Minoux, M.
The unique Horn-satisfiability problem and quadratic Boolean equations. (English)

Summary: The unique satisfiability problem for general Boolean expressions has attracted interest in recent years in connection with basic complexity issues. We investigate here unique Horn-satisfiability, i.e. the subclass of unique-Sat restricted to Horn expressions. We introduce two operators, reduction and shrinking, each transforming a given Horn expression into another Horn expression involving strictly fewer variables and preserving the unique satisfiability property, if present.

Uniquely satisfiable Horn expressions are then characterized as those Horn expressions which can be converted into a formula composed of an empty set of clauses on an empty set of free variables through finitely many applications of the shrink-and-reduce operator.

Finally, an algorithm for testing whether a given irreducible Horn formula is uniquely satisfiable is described. Data structures for its implementation are discussed, leading to $O(mn)$ complexity for the general case ($m =$ number of clauses, $n =$ number of variables), and hence to linear complexity for dense formulae.

MSC: 68T15 Theorem proving (deduction, resolution, etc.) (MSC2010)

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References:


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