End-conditions for subdivision curves and surfaces

Problem description: Subdivision curves and surfaces are an efficient and flexible representation of geometry. There exists a myriad of curve and surface subdivision schemes. While end-conditions for some schemes are well-understood, e.g. in the case of B-spline subdivision (see e.g. http://www.cs.rug.nl/~jiri/applet.html), it is not the case for other schemes, and interpolatory ones in particular.

The research question of this project is how to modify the subdivision rules near ends of curves created by interpolatory subdivision, such as the 4-point scheme, the 6-point scheme, or possibly even in the case of quasi-interpolatory schemes.

Successful concepts form the curve case will be considered for generalisation to subdivision surfaces.

Expected outcomes: An algorithm and a tool with a user interface for handling end-conditions in subdivision curves should be researched and implemented. The student will be provided with a framework (OpenGL, Qt, C++) capable of displaying polylines and subdividing a (closed) curve.

Prerequisites: The tool is expected to be implemented in C++ using OpenGL and Qt, although other frameworks may be considered. The interested student should be familiar with basic graphics algorithms (at the level of the Bachelor Computer Graphics course), have some experience with OpenGL and C++, and ideally be familiar with B-splines or even NURBS and have successfully completed the Advanced Computer Graphics course at RUG.