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Towards 2000

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Edited by
L.M. Venter
R.R. Lombard
Foreword

This book contains a collection of papers presented at a Research and Development conference of the South African Institute of Computer Scientists and Information Technologists (SAICSIT). The conference was held on 13 & 14 November 1997 at the Riverside Sun, Vanderbijlpark. Most of the organization for the conference was done by the Department of Computer Science and Information Technology of the Vaal Triangle Campus, Potchefstroom University for Christian Higher Education.

The programming committee accepted a wide selection of papers for the conference. The papers range from detailed technical research work to reports of work in progress. The papers originate mainly from Academia, but also describe work done in and for Industry. It is hoped that the papers give a true reflection of the current research scene in Computer Science and Information Technology in South Africa. Since one of the aims of the conference is Research development, the papers were not subjected to a refereeing process.

A number of people spent numerous hours helping with the organization of this conference. In this regard, we wish to thank the members of the Organizing committee, and the Programming committee who had very little time to screen the abstracts and compile the program. A special thanks goes to the secretary of the department, Mrs Helei Jooste, whose very able work was interrupted by the birth of her first child.
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Beliefs of a Resource-bounded Agent

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Logics of belief and knowledge are typically formulated in terms of modal languages. A possible world semantics is traditionally used for such languages but when a formula $\square A$ is read as “The agent believes that A”, the problem of logical omniscience cannot be avoided. Given a set of possible worlds, this means that the agent believes all valid formulae and believes all the logical consequences of his (initial) beliefs. This is not a good description of most situations in “real life” because both humans and robots are not ideal reasoners. They are resource-bounded: time or space is not adequate to infer all the logical consequences of their beliefs. Furthermore, an agent’s rules by which he derives “new” beliefs from “old” ones are often incomplete so that even with unlimited time he cannot arrive at all the consequences. The database consisting of the beliefs of such an agent may be inconsistent without being contradictory.

In Konolige’s deduction model of belief he addresses the problem of resource-bounded agents. His semantics was developed in an effort to define accurate models of the beliefs of robots. By considering robots the (incomplete) set of rules of the agent is available to us, the outside observers. The semantics involves a set of initial beliefs and some algorithm which can be applied to these beliefs in order to derive new beliefs. The only assumption about the belief set of an agent will be that it is deductively closed, i.e. that no further beliefs will be produced if the algorithm is applied further.

The terms deduction structure, belief set and deductively closed will be defined and the semantics explained. Several examples dealing with a propositional modal language will be given.