

Non-deterministic Semantics for Logics with a Consistency Operator

Arnon Avron

School of Computer Science, Tel-Aviv University, Israel

`aa@cs.tau.ac.il`

In order to handle inconsistent knowledge bases in a reasonable way, one needs a logic which allows nontrivial inconsistent theories. Logics of this sort are called *paraconsistent*. One of the oldest and best known approaches to the problem of designing useful paraconsistent logics is da Costa's approach, which seeks to allow the use of classical logic whenever it is safe to do so, but behaves completely differently when contradictions are involved. Da Costa's approach has led to the family of logics of formal (in)consistency (LFIs). In this paper we provide in a modular way simple non-deterministic semantics for 64 of the most important logics from this family. Our semantics is 3-valued for some of the systems, and infinite-valued for the others. We prove that these results cannot be improved: neither of the systems with a three-valued non-deterministic semantics has either a finite characteristic ordinary matrix or a two-valued characteristic non-deterministic matrix, and neither of the other systems we investigate has a finite characteristic non-deterministic matrix. Still, our semantics provides decision procedures for all the systems investigated, as well as easy proofs of important proof-theoretical properties of them.