Canonical Logic Programs are Succinctly Incomparable with Propositional Formulas

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Canonical logic programs (CP) is essentially a propositional non-monotonic logic [5]. In this paper we address the question of whether CP are succinctly incomparable [4, 2] with propositional formulas (PF). Our main result shows that the PARITY problem (i.e., asking whether a binary string has odd number 1’s), which can be polynomially represented in PF, only has exponential representations in CP. In other words, PARITY separates PF from CP. Simply speaking, this means that exponential size blowup is generally inevitable when translating a set of formulas in PF into an equivalent program in CP (without introducing new variables). Furthermore, since it has been shown by Lifschitz and Razborov [7] that there is also a problem which separates CP from PF (assuming $P \not\subseteq NC^1/poly$ [8]), it follows that the two formalisms are indeed succinctly incomparable. In addition, we show that PARITY separates logic programs with cardinality constraints and choice rules (CC) [9] from CP. Moreover, assuming $P \not\subseteq NC^1/poly$, CP and definite causal theories (DT) [3] are succinctly incomparable, two-valued programs (TV) [6] are strictly more succinct than CP and DT.

References