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Soundness and completness theorem:

The set S of clauses is inconsistent $\Leftrightarrow S \vdash^{lin}_{Res} \square$

The backtracking algorithm stops in two cases:

1) the empty clause was derived and the conclusion will be that S is inconsistent

2) for the top clause all the possible side clauses were used but the empty set was not derived, then we conclude that the set S is consistent

U is a theorem $\Leftrightarrow CNF(\neg U) \vdash_{Res} \square$

Linear resolution is a refutation method because it model the "reductio ad absurdum" and it uses the negation of the formula to prove something.

$U = (t \to \neg s \vee r) \to (t \to \neg s \wedge r)$

$\neg U = \neg((t \to \neg s \vee r) \to (t \to \neg s \wedge r))$

We change $X \to Y$ with $\neg X \vee Y$

$\equiv \neg((\neg t \vee (\neg s \vee r)) \to (\neg t \vee (\neg s \wedge r))$

$\equiv \neg(\neg(\neg t \vee (\neg s \vee r)) \vee (\neg t \vee (\neg s \wedge r)))$

We apply De Morgan's laws

$\equiv (\neg t \vee (\neg s \vee r)) \wedge \neg(\neg t \vee (\neg s \wedge r))$

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$\equiv (\neg t \vee (\neg s \vee r)) \wedge (t \wedge (s \vee \neg r))$

$\equiv (\neg t \vee \neg s \vee r) \wedge t \wedge (s \vee \neg r)$

$S = \{\neg t \vee \neg s \vee r, t, s \vee \neg r\}$

$C_1 = \neg t \vee \neg s \vee r$

$C_2 = t$

$C_3 = s \vee \neg r$

We use C_1 as a top clause

I. C_2 is used as a side clause for C_1

$C_4 = Res_t(C_1 C_2) = \neg s \vee r$

$C_5 = Res_s(C_4, C_3) = \neg r \vee r \equiv T$ (tautology)

process blocked

II. We use C_3 as a side clause for C_1

$C_6 = Res_s(C_1, C_3) = \neg t \vee r \vee \neg r \equiv T$ (tautology)

The search process is blocked

A complete linear derivation process search was performed but $\square$ was not derived $\Rightarrow$ S is a consistent set $\Rightarrow$

$\Rightarrow$ U is not a theorem