

Scientific Visualization – Homework 3

Submission: May, 22nd, 2020, 8:15 am, via email

1. Exercise (11 points)

Consider the subdivision scheme for polygonal curves given by the averaging mask

$$r = \frac{1}{16}(-2, 5, 10, 5, -2).$$

- 1.) Determine a local subdivision matrix L corresponding to r .
- 2.) Determine an *eigensystem* for L , i.e. a basis of eigenvectors and corresponding eigenvalues.
- 3.) For a point $p^0 \in S^0$ derive its limit $p^\infty \in S^\infty$ in terms of p^0 and its neighbors p_-^0 and p_+^0 .
- 4.) Determine the local subdivision matrix L_{Chaikin} for Chaikin's corner cutting scheme and determine the limit point p^∞ for a point $p^0 \in S^0$. Proceed as above.

2. Exercise (5 points)

Let $S^0 \subset \mathbb{R}^2$ be a set of control points given by

$$S^0 = \left\{ P_0^0 = \begin{pmatrix} 4 \\ 0 \end{pmatrix}, P_1^0 = \begin{pmatrix} 0 \\ 4 \end{pmatrix}, P_2^0 = \begin{pmatrix} 2 \\ 6 \end{pmatrix}, P_3^0 = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \right\}.$$

Determine the first two subdivision steps S^1 and S^2 starting with S^0 using Chaikin's corner cutting scheme explicitly. Illustrate your results.

3. Exercise (0 points)

You can find the project overview on the course website. Send in your three favorite projects as usual via email. On May, 22nd, you will be told with whom on which project you are going to work.

Total: 16