Table of Contents

Chapter 1: Introduction **12**
1.1 Motivation ... 13
1.2 Contributions of the Thesis ... 14
1.3 Plan of the Thesis ... 15
1.4 Bibliographic Remarks ... 17

Chapter 2: Preliminaries **20**
2.1 Basic Concepts of Rewriting Logic ... 20
2.2 Rewriting in Rewriting Logic ... 23
2.3 Generalization modulo Equational Theories ... 26

Chapter 3: The Maude System and Language **27**
3.1 Origins of Maude ... 27
3.2 Core Maude ... 28
3.3 Full Maude ... 46

Chapter 4: Inspection of Rewriting Logic Computations **52**
4.1 The Running Examples ... 53
4.2 Instrumented Computations ... 58
4.3 The Exploration Technique ... 61
4.4 An Animated Debugging Session ... 63

Chapter 5: Runtime Verification of Maude Programs **69**
5.1 The Assertion Language ... 69
5.2 Satisfaction of Assertions ... 74
5.3 Uncovering Error Symptoms ... 78
5.4 Dynamic Assertion-Checking ... 82

Chapter 6: Automated Debugging of Maude Programs **88**
6.1 Slicing of Execution Traces and Programs ... 89
6.2 Improving the Inference of the Slicing Criteria ... 92

6.3 Integration of Assertion-Checking and Trace Slicing 93
6.4 Automatic Repair of Faulty Rules 97

Chapter 7: The ABETS System **102**
7.1 ABETS in a Nutshell 102
7.2 ABETS at Work 108
7.3 Implementation Details 112
7.4 Experimental Evaluation 117

Chapter 8: Mau-Dev: A Developer Extension of Maude **121**
8.1 Novel Operations 122
8.2 Compatibility 132
8.3 Experimental Evaluation 133

Chapter 9: Conclusion **136**
9.1 Related Work 136
9.2 Discussion of Results 140
9.3 Future Work 142

Bibliography **152**

Appendix A: A Stock Exchange System **153**

Appendix B: An Object-oriented Car Rental Store **156**