

Contents

1	Introduction	1
1.1	Thesis Outline and Contributions	2
 Part I Constraint and Concurrency Overview		
2	Constraints	7
2.1	Short History	7
2.2	Constraint Satisfaction Problems	8
2.3	CSP Solving: Systematic Search	9
2.4	CSP Solving: Consistency Techniques	10
2.5	Constraint Propagation	11
2.6	Stochastic and Heuristic Algorithms	12
2.7	Constraint Optimization	12
2.8	Constraint Programming Extensions	13
2.9	Applications	14
2.10	Limitations	14
3	Concurrency	17
3.1	Concurrent System	17
3.1.1	Single Core Systems	17
3.1.2	Parallel Systems	18
3.1.3	Distributed System	18
3.2	Concurrent System Problems	20
3.3	Mathematical Models	21
3.3.1	Petri Net	22
3.3.2	Process Calculus	22
3.4	Concurrent Programming	23
3.5	Service-Oriented Computing	24

Part II Constraints in Concurrent Languages

4	Constraint Handling Rules	29
4.1	Brief Background	29
4.2	Constraint Handling Rules: Notation	30
4.3	CHR Program	32
4.4	Traditional Operational Semantics	32
4.5	Abstract Operational Semantics	34
4.6	CHR with Priorities	34
5	Non Turing Powerful Fragments of CHR	37
5.1	Notation	38
5.2	Range-Restricted $\text{CHR}^{\text{ra}}(\text{C})$	39
5.3	Single-Headed $\text{CHR}^{\text{sa}}(\text{C})$	41
	5.3.1 Some Preparatory Results	41
	5.3.2 Decidability of Termination	46
5.4	Summary and Related Works	47
6	Expressive Power of Priorities in CHR	49
6.1	Language Encoding	51
6.2	Positive Results	52
	6.2.1 Encoding Static CHR^{op} into Static CHR_2^{op}	53
	6.2.2 Encoding CHR^{op} into Static CHR^{op}	60
6.3	Separation Results	64
6.4	Summary and Related Works	65

Part III Solving Constraints Exploiting Concurrent Systems

7	Constraints in Clouds	69
7.1	Parallel Constraint Solving	70
7.2	The CiC Framework	71
7.3	First Experiments	75
7.4	Summary	76
8	A Classification-Based Approach to Manage a Solver Portfolio	77
8.1	Preliminaries	78
8.2	The International CSP Competition Dataset	78
8.3	From Runtime Clustering to Runtime Classification	79
8.4	Experiments in Runtime Classification	81
8.5	Scheduling a Solver Portfolio	83
8.6	Parallel Solver Portfolio	89
8.7	Related Work	92
8.8	Summary	93

- 9 Broadcast Messages in Jolie** 95
 - 9.1 Background 98
 - 9.2 The Idea 100
 - 9.3 Building the Radix Trees. 103
 - 9.3.1 Using Radix Trees 106
 - 9.4 Correctness and Complexity Analysis 107
 - 9.5 Summary 109

- 10 Interruptible Request Responses in Jolie** 111
 - 10.1 SOCK 113
 - 10.2 Request–Response Interaction Pattern 118
 - 10.3 Multiple Request–Response Communication Pattern 123
 - 10.4 Related Works and Conclusions 125

- 11 Conclusions** 127

- Appendix A: Proofs** 131

- References** 143



<http://www.springer.com/978-94-6239-066-9>

Constraints Meet Concurrency

Mauro, J.

2014, XV, 148 p. 13 illus., Hardcover

ISBN: 978-94-6239-066-9

A product of Atlantis Press