

Contents

1 Constraints and Constraint Solving: An Introduction	1
<i>Jean-Pierre Jouannaud, Ralf Treinen</i>	
1.1 Introduction	1
1.2 A First Approach to Constraint Based Calculi	2
1.3 A Case Study of a Constraint System: Feature Constraints	18
1.4 Programming with Incomplete Constraint Solvers	29
1.5 Committed Choice: A More Realistic Approach	33
2 Constraint Solving on Terms	47
<i>Hubert Comon, Claude Kirchner</i>	
2.1 Introduction	47
2.2 The Principle of Syntactic Methods	48
2.3 Unification Problems	49
2.4 Dis-Unification Problems	70
2.5 Ordering Constraints	74
2.6 Matching Constraints	76
2.7 Principles of Automata Based Constraint Solving	78
2.8 Presburger Arithmetic and Classical Word Automata	79
2.9 Typing Constraints and Tree Automata	84
2.10 Set Constraints and Tree Set Automata	88
2.11 Examples of Other Constraint Systems Using Tree Automata	91
3 Combining Constraint Solving	104
<i>Franz Baader, Klaus U. Schulz</i>	
3.1 Introduction	104
3.2 Classification of Constraint Systems and Combination Approaches	105
3.3 The Nelson-Oppen Combination Procedure	112
3.4 Combination of <i>E</i> -Unification Algorithms	119
3.5 The Logical and Algebraic Perspective	129
3.6 Generalizations	140
3.7 Optimization and Complexity Issues	147
3.8 Open Problems	152

4 Constraints and Theorem Proving	159
<i>Harald Ganzinger, Robert Nieuwenhuis</i>	
4.1 Introduction	159
4.2 Equality Clauses	160
4.3 The Purely Equational Case: Rewriting and Completion	166
4.4 Superposition for General Clauses	174
4.5 Saturation Procedures	186
4.6 Paramodulation with Constrained Clauses	189
4.7 Paramodulation with Built-in Equational Theories	192
4.8 Effective Saturation of First-Order Theories	194
5 Functional and Constraint Logic Programming	202
<i>Mario Rodríguez-Artalejo</i>	
5.1 Introduction	202
5.2 A Rewriting Logic for Declarative Programming	204
5.3 Higher-Order Programming	234
5.4 Constraint Programming	252
5.5 Conclusions	260
6 Building Industrial Applications with Constraint Programming	271
<i>Helmut Simonis</i>	
6.1 Introduction	271
6.2 Constraint Programming	272
6.3 The CHIP System	278
6.4 Application Studies	280
6.5 Industrial Applications	280
6.6 Case Studies	286
6.7 Application Framework	298
6.8 Analysis	298
6.9 Does CLP Deliver?	301
6.10 Limitations	302
6.11 Future Trends	303
6.12 Conclusions	304