

TITLE: "Exact Global Nonlinear Optimization on Demand"

ABSTRACT: We present a method for exact global nonlinear optimization based on a real algebraic adaptation of the conflict-driven clause learning (CDCL) approach of modern SAT solving. This method allows polynomial objective functions to be constrained by real algebraic constraint systems with arbitrary boolean structure. Moreover, it can correctly determine when an objective function is unbounded, and can compute exact infima and suprema when they exist. The method requires computations over real closed fields containing infinitesimals (cf. [1]). Finally, we briefly sketch how this method can be adapted to linear integer arithmetic, and, more generally, to various theories of arithmetic possessing computable nonstandard models.

Joint work with Leonardo de Moura, Microsoft Research.

References:

[1] Computation in Real Closed Infinitesimal and Transcendental Extensions of the Rationals. Leonardo de Moura and Grant Olney Passmore. In Proceedings of the 24th International Conference on Automated Deduction (CADE) (2013).