

26. JANUARY 2022

GRAPHIC DATA PROCESSING ASSIGNMENT 10

Submission deadline for the exercises: 02. February 2022 6.00 am

Written Solutions

Written solutions have to be submitted digitally as one PDF file via Ilias.

10.1 De Casteljau (24 Points)

Use the de Casteljau algorithm to evaluate the position of the cubic Bézier curve with its control points at $(0, 0)$, $(1, 3)$, $(3, 2)$ and $(4, 0)$ for the parameter values $u_0 = 0.5$, and $u_1 = 0.75$. Draw a sketch for each parameter value.

10.2 Derivative of a Bézier Curve ($8 + 8 + 4 = 20$ Points)

- Compute the derivative of a cubic Bézier curve.
- Determine the first derivative (the hodograph) of the Bézier curve given in 10.1 (draw a sketch).
- Is the Bézier curve in the interval $(0, 1)$ C^0 , C^1 , C^2 , C^3 or C^∞ continuous?

10.3 Hermite Curves ($16 + 10 = 26$ Points)

- Derive the transformation Hermite to Bézier.
- Take the cubic Bézier curve from 10.1 and transform it to a Hermite curve (calculate the parameters).

10.4 Splines (20 Points)

Is it possible to draw a circle with a uniform B-Spline? Justify your answer.

10.5 Random Questions ($5 + 5 = 10$ Points)

- If a high-pass filter is applied to an image, what image characteristic is increased?
- What is the Nyquist frequency?