

Contents

1. Introduction	1
2. Definitions and Properties	5
2.1 Notations	5
2.2 The Restricted Problem: Equations	5
2.3 Periodic Solutions and Periodic Orbits	6
2.4 The Period-in-Family	8
2.5 Structure of Families	9
2.6 Family Segments	12
2.7 Symmetry	12
2.8 Stability	13
2.9 Generating Orbits and Keplerian Orbits	14
2.10 Species	16
3. Generating Orbits of the First Species	21
3.1 Kinds	21
3.2 First Kind	22
3.2.1 The Case $n = 1$	22
3.2.2 The Case $n \neq 1$	23
3.3 Second Kind	24
3.3.1 Symmetric Orbits	26
3.3.2 Asymmetric Orbits	31
3.4 Summary	33
4. Generating Orbits of the Second Species	35
4.1 Arcs	35
4.2 Supporting Ellipses and Types	38
4.3 Type 1	41
4.3.1 S -Arcs	42
4.3.2 The (A, Z) Plane	48
4.3.3 S -Arc Families	52
4.3.4 T -Arcs and T -Arc Families	55
4.3.5 Overview	59
4.4 Types 2, 3, 4	59

4.5	Ends of S - and T -Arc Families	62
4.6	Extremums of C : Arc Family Segments	68
4.7	Orbits	73
4.8	Second Species Families	75
4.9	Ends of Family Segments	76
5.	Generating Orbits of the Third Species	79
5.1	ν -Generating Orbits	79
5.2	Continuation from $\nu = 0$ to $\nu > 0$	82
5.2.1	First Species	82
5.2.2	Second Species	82
5.3	ν -Generating Orbits for $0 < \nu < 1/3$	83
5.3.1	First Species	84
5.3.2	Second Species	85
5.3.3	Third Species	88
5.4	ν -Generating Orbits for $\nu = 1/3$	88
5.5	Continuation from $\nu < 1/3$ to $\nu = 1/3$	91
5.5.1	Family f	91
5.5.2	Family a	91
5.5.3	Family c	92
5.5.4	Family g'	92
5.5.5	Family g	92
5.5.6	Recapitulation	92
5.5.7	Other Families	93
5.6	ν -Generating Orbits for $\nu > 1/3$	93
5.7	Continuation from $\nu = 1/3$ to $\nu > 1/3$	94
5.8	Conclusions	94
6.	Bifurcation Orbits	95
6.1	First Species and First Species	96
6.1.1	First Kind and First Kind	96
6.1.2	First Kind and Second Kind, Symmetric	96
6.1.3	First Kind and Second Kind, Asymmetric	97
6.1.4	Second Kind, Symmetric and Symmetric	97
6.1.5	Second Kind, Symmetric and Asymmetric	97
6.1.6	Second Kind, Asymmetric and Asymmetric	97
6.2	Second Species and First or Second Species	98
6.2.1	Total Bifurcation	99
6.2.2	Partial Bifurcation	115
6.3	Third Species and First or Second Species	123
6.4	Third Species and Third Species	123
6.5	Recapitulation	123

7. Junctions: Symmetry	125
7.1 First Species Bifurcations	125
7.2 Third Species Bifurcations	126
7.3 Second Species Bifurcations	126
7.3.1 Partial Bifurcation	127
7.3.2 Total Bifurcation	128
7.3.3 Conclusions	134
8. Junctions: Broucke's Principle	137
8.1 Definition	137
8.2 Side of Passage for a Node	139
8.2.1 Type 1	140
8.2.2 Type 2	143
8.2.3 Type 3	145
8.3 Side of Passage for an Antinode	147
8.3.1 Type 1	147
8.3.2 Type 2	150
8.3.3 Type 3	151
8.4 Results: Partial Bifurcation	152
8.4.1 Type 1	152
8.4.2 Type 2	160
8.4.3 Type 3	162
8.5 Results: Total Bifurcation	162
8.5.1 Type 1	162
8.5.2 Type 2	167
8.5.3 Type 3	167
8.6 Recapitulation	167
9. Fragments	171
9.1 Introduction	171
9.1.1 Accidents	172
9.1.2 Explanation of the Fragment Tables	173
9.2 First Species Family Segments	174
9.2.1 First Kind: Retrograde Orbits	174
9.2.2 First Kind: Direct Orbits	174
9.2.3 Second Kind	175
9.3 Second Species Family Segments	179
9.3.1 Detection of Bifurcation Orbits	179
9.3.2 Data on Arc Family Segments	183
9.3.3 Fragments	190
9.4 Third Species Family Segments	196

10. Generating Families	203
10.1 Algorithm	203
10.1.1 Explanation of the Tables	205
10.2 Natural Families	206
10.2.1 Family a	207
10.2.2 Family b	208
10.2.3 Family c	209
10.2.4 Family f	209
10.2.5 Family g	210
10.2.6 Family h	211
10.2.7 Family i	213
10.2.8 Family l	214
10.2.9 Family m	214
10.2.10 Summary	214
10.3 Other Families	214
10.4 Comparison with Computed Families	220
10.4.1 Family a	221
10.4.2 Family b	223
10.4.3 Family c	224
10.4.4 Family f	225
10.4.5 Family g	225
10.4.6 Family h	225
10.4.7 Family i	225
10.4.8 Families l and m	229
10.5 Final Comments	232
A. Correspondence Between Old and New Notations	235
A.1 Arcs	235
A.2 Arc Families	237
A.3 Critical Arcs	240
B. The Domain D_2	243
B.1 The Curved Boundary Γ	243
B.2 S -Arc Families in Domain D_2	245
C. Number of Branches	251
C.1 Partial Bifurcation	251
C.1.1 Type 1	251
C.1.2 Type 2	253
C.1.3 Type 3	254
C.2 Total Bifurcation	255
C.2.1 Type 1	256
C.2.2 Type 2	258
C.2.3 Type 3	260
C.3 Conclusions	264

Index of Definitions..... 265

Index of Notations..... 269

References 275

Symmetry and Perturbation Theory in Nonlinear
Dynamics

Cicogna, G.; Gaeta, G.

1999, XI, 212 p., Hardcover

ISBN: 978-3-540-65904-4