Advanced Computer Graphics
Wednesday 2nd December, 2020

Assignment 3 (Catmull-Clark subdivision++)

In this lab session we will take a look at the Catmull-Clark subdivision scheme. Download the skeleton code from Nestor (*Lab Sessions*), unzip/extract the files and open `CatmarkSdv.pro` in QtCreator.

Main assignment

Implement a method to project vertices (at any subdivision level) to their limit positions (i.e. the positions the vertices converge to when the number of subdivision steps goes to infinity) using *limit stencils*. Boundaries should be supported. The GUI should be extended with one or more widgets to switch between the given position and the limit position of the vertices.

In addition, implement a method to render the surface patches associated with the regular quads in the control net (i.e. quads for which all vertices have valency 4 and are surrounded by quads) as uniform cubic B-splines or as Bézier patches. Use tessellation shaders for this purpose. Patches associated with irregular quads (or n-gons) should be skipped.

Additional feature

Extend the tessellation shaders such that the true normals (i.e. the analytical normals of the surface patches) can be used in the fragment shader.

Bonus

Extend the GUI with a *user-friendly* way to control the individual tessellation levels (per-edge or at least outer and inner) of the surface patches.

Deadline

See Nestor (*Time Schedule*). Details on how to submit your work can also be found on Nestor (*Lab Sessions*).

Assessment

See Nestor (*Assessment* → `CodeForm.pdf`).