

Contents

Preface

page vii

1	A matricial approach to Euclidean geometry	1
1.1	Euclidean point space	1
1.2	n -simplex	4
1.3	Some properties of the angles in a simplex	12
1.4	Matrices assigned to a simplex	15
2	Simplex geometry	24
2.1	Geometric interpretations	24
2.2	Distinguished objects of a simplex	31
3	Qualitative properties of the angles in a simplex	46
3.1	Signed graph of a simplex	46
3.2	Signed graphs of the faces of a simplex	50
3.3	Hyperacute simplexes	52
3.4	Position of the circumcenter of a simplex	53
4	Special simplexes	64
4.1	Right simplexes	64
4.2	Orthocentric simplexes	72
4.3	Cyclic simplexes	94
4.4	Simplexes with a principal point	108
4.5	The regular n -simplex	112
5	Further geometric objects	114
5.1	Inverse simplex	114
5.2	Simplicial cones	119
5.3	Regular simplicial cones	131
5.4	Spherical simplexes	132
5.5	Finite sets of points	135
5.6	Degenerate simplexes	142

6	Applications	145
6.1	An application to graph theory	145
6.2	Simplex of a graph	147
6.3	Geometric inequalities	152
6.4	Extended graphs of tetrahedrons	153
6.5	Resistive electrical networks	156
	Appendix	159
A.1	Matrices	159
A.2	Graphs and matrices	175
A.3	Nonnegative matrices, M - and P -matrices	179
A.4	Hankel matrices	182
A.5	Projective geometry	182
	<i>References</i>	193
	<i>Index</i>	195