

Contents

1	Introduction and Overview	1
1.1	Refined Polyhedra	1
1.2	Control Nets	2
1.3	Splines with Singularities	4
1.4	Focus and Scope	6
1.5	Overview	7
1.6	Notation	7
1.7	Analysis in the Shift-Invariant Setting	8
1.8	Historical Notes on Subdivision on Irregular Meshes	11
2	Geometry Near Singularities	15
2.1	Dot and Cross Products	16
2.2	Regular Surfaces	17
2.3	Surfaces with a Singular Point	23
2.4	Criteria for Injectivity	31
3	Generalized Splines	39
3.1	An Alternative View of Spline Curves	40
3.2	Continuous Bivariate Splines	41
3.3	C^k -Splines	44
3.4	C_r^k -Splines	47
3.5	A Bicubic Illustration	53
4	Subdivision Surfaces	57
4.1	Refinability	58
4.2	Segments and Rings	59
4.3	Splines in Finite-Dimensional Subspaces	65
4.4	Subdivision Algorithms	67
4.5	Asymptotic Expansion of Sequences	71
4.6	Jordan Decomposition	72
4.7	The Subdivision Matrix	75

5	C_1^k-Subdivision Algorithms	83
5.1	Generic Initial Data	84
5.2	Standard Algorithms	84
5.3	General Algorithms	89
5.4	Shift Invariant Algorithms	95
5.5	Symmetric Algorithms	103
6	Case Studies of C_1^k-Subdivision Algorithms	109
6.1	Catmull–Clark Algorithm and Variants	109
6.2	Doo–Sabin Algorithm and Variants	116
6.3	Simplest Subdivision	120
7	Shape Analysis and C_2^k-Algorithms	125
7.1	Higher Order Asymptotic Expansions	126
7.2	Shape Assessment	134
7.3	Conditions for C_2^k -Algorithms	140
7.4	A Framework for C_2^k -Algorithms	145
7.5	Guided Subdivision	149
8	Approximation and Linear Independence	157
8.1	Proxy Splines	157
8.2	Local and Global Linear Independence	169
9	Conclusion	175
9.1	Function Spaces	176
9.2	Recursion	177
9.3	Combinatorial Structure	178
	References	183
	Index	199



<http://www.springer.com/978-3-540-76405-2>

Subdivision Surfaces

Peters, J.; Reif, U.

2008, XVI, 204 p. 52 illus., 8 illus. in color., Hardcover

ISBN: 978-3-540-76405-2