

UNICORNO

KB: Unicorno mitico \Rightarrow immortale

\neg mitico \Rightarrow mammifero \wedge mortale

unicorno \Leftrightarrow (immortale \vee mammifero) \Rightarrow corna

unicorno magico \Leftarrow ha le corna

a) Formalizzazione:

$$M_i \Rightarrow \neg M_o$$

$$\neg M_i \Rightarrow M_m \wedge M_o$$

$$\neg M_o \vee M_m \Rightarrow C$$

$$C \Rightarrow M_a$$

b) TT-Entails:

Th KB \models mitico, KB \models magico, KB \models corna

M_i	M_o	M_m	C	M_a
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T	F	?	T	T
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F	T	T	T	T
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KB non garantisce M_i ,
garantisce M_a , C .

c) Trasformazione in clausole:

$$\{ \neg M_i, \neg M_o \}$$

$$\{ M_i, M_m \}, \{ M_i, M_o \}$$

$$\{ M_o, C \}, \{ \neg M_m, C \}$$

$$\{ \neg C, M_a \}$$

d) DPLL

KB $\models M_i$

$$\{ \neg M_i, \neg M_o \}, \{ M_i, M_m \}, \{ M_i, M_o \}, \{ M_o, C \}, \{ \neg M_m, C \}, \{ \neg C, M_a \}, \{ \neg M_i \}$$

7 unitaire:

$$\{T, \neg M_0\}, \{F, M_m\}, \{F, M_0\}, \{M_0, C_0\}, \{\neg M_m, C_0\}, \{C_0, M_a\}$$

1 unitaire:

$$\{F, M_m\}, \{F, M_0\}, \{M_0, C_0\}, \{\neg M_m, C_0\}, \{\neg C_0, M_a\}$$

$$M_0 = T:$$

$$\{F, M_m\}, \{\neg M_m, C_0\}, \{\neg C_0, M_a\}$$

$$M_a = T$$

$$\{F, M_m\}, \{\neg M_m, C_0\}$$

$$C_0 = T, M_m = T$$

T

Satisfiable

$$\Rightarrow KB \models M_i$$

$$KB \models M_a$$

$$\{\neg M_i, \neg M_0\}, \{M_i, M_m\}, \{M_i, M_0\}, \{M_0, C_0\}, \{\neg M_m, C_0\}, \{C_0, M_a\}, \{M_a\}$$

7 unitaire:

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$$\{\neg C_0\}$$

$$C_0 = F:$$

$$\{\neg M_i, \neg M_0\}, \{M_i, M_m\}, \{M_i, M_0\}, \{M_0\}, \{\neg M_m\}$$

4, 5 unitaire:

$$\{\neg M_i\}, \{M_i\}$$

Non satisfiable

$$KB \models M_a$$

e) WALKSAT:

$$KB \models C_0$$

$\{ \neg Hi, \neg Mo \}, \{ Hi, Mm \}, \{ Hi, Mo \}, \{ Mo, Co \}, \{ \neg Mm, Co \}, \{ Co, Ma \}, \{ Co \}$

$Co = T, Ma = F, Hi = F, Mm = F, Mo = F$

T F F T T F T

Modifico 3:

Ribalto Hi

T T T T T F T

Modifico 6:

Ribalto Ma
T

$Co = T, Ma = T, Hi = T, Mm = F, Mo = F$

$\Rightarrow KB \neq Co$

f) PROP:

$KB \models Hi$

$\{ \neg Hi, \neg Mo \}, \{ Hi, Mm \}, \{ Hi, Mo \}, \{ Mo, Co \}, \{ \neg Mm, Co \}, \{ \neg Co, Ma \}, \{ \neg Ma \}$

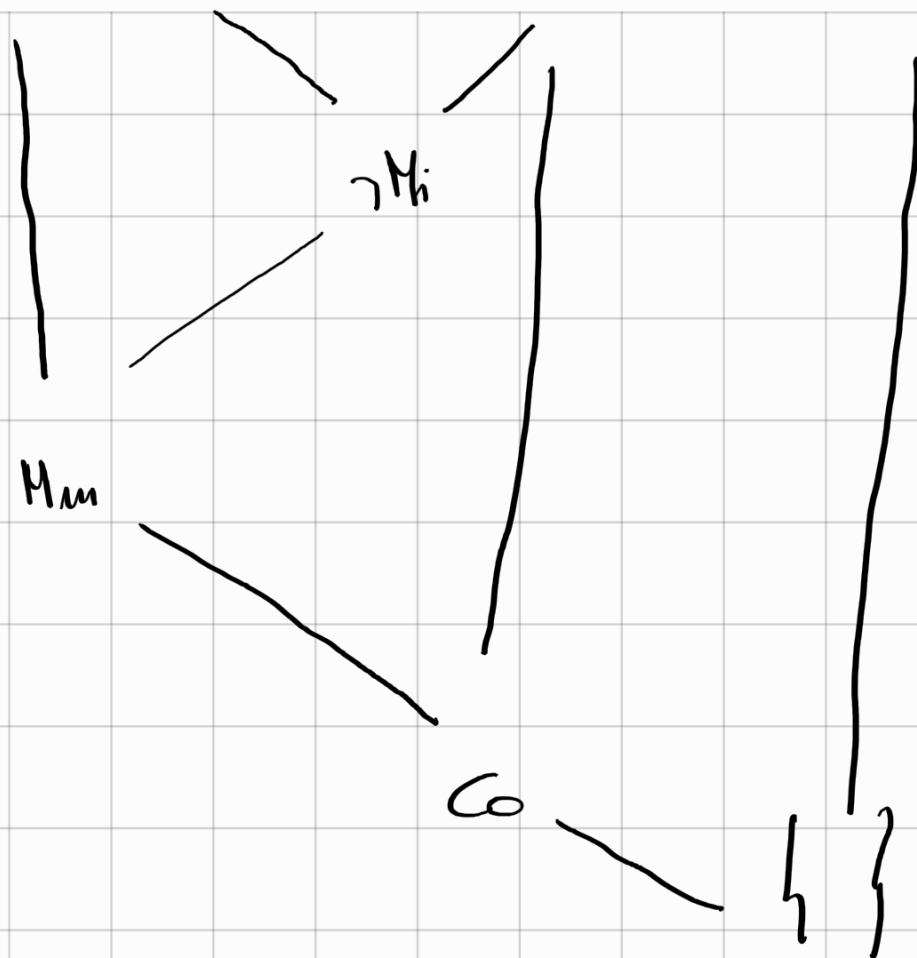
Tautologie

$KB \models Ma$

$\{ \neg Hi, \neg Mo \}, \{ Hi, Mm \}, \{ Hi, Mo \}, \{ Mo, Co \}, \{ \neg Mm, Co \}, \{ \neg Co, Ma \}, \{ \neg Ma \}$

~~Diagram showing a path from $\{ \neg Hi, \neg Mo \}$ to $\{ \neg Ma \}$ via $\{ \neg Co, Ma \}$ and $\{ \neg Mm, Co \}$.~~

Diagram showing a path from $\{ \neg Hi, \neg Mo \}$ to $\{ \neg Ma \}$ via $\{ \neg Co, Ma \}$ and $\{ \neg Mm, Co \}$, with Mo and $\neg Co$ indicated.



UNIFICATIONE

a) $P(A, B, B), P(x, y, z)$

$\text{unify}(P(A, B, B), P(x, y, z))$

'P', 'P'

OK

'A', 'x', $\{x/A\}$

'y', 'B', $\{y/B\}$

'z', 'B', $\{z/B\}$

$P(A, B, B), P(A, B, B)$ OK

MARY ANA JOHN

Hp Tutti sanno chi sono queste

John Anna Mary

The Mary Anna John

FOL: $\forall x. \forall y. (\exists z. \text{Anna}(y, z)) \Rightarrow \text{Anna}(x, y)$
 $\text{Anna}(\text{John}, \text{Mary})$

Clause: $\forall x. \forall y. (\exists z. \text{Anna}(y, z)) \Rightarrow \text{Anna}(x, y)$
 $\Leftrightarrow \forall x. \forall y. \forall z. \neg \text{Anna}(y, z) \vee \text{Anna}(x, y)$
 $\{ \neg \text{Anna}(y, z), \text{Anna}(x, y) \}$
 $\{ \text{Anna}(\text{John}, \text{Mary}) \}$

Risolve per refutazione:

$\{ \neg \text{Anna}(y, z), \text{Anna}(x, y) \} \quad \{ \text{Anna}(\text{John}, \text{Mary}) \} \quad \{ \neg \text{Anna}(\text{Mary}, \text{John}) \}$
 $\swarrow \quad \searrow \quad \swarrow \quad \searrow$
 $y/\text{John}, z/\text{Mary} \quad x/\text{Mary}$
 $\text{Anna}(x, \text{John})$
 $\{ \}$
 $\Rightarrow \text{KB} \neq \text{Anna}(\text{Mary}, \text{John})$