Contents

0. Motivation and approach 1
1. Theoretical notions 3
2. Logic Programming 8
    2.1 Declarative semantics 8
    2.2 Procedural semantics 13
    2.3 Negation 16
    2.4 Programming with the completion 17
3. Logic Programming extended with parallelism 22
    3.1 Types of parallelism 22
    3.2 Theoretical model of AND parallelism in LP 30
    3.3 Parallelism implementation in LP 42
    3.4 Extra-logical predicates in parallel LP 58
    3.5 Chapter conclusions 63
4. Committed Choice Languages (CC) 65
    4.1 Declarative and operational semantics of CC languages 66
    4.2 Implementation implications of parallelism 70
    4.3 Resolution tree 71
    4.4 Variables and their representation 72
    4.5 Concurrent LP mechanisms 75
    4.5 Chapter conclusions 84
5. Constraints 86
    5.1 Problem specifications 86
    5.2 Efficiency with constraints 88
    5.3 Systems with constraints 93
    5.4 Chapter conclusions 98
6. Logic Programming with Constraints 99
    6.1 Theoretical model 99
    6.2 Declarative semantics 101
    6.3 Operational semantics 102
    6.4 Concurrent programming with constraints 106
    6.5 Design and implementation of a concurrent constraint logic language CCP – Concurrent Constraint Prolog 116
        6.5.1 Comparison with existing models 116
        6.5.2 Sintax 118
        6.5.3 Semantics 119
        6.5.4 Translation in Prolog with freeze (P_f) 120
        6.5.5 Meta-interpreter 124
        6.5.6 Language expressiveness–mechanisms implemented in CCP 128
        6.5.7 CCP conclusions 137
    6.6 Interpretation of the results 139
    6.7 Chapter conclusions 143
7. Final conclusions and original contributions 145
8. References 149