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CPSC 5610 – AI

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Assignment 2 (Problem 3)

Propositional Logical Inference by Resolution

If the unicorn is mythical, then it is immortal, but if it is not mythical, then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned.

Assign propositional symbols as follows:

- MY – the unicorn is mythical
- IM – the unicorn is immortal
- MO – the unicorn is mortal
- MA – the unicorn is a mammal
- HO – the unicorn is horned

Axioms

1. $MY \Rightarrow IM$
2. $\neg MY \Rightarrow (MO \wedge MA)$
3. $(IM \vee MA) \Rightarrow HO$

Goal Statement

4. The unicorn is magical if it is horned. (HO)

Converting to CNF

(Axiom 1): $MY \Rightarrow IM$

C1: $\neg MY \vee IM$ --Definition of $\Rightarrow$; this is a disjunction

(Axiom 2): $\neg MY \Rightarrow (MO \wedge MA)$

$\neg (\neg MY) \vee (MO \wedge MA)$ --Definition of $\Rightarrow$

$MY \vee (MO \wedge MA)$ --Double negation elimination

$(MY \vee MO) \wedge (MY \vee MA)$ --Distribute $\vee$ over $\wedge$; have two conjucts

C2: $(MY \vee MO)$

C3: $(MY \vee MA)$

(Axiom 3): $(IM \vee MA) \Rightarrow HO$

$\neg (IM \vee MA) \vee HO$ --Definition of $\Rightarrow$

$(\neg IM \wedge \neg MA) \vee HO$ --Move negation to propositions

$(\neg IM \vee HO) \wedge (\neg MA \vee HO)$ --Distribute $\vee$ over $\wedge$; have two conjucts

C4: ($\neg$ IM $\vee$ HO)

C5: ($\neg$ MA $\vee$ HO)

(4 Goal): HO

NG1: $\neg$ HO --Negate the goal

Resolution Proof

Clause #	Clause	Derivation
C1	$\neg$ MY $\vee$ IM	
C2	(MY $\vee$ MO)	
C3	(MY $\vee$ MA)	
C4	($\neg$ IM $\vee$ HO)	
C5	($\neg$ MA $\vee$ HO)	
NG1	$\neg$ HO	
1	$\neg$ IM	NG1 + C4
2	$\neg$ MY	1 + C1
3	MA	2 + C3
4	HO	3 + C5
5	[ ]	4 + NG1

We can say that the goal, the unicorn is horned, follows from axioms 1 through 3.