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Tutorials for “Automated Reasoning II”
Exercise sheet 3

Exercise 3.1:

The conditions of Thm. 1.9 are a bit stronger than necessary. Can you think about weaker conditions that are still sufficient to prove the theorem (with almost the same proof)?

Exercise 3.2:

Find a simple example that demonstrates that the deterministic Nelson-Open combination procedure remains incomplete for the combination of non-linear real arithmetic and EUF if we change the calculus in such a way that not only entailed equations but also entailed negated equations are propagated.

Exercise 3.3:

Use the CDCL(EUF) calculus to determine whether the following set of clauses is satisfiable or not:

$$f(a, b) \not\approx f(a', b') \quad (1)$$

$$g(g(c)) \not\approx c \quad (2)$$

$$g(d) \approx c \vee g(g(c)) \approx c \quad (3)$$

$$a \approx a' \vee c \approx d \quad (4)$$

$$b \approx b' \vee c \approx d \quad (5)$$

Exercise 3.4:

Normalization of the input literals is an important part of the preprocessing that takes place in an SMT solver before running the actual CDCL(\mathcal{T}) algorithm. How would you normalize literals in linear integer arithmetic?

Exercise 3.5:

In Sect. 2.9 of the Automated Reasoning I lecture notes, we have discussed several preprocessing and inprocessing techniques for CDCL. Which of these are still permitted in CDCL(\mathcal{T})?

Bring your solution (or solution attempt) to the tutorial on May 28.