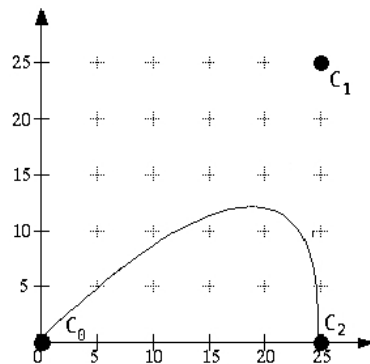
Computer Graphics and Multimedia Systems Group

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Assignment 1 [1 Point] Spline-based animation

Given the Bezier curve $\mathbf{C}(u)$ (shown in the figure) with control points

$$\mathbf{C}_0 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \quad \mathbf{C}_1 = \begin{pmatrix} 25 \\ 25 \end{pmatrix} \text{ und } \mathbf{C}_2 = \begin{pmatrix} 25 \\ 0 \end{pmatrix}.$$



Also given curve points for $u_1 = 0.2$, $u_2 = 0.4$, $u_3 = 0.6$, $u_4 = 0.8$:

$$\mathbf{C}(u_1) = \begin{pmatrix} 9 \\ 8 \end{pmatrix}, \quad \mathbf{C}(u_2) = \begin{pmatrix} 16 \\ 12 \end{pmatrix}, \quad \mathbf{C}(u_3) = \begin{pmatrix} 21 \\ 12 \end{pmatrix}, \quad \mathbf{C}(u_4) = \begin{pmatrix} 24 \\ 8 \end{pmatrix}.$$

Two lookup tables with arc lengths have to be completed:

u_i	Bogen
$u_0 = 0$	$l_0 = 0$
$u_1 = 0,2$	$l_1 =$
$u_2 = 0,4$	$l_2 =$
$u_3 = 0,6$	$l_3 =$
$u_4 = 0,8$	$l_4 =$
$u_5 = 1,0$	$l_5 =$

Bogen	u_i^*
$l_0^* = 0$	$u_0^* = 0$
$l_1^* =$	$u_1^* =$
$l_2^* =$	$u_2^* =$
$l_3^* =$	$u_3^* =$
$l_4^* =$	$u_4^* =$
$l_5^* =$	$u_5^* =$

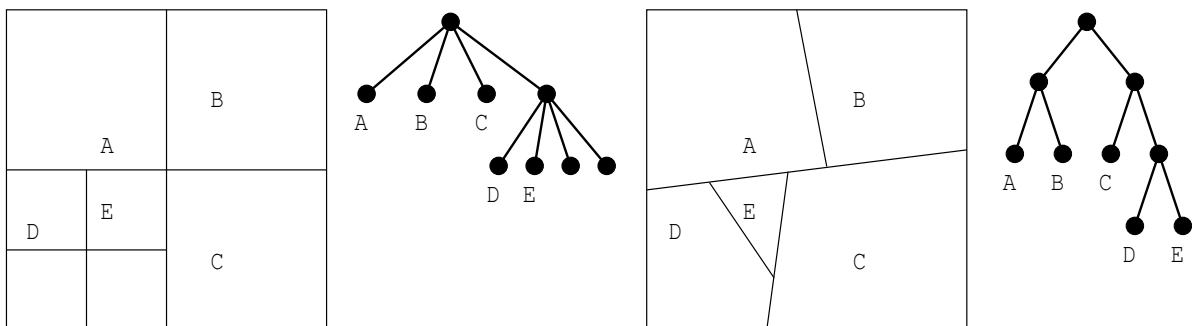
1. For Parameters u_0, \dots, u_5 compute respectively the approximations l_i between $\mathbf{C}(u_0)$ und $\mathbf{C}(u_i)$. Insert the values into the table.
2. Divide the total length into five equidistant parts and insert the interim values l_1^*, \dots, l_5^* into the table.

3. Determine for the arc lengths l_1^*, \dots, l_5^* the corresponding parameters u_1^*, \dots, u_5^* , to get the curve points in equidistant distances.

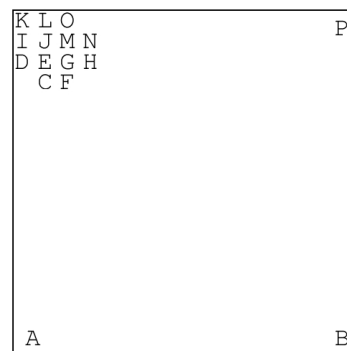
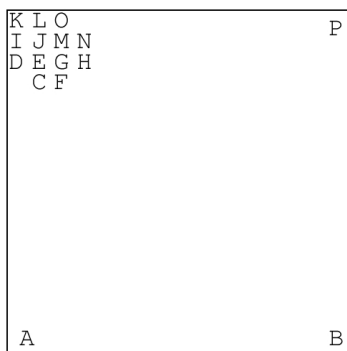
Hint: For every arc length perform a search in the left table. If the searched value is between two table entries then use linear interpolation to obtain the new parameter.

Assignment 2 [1 Point] Quadtree vs. BSP Tree

Create schematically both, a quadtree and a BSP tree on the basis of a given space with positioned objects (**A - P**). When creating the BSP-Trees, the subdivisions should be made in the way that the divided space divides objects into two subspaces of equal numbers. The subdivision has to be repeated until only one object per segment is present. Example:



1. Draw the quadtree and the BSP partitioning, and specify the corresponding trees for the following objects:



2. Evaluate your results: What can be said about the complexity of locating an object within a Tree? Note: Consider possible extreme situations for the distribution of objects in the room!

Submission: 8.1.2015, before/at the beginning of the exercise.