

Title: Canonization for L^k -equivalence is hard

Author: Martin Grohe

Abstract: Let L^k be the k -variable fragment of first-order logic, for some $k \geq 3$. We prove that equivalence of finite structures in L^k has no P-computable canonization function unless $NP \subseteq P/poly$. The latter assumption is considered as highly unlikely, in particular it implies a collapse of the polynomial hierarchy.

The question for such a canonization function came up in the context of the problem of whether there is a logic for P. Slight modifications of our result yield answers to questions of Dawar, Lindell, and Weinstein and Otto concerning the inversion of the so-called L^k -invariants.