Ground Resolution Algorithm

Goal: Determine whether \( \{ \varphi_1, \ldots, \varphi_k \} \models \varphi \) holds

1. Let \( \xi \) be the formula \( \varphi_1 \land \ldots \land \varphi_k \land \neg \varphi \).

2. Transform \( \xi \) into Skolem normal form \( \forall X_1, \ldots, X_n \psi \).

3. Transform \( \psi \) into CNF resp. into clause set \( \mathcal{K}(\psi) \).

4. Choose an enumeration \( \{ K_1, K_2, \ldots \} \) of all ground instances of the clauses from \( \mathcal{K}(\psi) \).

5. Compute \( Res^*({K_1, K_2}) \), \( Res^*({K_1, K_2, K_3}) \), \ldots \) If one of these sets contains \( \Box \), stop and return “true”.

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Resolution for Predicate Logic

\{ \{ p(X), \neg q(X) \}, \{ \neg p(f(Y)) \}, \{ q(f(a)) \} \}

• use substitution \{ X/f(Y) \} for resolution of the first two clauses

• \( p(X)[X/f(Y)] = p(f(Y)) \) and \( \neg p(f(Y))[X/f(Y)] = \neg p(f(Y)) \)

• \{ X/f(Y) \} is most general unifier of \{ p(X), p(f(Y)) \}

• resolvent is \{ \neg q(X)[X/f(Y)] \} = \{ \neg q(f(Y)) \}