Problem jankovAxiom

Input formula: $\neg a \vee \neg\neg a$

Logic: GL

Proved

Clauses in R_0 (7) are defined at the end of the document

Implication clauses in X_0 (2):

$\lambda_0 \; = \; (\tilde{p}_0 \to \bot) \to \tilde{p}_1$

$\lambda_1 \; = \; (a \to \bot) \to \tilde{p}_0$

Substitution

$\tilde{p}_0 \;\mapsto\; \neg a$

$\tilde{p}_1 \;\mapsto\; \neg\neg a$

$\tilde{p}_2 \;\mapsto\; \neg a \vee \neg\neg a$

$\tilde{g} \;\mapsto\;$ input formula

Start

(1) $R_0 \vdash_{\mathrm{c}} \tilde{g}$?

No($\emptyset$)

New world: w_0

W		λ s.t. $w \not\triangleright_W \lambda$
w_0	$\emptyset$	λ_0, λ_1

Selected: $\langle\, w_0\,,\, \lambda_0 \;=\; (\tilde{p}_0 \to \bot) \to \tilde{p}_1 \,\rangle$

(2) $R_0,\, w_0,\, \tilde{p}_0 \vdash_{\mathrm{c}} \bot$?

No($\{\, \tilde{g},\, \tilde{p}_0,\, \tilde{p}_2 \,\}$)

New world: w_1

W		λ s.t. $w \not\triangleright_W \lambda$
w_1	$\tilde{g}$, $\tilde{p}_0$, $\tilde{p}_2$	$\emptyset$
w_0	$\emptyset$	λ_1

Selected: $\langle\, w_0\,,\, \lambda_1 \;=\; (a \to \bot) \to \tilde{p}_0 \,\rangle$

(3) $R_0,\, w_0,\, a \vdash_{\mathrm{c}} \bot$?

No($\{\, a,\, \tilde{g},\, \tilde{p}_1,\, \tilde{p}_2 \,\}$)

New world: w_2

W		λ s.t. $w \not\triangleright_W \lambda$
w_2	a, $\tilde{g}$, $\tilde{p}_1$, $\tilde{p}_2$	$\emptyset$
w_1	$\tilde{g}$, $\tilde{p}_0$, $\tilde{p}_2$	$\emptyset$
w_0	$\emptyset$	$\emptyset$

Check the obtained model mod0 (see file `mod0`.png)

Semantic failure

Learned axiom:

$(a \to \neg a) \vee (\neg a \to a)$

New clauses after clausification (6):

$\tilde{p}_3 \to \tilde{p}_4$

$a \to \tilde{p}_5$

$\tilde{p}_3 \wedge \tilde{p}_5 \to a$

$a \wedge \tilde{p}_4 \to \tilde{p}_3$

$a \wedge \tilde{p}_3 \to \bot$

$\tilde{p}_4 \vee \tilde{p}_5$

New implication clauses after clausifications (3):

$\lambda_4 \ = \ (\tilde{p}_3 \to a) \to \tilde{p}_5$

$\lambda_3 \ = \ (a \to \bot) \to \tilde{p}_3$

$\lambda_2 \ = \ (a \to \tilde{p}_3) \to \tilde{p}_4$

$R_1 \ = \ R_0$ + new clauses

Substitution

$\tilde{p}_0 \ \mapsto \ \neg a$

$\tilde{p}_1 \ \mapsto \ \neg\neg a$

$\tilde{p}_2 \ \mapsto \ \neg a \vee \neg\neg a$

$\tilde{p}_3 \ \mapsto \ \neg a$

$\tilde{p}_4 \ \mapsto \ a \to \neg a$

$\tilde{p}_5 \ \mapsto \ \neg a \to a$

$\tilde{g} \ \mapsto$ input formula

Learned axiom with the substitution applied

$(a \to \neg a) \vee (\neg a \to a)$

Restart 1 (semantic)

(4) $R_1 \vdash_{\mathrm{c}} \tilde{g}$?

No($\{\tilde{p}_4\}$)

New world: w_3

W		λ s.t. $w \not\triangleright_W \lambda$
w_3	$\tilde{p}_4$	λ_0, λ_1, λ_3, λ_4

Selected: $\langle\, w_3\,,\ \lambda_0 \ = \ (\tilde{p}_0 \to \bot) \to \tilde{p}_1 \,\rangle$

(5) $R_1,\, w_3,\, \tilde{p}_0 \vdash_{\mathrm{c}} \bot$?

No($\{\tilde{g},\, \tilde{p}_0,\, \tilde{p}_2,\, \tilde{p}_4\}$)

New world: w_4

W		λ s.t. $w \not\triangleright_W \lambda$
w_4	$\tilde{g}$, $\tilde{p}_0$, $\tilde{p}_2$, $\tilde{p}_4$	λ_3, λ_4
w_3	$\tilde{p}_4$	λ_1, λ_3, λ_4

Selected: $\langle\, w_4\,,\ \lambda_4 \ = \ (\tilde{p}_3 \to a) \to \tilde{p}_5 \,\rangle$

(6) $R_1,\, w_4,\, \tilde{p}_3 \vdash_{\mathrm{c}} a$?

No($\{\tilde{g},\, \tilde{p}_0,\, \tilde{p}_2,\, \tilde{p}_3,\, \tilde{p}_4\}$)

New world: w_5

W		λ s.t. $w \not\triangleright_W \lambda$
w_5	$\tilde{g}$, $\tilde{p}_0$, $\tilde{p}_2$, $\tilde{p}_3$, $\tilde{p}_4$	$\emptyset$
w_4	$\tilde{g}$, $\tilde{p}_0$, $\tilde{p}_2$, $\tilde{p}_4$	λ_3
w_3	$\tilde{p}_4$	λ_1, λ_3

Selected: $\langle\, w_4\,,\ \lambda_3 \ = \ (a \to \bot) \to \tilde{p}_3 \,\rangle$

(7) $R_1,\, w_4,\, a \vdash_{\mathrm{c}} \bot$?

Yes($\{a,\, \tilde{p}_0\}$)

$R_1,\, a,\, \tilde{p}_0 \vdash_{\mathrm{c}} \bot$

Learned basic clause: $\tilde{p}_0 \to \tilde{p}_3$

$R_2 \ = \ R_1 + \text{learned basic clause}$

Restart 2 (basic)

(8) $R_2 \vdash_c \tilde{g}$?

No($\{ a, \tilde{p}_5 \}$)

New world: w_6

W		λ s.t. $w \not\triangleright_W \lambda$
w_6	$a, \tilde{p}_5$	λ_0

Selected: $\langle w_6 , \lambda_0 = (\tilde{p}_0 \to \bot) \to \tilde{p}_1 \rangle$

(9) $R_2, w_6, \tilde{p}_0 \vdash_c \bot$?

Yes($\{ a, \tilde{p}_0 \}$)

$R_2, a, \tilde{p}_0 \vdash_c \bot$

Learned basic clause: $a \to \tilde{p}_1$

$R_3 = R_2 +$ learned basic clause

Restart 3 (basic)

(10) $R_3 \vdash_c \tilde{g}$?

No($\{ \tilde{p}_3, \tilde{p}_4 \}$)

New world: w_7

W		λ s.t. $w \not\triangleright_W \lambda$
w_7	$\tilde{p}_3, \tilde{p}_4$	λ_0, λ_1

Selected: $\langle w_7 , \lambda_0 = (\tilde{p}_0 \to \bot) \to \tilde{p}_1 \rangle$

(11) $R_3, w_7, \tilde{p}_0 \vdash_c \bot$?

No($\{ \tilde{g}, \tilde{p}_0, \tilde{p}_2, \tilde{p}_3, \tilde{p}_4 \}$)

New world: w_8

W		λ s.t. $w \not\triangleright_W \lambda$
w_8	$\tilde{g}, \tilde{p}_0, \tilde{p}_2, \tilde{p}_3, \tilde{p}_4$	$\emptyset$
w_7	$\tilde{p}_3, \tilde{p}_4$	λ_1

Selected: $\langle w_7 , \lambda_1 = (a \to \bot) \to \tilde{p}_0 \rangle$

(12) $R_3, w_7, a \vdash_c \bot$?

Yes($\{ a, \tilde{p}_3 \}$)

$R_3, a, \tilde{p}_3 \vdash_c \bot$

Learned basic clause: $\tilde{p}_3 \to \tilde{p}_0$

$R_4 = R_3 +$ learned basic clause

Restart 4 (basic)

(13) $R_4 \vdash_{\mathrm{c}} \tilde{g}$?

No($\{\tilde{p}_5\}$)

New world: w_9

W		λ s.t. $w \not\triangleright_W \lambda$
w_9	$\tilde{p}_5$	$\lambda_0, \lambda_1, \lambda_2, \lambda_3$

Selected: $\langle\, w_9\,,\ \lambda_0 \;=\; (\tilde{p}_0 \to \bot) \to \tilde{p}_1 \,\rangle$

(14) $R_4, w_9, \tilde{p}_0 \vdash_{\mathrm{c}} \bot$?

Yes($\{\tilde{p}_0, \tilde{p}_5\}$)

$R_4, \tilde{p}_0, \tilde{p}_5 \vdash_{\mathrm{c}} \bot$

Learned basic clause: $\tilde{p}_5 \to \tilde{p}_1$

$R_5 \;=\; R_4 +$ learned basic clause

Restart 5 (basic)

(15) $R_5 \vdash_{\mathrm{c}} \tilde{g}$?

No($\{\tilde{p}_4\}$)

New world: w_{10}

W		λ s.t. $w \not\triangleright_W \lambda$
w_{10}	$\tilde{p}_4$	$\lambda_0, \lambda_1, \lambda_3, \lambda_4$

Selected: $\langle\, w_{10}\,,\ \lambda_0 \;=\; (\tilde{p}_0 \to \bot) \to \tilde{p}_1 \,\rangle$

(16) $R_5, w_{10}, \tilde{p}_0 \vdash_{\mathrm{c}} \bot$?

No($\{\tilde{g}, \tilde{p}_0, \tilde{p}_2, \tilde{p}_3, \tilde{p}_4\}$)

New world: w_{11}

W		λ s.t. $w \not\triangleright_W \lambda$
w_{11}	$\tilde{g}, \tilde{p}_0, \tilde{p}_2, \tilde{p}_3, \tilde{p}_4$	$\emptyset$
w_{10}	$\tilde{p}_4$	λ_1, λ_3

Selected: $\langle\, w_{10}\,,\ \lambda_1 \;=\; (a \to \bot) \to \tilde{p}_0 \,\rangle$

(17) $R_5, w_{10}, a \vdash_{\mathrm{c}} \bot$?

Yes($\{a, \tilde{p}_4\}$)

$R_5, a, \tilde{p}_4 \vdash_{\mathrm{c}} \bot$

Learned basic clause: $\tilde{p}_4 \to \tilde{p}_0$

$R_6 \;=\; R_5 +$ learned basic clause

Restart 6 (basic)

(18) $R_6 \vdash_{\mathrm{c}} \tilde{g}$?

Yes($\emptyset$)

$R_6 \vdash_{\mathrm{c}} \tilde{g}$

Goal proved

Problem description

Restarts: 6 (5 basic, 1 semantic)

Learned axioms (1):

$(a \to \neg a) \vee (\neg a \to a)$

Flat clauses R_0 (7):

$\tilde{g} \to \tilde{p}_2$

$\tilde{p}_0 \to \tilde{p}_2$

$a \wedge \tilde{p}_0 \to \bot$

$\tilde{p}_1 \to \tilde{p}_2$

$\tilde{p}_0 \wedge \tilde{p}_1 \to \bot$

$\tilde{p}_2 \to \tilde{g}$

$\tilde{p}_2 \to \tilde{p}_0 \vee \tilde{p}_1$

Implication clauses X_0 (2):

$\lambda_0 \; = \; (\tilde{p}_0 \to \bot) \to \tilde{p}_1$

$\lambda_1 \; = \; (a \to \bot) \to \tilde{p}_0$

Clauses added in basic restarts (5):

$\tilde{p}_0 \to \tilde{p}_3$

$a \to \tilde{p}_1$

$\tilde{p}_3 \to \tilde{p}_0$

$\tilde{p}_5 \to \tilde{p}_1$

$\tilde{p}_4 \to \tilde{p}_0$

Clauses added in semantic restarts (6):

$\tilde{p}_3 \to \tilde{p}_4$

$a \to \tilde{p}_5$

$\tilde{p}_3 \wedge \tilde{p}_5 \to a$

$a \wedge \tilde{p}_4 \to \tilde{p}_3$

$a \wedge \tilde{p}_3 \to \bot$

$\tilde{p}_4 \vee \tilde{p}_5$

Implication clauses learned in semantic restarts (3):

$\lambda_2 \;=\; (a \to \tilde{p}_3) \to \tilde{p}_4$

$\lambda_3 \;=\; (a \to \bot) \to \tilde{p}_3$

$\lambda_4 \;=\; (\tilde{p}_3 \to a) \to \tilde{p}_5$

Substitution

$\tilde{p}_0 \;\mapsto\; \neg a$

$\tilde{p}_1 \;\mapsto\; \neg\neg a$

$\tilde{p}_2 \;\mapsto\; \neg a \vee \neg\neg a$

$\tilde{p}_3 \;\mapsto\; \neg a$

$\tilde{p}_4 \;\mapsto\; a \to \neg a$

$\tilde{p}_5 \;\mapsto\; \neg a \to a$

$\tilde{g} \;\mapsto\;$ input formula