

First Class Boolean Type in First-Order Theorem Proving and TPTP*

Evgeny Kotelnikov¹, Laura Kovács¹, and Andrei Voronkov²

¹ Chalmers University of Technology, Sweden
`evgenyk@chalmers.se`, `laura.kovacs@chalmers.se`

² University of Manchester, UK
`andrei@voronkov.com`

Abstract

Automated analysis and verification of programs requires proving properties in the combination of first-order theories of various data structures, such as integers, arrays, or lists. Automated first-order theorem provers face new requirements from reasoning-based analysis and verification, and their efficiency largely depends on how programs are translated into a collection of logical formulas capturing the program semantics. Recent extensions to the TPTP language, the input language of automated provers, support new programming languages features aimed to keep translation-sensitive semantics on the level of the theorem prover. For example, TPTP has recently been extended with if-then-else and let-in constructs over terms and formulas. In this paper we propose to extend TPTP with the built-in first class boolean type that can facilitate translation of programs with conditional statement and simplify the treatment of if-then-else and let-in constructs of TPTP. The treatment of a built-in first class boolean type can be efficiently implemented in the Vampire theorem prover without major changes in its architecture.

*This work was partially supported by the Swedish VR grant D0497701 and the Austrian research projects FWF S11410-N23 and WWTF ICT C-050.