

Non-deterministic Logical Matrices and their Applications

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A major generalization of ordinary logical matrices are non-deterministic matrices (Nmatrices) - multiple-valued structures in which the value assigned by a valuation to a complex formula can be chosen non-deterministically out of a certain nonempty set of options. Thanks to the use of Nmatrices, we can provide finite-valued semantics for many important logics which cannot be characterized by finite ordinary matrices. They include, among others: all logics obtained from the classical logic by deleting some rule(s) from its standard sequent calculus, the majority of paraconsistent LFIs (Logics of Formal Inconsistency) for reasoning about inconsistent information, and the source-processor logics extending the well-known Belnap's approach to collecting and integrating information from many sources. The crucial advantage of Nmatrices is that logics with a finite characteristic Nmatrix enjoy the main good properties possessed by logics with an ordinary (deterministic) finite characteristic matrix.

We present the foundations of Nmatrices, the general method for developing an analytic proof system for a finite Nmatrix, and some applications of this framework.