Cutting Edge Refinement

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Local corner cutting means to cut the initial and new corners of a polygon(al curve). If all corners are cut eventually, we can organize the cuts such that we repeatedly cut all corners of a polygon simultaneously. A corner cutting scheme organized in such a way is represented by an infinite sequence of edge trisection ratios which can be visualized as a point sequence in the unit triangle. In 1989, John Gregory and Ruibin Qu proved that C^1 curves are obtained for any sequences in a certain quadrilateral covering a third of the unit triangle [3]. Later Carl de Boor showed that local corner cutting schemes generate C^1 curves if and only if the maximum exterior angle of the polygons generated tend to zero [1]. Finally, using the dual form of corner cutting algorithms, it was shown in [5] that any refinement squence leads to a C^1 curve if it is bounded away form the three edges of the unit triangle.

For surfaces, no such results are known. Moreover, no corner cutting scheme for convex polyhedra is known so far. Only if we dualize the honeycomb scheme [2], we obtain such a scheme, but it does not generate C^1 surfaces [4]. In this talk, I will show how we can generalize the results for local corner cutting from curves to surfaces of dimension 2 and higher. Furthermore, I present a honeycomb edge cutting algorithms for convex polyhedra that generate C^1 surfaces in the limit and show that any convex C^1 surface can be generated by such a honeycomb cutting algorithm.

References

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