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Nonmonotonic Logics

Basic Concepts, Results,
and Techniques



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Preface

Nonmonotonic logics were created as an abstraction of some types of common sense reasoning. They have the surprising property – for logicians trained on classical logic – of being nonmonotonic in the following sense: increasing the axiom set will not necessarily result in an increase in the set of formulas deducible from these axioms. Such situations arise naturally, e.g., in the use of information of different degrees of reliability. We might draw a tentative conclusion based on some information, but will withdraw the conclusion in the light of new, more reliable, and contradictory information. Nonmonotonic logics were created to treat such reasoning in abstract terms, but without going into the details of reliability, as necessary, for instance, for statistical reasoning.

The field has evolved quite rapidly from the more or less descriptive level to serious investigation, and it is now common to have formal semantics and proof systems, linked by soundness and completeness theorems. This book is intended to give the reader a flavour of the ideas and techniques to be found in these logical investigations.

Part of this work was carried out while the author was at the LILOG project of IBM Germany, Stuttgart. IBM provided its financial support for our work and a generous framework, which enabled fundamental research on fascinating problems originating from applications. I would like to thank O. Herzog (now at the University of Bremen) and C. Rollinger (now at the University of Osnabrück), who at that time directed the project, and C. Habel (University of Hamburg) for his support, and for pointing out to me the existence of nonmonotonic logic. Sven Lorenz took the burden of implementation from the author.

David Makinson, Paris, cooperated with many comments, encouragements, open problems, and his contagious enthusiasm. Yuri Gurevich, Ann Arbor, helped to clear several topics of this introduction in long discussions. Hans Rott, Konstanz, corrected a mistake in an original version of Chapter 5. Finally, many persons' papers and many referees' comments improved substance and presentation. Jörg Siekmann, Saarbrücken, helped with constructive criticism to approximate this text to the form of a book.

Parts of this book have already appeared elsewhere. Sections 2.1.4–2.1.5 have appeared in [Sch92], Section 2.2 in [SM94], Section 2.3 in [Sch91-2], Chapter 3 in [Sch95-1], Chapter 4 in [Sch95-2], Chapter 5 in [Sch91-1] and [Sch91-3], Section 6.1.5 in [Sch93], Section 6.1.6 in [Sch90].

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