

Title: An Existential Locality Theorem

Author: Martin Grohe and Stefan Wöhrle

Abstract: Gaifman's locality theorem (1981) states that every first-order sentence is equivalent to a Boolean combination of sentences saying: There exist elements a_1, \dots, a_k that are far apart from one another, and each a_i satisfies some local condition described by a first-order formula. We prove that every existential first-order sentence is equivalent to a positive Boolean combination of sentences saying: There exist elements a_1, \dots, a_k that are far apart from one another, and each a_i satisfies some local condition described by an existential first-order formula.

We then show how a variant of this existential locality theorem can be applied to evaluate existential first-order sentences in certain finite structures, such as planar graphs or graphs of bounded degree, improving a result of Frick and Grohe (1999) for the special case of existential sentences.

April 6, 2001 - Martin Grohe