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Tutorials for Decision Procedures
Exercise sheet 9

Exercise 1: Dutertre-de-Moura vs. Quantifier Elimination for $T_{\mathbb{Q}}$

Consider the following formula:

$$F : x_1 + 2x_2 > 1 \ \wedge \ 2x_1 + x_2 > 1 \ \wedge \ x_1 + x_2 < 1$$

(a) Apply the Dutertre-de-Moura algorithm to decide the $T_{\mathbb{Q}}$-satisfiability of F.

(b) Use quantifier elimination to decide the $T_{\mathbb{Q}}$-satisfiability of F.

Exercise 2: DP for quantifier-free T_{A}

Apply the decision procedure for quantifier-free T_{A} to decide *satisfiability* of the following Σ_{A}-formulae:

(a) $a\langle i \triangleleft e\rangle[j] = e \wedge j \neq i$

(b) $a\langle i \triangleleft e\rangle[j] = f \wedge a[j] \neq f$

(c) $a\langle i \triangleleft e\rangle[j] = f \wedge i = j \wedge e \neq f$

(d) $a\langle i \triangleleft e\rangle\langle j \triangleleft f\rangle[i] = g \wedge e \neq g$

(e) $a\langle i \triangleleft e\rangle\langle j \triangleleft f\rangle[i] = g \wedge e \neq g \wedge j \neq i$

Exercise 3: Decision Procedure for T_{A}

Apply the decision procedure for arrays to decide *validity* on the following Σ_{A}-formulae:

(a) $j = k \ \rightarrow \ \forall i.\ a\langle j \triangleleft v\rangle[i] = a\langle k \triangleleft v\rangle[i]$

(b) $(\forall i. a[i] = b[i]) \ \rightarrow \ (\forall i.\ a\langle j \triangleleft v\rangle[i] = b\langle j \triangleleft v\rangle[i])$

(c) $\exists j. a\langle i \triangleleft v\rangle[j] = v$

(d) $\forall j. a\langle i \triangleleft v\rangle[j] = v$