The Exact Satisfiability problem XSAT is a much studied variant of the propositional satisfiability problem SAT: given a formula F in CNF, i.e., a set of clauses, the question is whether there is an assignment that satisfies exactly one literal in every clause in F.

The present paper studies the following generalisations of XSAT: an instance of GiXSAT specifies for each clause a number $j \leq i$, such that exactly j literals in that clause have to be satisfied.

The paper presents improved exponential time algorithms to solve these problems. These algorithms achieve the following worst-case upper bounds: they solve G2XSAT in time $O(1.3674^n)$, G3XSAT in time $O(1.5687^n)$, and G4XSAT in time $O(1.6545^n)$. These algorithms use polynomial space.

The paper also presents faster exponential time algorithms using exponential space, which solve G2XSAT in time $O(1.3188^n)$, G3XSAT in time $O(1.3407^n)$, and G4XSAT in time $O(1.3536^n)$.

The algorithms are Davis-Putnam-Logeman-Loveland- (DPLL-) style backtracking algorithms, and their analyses employ the method of Kullmann [1] using branching tuples, and extensive case distinctions.

References

[1] O. Kullmann, New methods for 3-SAT decision and worst-case analysis, Theoret. Comput. Sci. **223** (1999), no. 1-2, 1–72. MR1704636