Native Cardinality Constraints: More Expressive, More Efficient Constraints

Jordyn C. Maglalang
Illinois Wesleyan University

Mark Liffiton, Faculty Advisor
Illinois Wesleyan University

Follow this and additional works at: https://digitalcommons.iwu.edu/jwprc

https://digitalcommons.iwu.edu/jwprc/2012/oralpres10/3

This Event is protected by copyright and/or related rights. It has been brought to you by Digital Commons @ IWU with permission from the rights-holder(s). You are free to use this material in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s) directly, unless additional rights are indicated by a Creative Commons license in the record and/or on the work itself. This material has been accepted for inclusion by faculty at Illinois Wesleyan University. For more information, please contact digitalcommons@iwu.edu.
©Copyright is owned by the author of this document.
NATIVE CARDINALITY CONSTRAINTS: MORE EXPRESSIVE, MORE EFFICIENT CONSTRAINTS

Jordyn C. Maglalang and Mark Liffiton*
Computer Science Department, Illinois Wesleyan University

Boolean cardinality constraints are commonly translated (encoded) into Boolean CNF clauses, a standard form of Boolean satisfiability, which can be solved using a standard SAT solving program. However, cardinality constraints are a simple generalization of clauses, and the complexity entailed by encoding them into CNF can be avoided by reasoning about cardinality constraints natively within a SAT solver. In this work, we compare the performance of two forms of native cardinality constraints against some of the best performing encodings from the literature. We designed a number of cardinality constraints including crafted, random and application problems, to be run in parallel on a cluster of computers. Native implementations substantially outperform CNF encodings on instances composed entirely of cardinality constraints, and instances that are mostly clauses with few cardinality constraints exhibit mixed results warranting further study.