- BS(LRA) LMA integer + rat variable

timed automata $\rightsquigarrow$ time

$$x<y \;\|\; Rain(x) \longrightarrow Sun(y)$$

integer programs

ℓ_1 while $(x<y)$ {

ℓ_2 $x = y + 1$

ℓ_3 }

$$x<y \;\|\; P_{\ell_1}(x,y) \longrightarrow P_{\ell_2}(x,y)$$

$$x \geq y \;\|\; P_{\ell_1}(x,y) \longrightarrow P_{\ell_4}(x,y)$$

$$z = y+1 \;\|\; P_{\ell_2}(x,y) \longrightarrow P_{\ell_3}(z,y)$$

$$\|\; P_{\ell_3}(x,y) \longrightarrow P_{\ell_1}(x,y)$$

Knowledge Representation

→ EL, ALC,

Web-Language

→ ECU   Electronical Control Unit

Modelling a real World ECU

for a car engine

$$\underbrace{y = x+1,\ z > y \ \|\ \underbrace{R(x,y) \to R(x,z)}_{\mathrm{I}}}_{\mathrm{II}}$$

I similar to NRCL

$R(x, b)$

$\neg R(a, y)$

$\Omega = \{a, b\}$

$B = \{a\}$

$\Rightarrow^{\text{Propagate}}_{2}$ $\left(\left[R(a,b)^{R(x,b)\{x \to a\}} , \neg R(a,a)^{\neg R(a,y)\{y \to a\}} \right], \ldots \right)$

SCL

Grow: extend B

Just Gen $B = \{a, b\}$

$\Rightarrow^{\text{Propagate}}$ $\left(\left[R(a,b)^{R(x,b)\{x \to a\}} \right], \ldots \right)$

$\Rightarrow^{\text{Conflict}}$ $\left(\left[\quad \right], , \neg R(a,b)^{R(a,y)\{y \to b\}} \right)$

$\Rightarrow^{\text{Res}}$ $(\varepsilon, \_\_\_\_, \bot)$

$2: \quad \neg P(x_1, x_2, x_3, 0) \vee P(x_1, x_2, x_3, 1)$

$3: \quad \neg P(x_1, x_2, 0, 1) \vee P(x_1, x_2, 1, 0) \quad \|$

$7: \quad \neg P(x_1, x_2, 0, 0) \vee P(x_1, x_2, 1, 0)$

$\Rightarrow^{\text{Decide } 2} ([P(1,1,0,0)^1, \neg P(1,1,1,0)^2]; N; \emptyset; \{0,1\}; 2; T)$

$\Rightarrow^{\text{Prop}} ([P(1,1,0,0)^1, \neg P(1,1,1,0)^2, \neg P(1,1,0,1)^{(3): \{x_1, x_2 \to 1\}}; \ldots)$

$\Rightarrow^{\text{Conflict}} (\;\; '' \;\; ; \ldots ; (2): \{x_1 \to 1, x_2 \to 1, x_3 \to 0\})$

$\Rightarrow^{\text{Resolve}}$ — $7:$

Proof $\Rightarrow^{\text{Conflict}} (M''; N; U; B; k; C_0 \cdot \sigma_0)$

$\Rightarrow^{\{\text{Skip}, \text{Fac}, \text{Res}\}^*}_{\ }$ $(M, K^{i+1}, M'; N; U; B; k; C_n \cdot \sigma_n)$

$\Rightarrow^{\text{Backtrack}} (M, L\sigma^{(D \vee L)\cdot\sigma}; N; U \cup \{D \vee L\}; B; i; \top)$

$C_n = D \vee L$

$C_n\sigma$ is non-redundant

(i) $C_n\sigma$ is false under $[M''], [M, K^{i+1}, M']$ (well-founded, rel. lemma)

assume $C_n\sigma$ is redundant

$N' \subseteq gnd((\Sigma, \mathcal{B}, \top), N \cup U)^{\prec C_n\sigma}$ and $N' \models C_n\sigma$

$M'' \not\models N'$ otherwise $M'' \models C_n\sigma$ ↯

there is a clause $C' \in N'$, $C' \prec C_n\sigma$, $M'' \models \neg C'$

we have to show $C' \prec C_0 \cdot \sigma_0$ because every Res step with max literal

↯ $C_0 \cdot \sigma_0$ redundant