

Contents

1	Introduction	1
2	Deformation Theories	7
2.1	Coordinate Systems	7
2.1.1	Cartesian and Curvilinear Coordinates	7
2.1.2	Surface Normal Coordinates	9
2.2	Three-Dimensional Deformations	10
2.2.1	Preliminary Remarks	10
2.2.2	General Fundamentals	11
2.2.2.1	Isoparametric Representation	11
2.2.2.2	Lagrangian Representation	11
2.2.3	Special Deformation Measures	14
2.3	Surface Deformations	15
2.3.1	Preliminary Remarks	15
2.3.2	Internal Surface Deformations	15
2.3.2.1	Isoparametric Representation	15
2.3.2.2	Computations on the Basis of the Gaussian Surface Representation	16
2.3.2.3	Computations in External Surface Normal Coordinates	19
2.3.2.4	Computations in Ellipsoidal Coordinates	20
2.3.3	External Surface Deformations	22
2.3.3.1	Computations on the Basis of the Gaussian Surface Representation	22
2.3.3.2	Computations in External Surface Normal Coordinates	29
2.3.3.3	Computations in Ellipsoidal Coordinates	32
2.3.4	Deformations and Stresses	33

3	Geometric Modelling	39
3.1	General Fundamentals	39
3.2	Interpolation by Polynomials	42
3.3	Interpolation by Collocation	44
3.4	Subdivision of a Surface by Finite Triangle Elements . .	49
3.4.1	Preliminary Remarks	49
3.4.2	Triangle Elements	50
3.4.3	Discrete Deformation Measures	52
3.4.4	Determination of the Change of the Bend Between the Neighbouring Triangles	54
4	Application	57
4.1	Deformation of the Earth's Crust	57
4.2	Geodetic Contributions to Deformation Analyses	62
4.3	Tectonic Development of the Adriatic Sea Area	63
4.4	Geometric Modelling	64
4.4.1	Interpolation Methods Applied	64
4.4.2	Explanations of the Graphic Representations . .	66
4.5	Surface Deformations in the Adriatic Sea Area	70
4.5.1	GPS Observations	70
4.5.2	Processing Strategy of the GPS Data	73
4.5.3	Data Processing	73
4.5.4	Checking of Data Quality	74
4.5.5	Multi Campaign Solutions	76
4.5.5.1	Absolute Coordinate Solution	78
4.5.5.2	Relative Coordinate Solution	78
4.5.6	Internal Surface Deformations	79
4.5.7	External Surface Deformations	80
4.5.8	Figures of the Adriatic Sea Area	81
4.6	Summary	88
	Bibliography	89
	Index	98